Illinois Solar for All
Comments on Site Suitability Guidelines

Central Road Energy

My primary issues are with the ground mount requirements. In particular, it seems to me to be unnecessary, costly, and burdensome to require PE certification of the Civil Assessment (CA) prior to awarding a REC contract.

The majority of the issues addressed in the draft CA could be performed by a layperson with minimal experience in development. This includes searching publicly available databases such as FIRM and requesting reports from the IDNR/FWS. For our developments, we perform a preliminary analysis of wetland and floodplain issues through government-provided, publicly-available GIS systems which include the Fish and Wildlife Service (FWS) online mapping tool and the FEMA Flood Map Service Center. For our McHenry County CS project, we used McHenry County's GIS tool (http://www.mchenrycountygis.org/Athena/) that includes:

- soil geographic data developed by the National Cooperative Soil Survey;
- Flood Insurance Rate Map with flood zones determined by FEMA;
- Advanced Identification of Wetlands program wetlands (i.e., ADID Wetlands); and
- topography

It should be noted that a majority of the site suitability requirements for ground mount systems are very likely satisfied through local non-ministerial permitting, a requirement for submittal of a project to the ILSfA program. For example, as part of our Conditional Use Permitting for our McHenry County project, we performed a wetland and floodplain delineation and a drain tile investigation and applied for and received an EcoCat report and a Natural Resources Information Report. The Natural Resources Report, prepared by the McHenry-Lake County Soil & Water Conservation District, included evaluations of:

- Archeological/Cultural Resources
- Ecologically Sensitive Areas
- Woodlands
- Geologic Information
- Aquifer Sensitivity and Recharge
- Soil leachability, permeability, and building limitations
- Soil Erosion and Sediment Control
- Prime Farmland Soils and Agricultural Areas
- Land Use Plans
- Drainage, Runoff, and Floodplain Information and Regulations
- Wetland Information and Regulations
- Hydric Soils

Many of these evaluations can very much affect the "buildability" of a project but are not included in the current draft site suitability guidelines.

We feel that a PE stamped evaluation of geotechnical and foundational evaluations are rarely necessary for development prior to REC contracting. For example, the McHenry County CS project is located in what is currently a fallow field. Consequently, as part of our due diligence, we performed only a preliminary review of soils and geotechnical conditionals to confirm that standard racking and foundation systems would work at the site. The detailed geotechnical evaluation and structural design typically occurs during the acquisition of ministerial permits after REC contracting. An alternative would be to require the applicant to identify any unique site conditions that might necessitate out-of-the-ordinary anchoring for ground mount systems. For example, if the site was a landfill, we would want to know soil conditions, cap thickness, and any regulatory restraints that might limit our rack anchoring options and confirm that the remaining anchoring options can meet local, state, and federal wind and snow load requirements.

Please also note that the presence of wetlands does not eliminate a property from consideration for development. Our McHenry County CS project property has a few small wetlands on-site. As required by McHenry County, Central Road Energy will mitigate any wetland impacts from this development by:

- creating new wetlands or enhancing degraded wetlands on the project site or on an off-site property within the same watershed as the wetland impacts;
- purchasing credits from a mitigation bank; or
- using the SMC Wetland Restoration Fund (WRF), which provides for fee-in-lieu of mitigation when no mitigation bank credits are available in the watershed.

Bottom line - I don't think it necessary to require any more ground mount site suitability demonstration than the ABP requires for their ground mount REC contract applications – Interconnect agreement, a demonstration of property control, and non-ministerial permits. The ILSfA program will require a deposit when the REC contract is awarded. The developer takes the risk that the system will be unbuildable because of some ministerial permitting issue including wetlands/geotechnical/floodplain. If the project fails to be built, the developer is out the deposit money. The ILSfA program has no money at risk during construction because no money is paid out to the project until the project is energized.

I think the suitability guidelines could be used to help rank projects – i.e., the more of the information that they can provide with regards to the buildability of the project, the more likely they should be to get a REC contract. At the very least, the site suitability guidelines as they now exist for ground mount could be utilized as an educational brochure for people that want to develop under the program.

I am not as concerned about the roof top portion of the site suitability guidelines. Central Road Energy will not develop small rooftop DG under the ILSfA program unless the home/building is new construction and is designed and constructed for solar installation. For example, we are interested in working with community organizations that construct low income housing. We would work with them to design the home's roof and electrical systems to support solar installations thus meeting the applicable site suitability guidelines.

On a separate but related note, I am struggling through the Approved Vendor Application and should have it ready to submit in the next week or so. Very much looking forward to working with Elevate to get that squared away!

Jay Corgiat, Ph.D.
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Illinois Solar for All
Comments on Site Suitability Guidelines

CertaSun

Dear Administrator:

Certasun is considering applying to be an Approved Vendor under Illinois Solar For All for Distributed Generation (1-4 unit buildings). We would like to provide a few brief comments on the Draft Site Suitability Guidelines.

Page 3 of the Guidelines states "Approved Vendors, as well as their Designees, installers and subcontractors, will follow these assessment protocols and ensure all requirements are net *before* contracting with participants." (Italics added.) We do not believe requiring a site assessment as comprehensive as that described in the Guidelines prior a sale of a residential system is financially viable. In fact, no residential solar market in the U.S. we know about operates this way. Only a fraction of sales opportunities turn into contracts, so to require an assessment before contract would add significant extra cost.

However, we understand and appreciate the administrator's goal of protecting consumers against surprise expenses. We would like to propose an alternative that we believe protects customers while avoiding unnecessary cost: allow homeowners to cancel their contract without penalty if the site assessment reveals remedial work the customer does not want to undertake. This would have three benefits. First, it would provide incentives for Approved Vendors to have their salespeople to avoid homes with obviously extensive problems. Second, it would allow detailed site assessments to be performed only on homes where solar is actually likely to be installed. Finally, it would allow those assessments to be conducted by a construction professional rather than a salesperson.

Can you please advise if this would be permissible to the Administrator for 1-4 unit residential distributed generation?

Sincerely,

Josh Lutton

Josh Lutton
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Illinois Solar for All
Comments on Site Suitability Guidelines

Melink Solar

Please see our comments for the Illinois Solar For All, Site Suitability Guidelines:

We submit that under the Ground Mounted Systems section, that a complete Civil Assessment be removed as a requirement in Part 1 of the project application. Our recommendation would be to make a complete Civil Assessment a requirement before construction commences. We also recommend that the requirement around having an executed interconnection agreement should be changed to read an executed interconnection agreement or proof that the project was forced to withdraw from the interconnection queue. Finally, we recommend changing the language stating documentation of all local permitting for systems 25 kW or larger, to documentation of having applied for the special permit, where applicable and a having all applicable local permits in hand before construction.

Jeremy Chapman
Partner
Melink Solar Development
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Illinois Solar for All
Comments on Site Suitability Guidelines

Ruyle Mechanical Services Inc

Hello and thank you for this opportunity to provide comments to the Site Suitability Guidelines.

I have suggestions concerning the Ground Mount section of the Guidelines. The section reads as follows:

A completed Civil Assessment must be presented, stamped and submitted by a civil engineer licensed to practice in the Authority Having Jurisdiction, including:
- A completed Geotechnical Report
- A completed Structural Report, including foundation requirements for proposed ballast type or tracking type system to be stamped and submitted by a structural engineer licensed to practice in the Authority Having Jurisdiction.
- Flood Insurance Rate Map (FIRM) review through the Federal Emergency Management Agency (FEMA) to confirm lack of flooding risk for the site. If the FIRM is not available for the site, provide the flood risk report through the External Data Request report.
- Confirmation that the ground mounted system does not intrude on protected wetlands. Provide report from Fish and Wildlife Service (FWS) online mapping tool.
- Completed Ecological Compliance Technical Tool Report (EcoCAT)

Additional requirements for Part I project application include the full system design parameters and equipment, shading study, as well as the executed interconnection agreement and documentation of all local permitting for systems 25 kW or larger.

The costs associated with the hiring of a civil engineer licensed to practice in the AHJ will cost thousands of dollars making a Ground Mount system unsuitable for this program. Please reconsider some of these requirements.

Many ground mount system racking designers have engineers who provide certified letters such as the one attached here. If this is available for the material used in the ground mount system, this should meet the requirements of this program versus having a civil engineer run a geotechnical report and a structural report. The structural engineer stamping this report may not have a license in the specific AHJ the ground mount system is located in. Please consider modifying that language in the site suitability guidelines.

Also, provided that the FIMR, FWS online mapping tool and EcoCAT sites are accessible to any and all citizens of the US, it seems there's no reason for specifically a civil engineer to produce these documents and stamp them. Certainly any citizen should be able to produce these documents for review by the program.

In addition, please include in the program that the inspector of any Solar PV System have proper credentials to be able to do so. A visiting site inspector should have the proper knowledge of Solar PV to be able to conduct a site inspection. Please require NABCEP, IBEW Journeyman

Electrician, IREC Certified Electrical inspector or compatible credential to conduct site inspections.

Please consider restructuring the requirements of the ground mount system. Thank you.

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GENERAL NOTES:

1. ALL CONSTRUCTION FOR UNIRAC'S "GROUND FIXED TILT" (GFT) RACKING SYSTEM AND FOUNDATION REQUIREMENTS SHALL CONFORM TO THE 2009, 2012, AND 2015 EDITION OF THE INTERNATIONAL BUILDING CODE (IBC).
2. WHEREVER THE TERM CONTRACTOR IS USED IN THE CONSTRUCTION DOCUMENTS, IT SHALL BE DEFINED TO MEAN THE GENERAL CONTRACTOR AND ANY SUB-CONTRACTOR COLLECTIVELY AS APPLICABLE AND AS REQUIRED.
3. THE CONTRACT "STRUCTURAL RACKING" DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE MEANS, METHOD, OR SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND PROVIDE ALL MEASURES NECESSARY TO PROTECT THE RACKING SYSTEM FROM THE POINT OF MATERIAL DELIVERY THROUGH THE COMPLETION OF CONSTRUCTION. UNIRAC AND THE ENGINEER OF RECORD WILL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OF CONSTRUCTION. UNIRAC AND THE ENGINEER OF RECORD WILL NOT BE RESPONSIBLE FOR CONSTRUCTION SITE SAFETY, OR SAFETY PRECAUTIONS AND PROGRAMS INCIDENT HERETO.
4. IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSPECT AND ENSURE THAT ALL WORK IS IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY STRUCTURAL INSPECTION/OBSERVATION PROVIDED BY OTHERS DOES NOT RELIEVE THE CONTRACTOR OF THIS RESPONSIBILITY.
5. ANY DEVIATIONS FROM THE CONTRACT DOCUMENTS THAT ARE ENCOUNTERED AT A LATER DATE AND ARE DECLARED TO BE SIGNIFICANT BY THE RACKING DISTRIBUTOR SHALL BE CORRECTED BY THE CONTRACTOR (AT THE CONTRACTOR'S EXPENSE).
6. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND COORDINATE SITE CONDITIONS WITH THESE DRAWINGS PRIOR TO BIDDING OR THE START OF CONSTRUCTION. ANY CONFLICTS, DISCREPANCIES, OR OMISSIONS SHALL BE RESOLVED THROUGH YOUR RACKING DISTRIBUTOR PRIOR TO PROCEEDING.
7. DO NOT SCALE OFF OF THESE DRAWINGS. WRITTEN DIMENSIONS SHALL BE USED OR WHERE NO DIMENSION IS PROVIDED. CONSULT WITH YOUR RACKING DISTRIBUTOR FOR CLARIFICATION BEFORE PROCEEDING WITH THE BID OR THE WORK.
8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT THE EQUIPMENT AND INSTALLATION PROCESS (MEANS AND METHODS) ARE APPROPRIATE FOR THE FOUNDATIONS AND THAT THE PILES ARE INSTALLED TO THE SPECIFIED TOLERANCES. UNIRAC IS NOT RESPONSIBLE FOR DAMAGED AND/OR OUT-OF-TOLERANCE PILES DUE TO IMPROPER INSTALLATION EQUIPMENT AND METHODS.
9. WHERE ANY DISCREPANCIES OCCUR BETWEEN PLANS, DETAILS, STRUCTURAL NOTES AND SPECIFICATIONS, THE GREATER (MOST CONSERVATIVE) REQUIREMENTS SHALL GOVERN. WHERE NO SPECIFIC DETAIL IS SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT, OR IF THERE IS NO SIMILAR WORK, THEN CONSTRUCTION SHALL CONFORM TO INDUSTRY STANDARDS. CONTRACTOR MUST INFORM UNIRAC OF ANY DISCREPANCIES.
10. REFER TO SITE PLAN, PILE LAYOUT DRAWING, ELECTRICAL DRAWINGS AND/OR OTHER CIVIL DRAWINGS FOR SPECIFIC PILE LOCATIONS, NORTH-SOUTH PILE SPACING, LOCATION AND DETAILS OF CURBS, INVERTER/EQUIPMENT PADS, TRENCHING/CONDUIT LOCATIONS, JUNCTION BOXES, SITE WORK ITEMS, ETC. AND DIMENSIONS NOT SHOWN ON STRUCTURAL RACKING DRAWINGS.
11. CONTRACTOR SHALL INVESTIGATE THE SITE DURING CLEARING AND EARTHWORK OPERATIONS FOR FILLED EXCAVATIONS OR BURIED STRUCTURES, SUCH AS CESSPOOLS, CISTERNS, FOUNDATIONS, ETC.
12. ASTM SPECIFICATIONS ON THE DRAWINGS SHALL BE OF THE LATEST ASTM STANDARD SPECIFICATION.
13. ANY ENGINEERING DESIGN PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW SHALL BEAR THE SEAL OF A PROFESSIONAL CIVIL OR STRUCTURAL ENGINEER REGISTERED IN THE STATE OF THE LOCAL JURISDICTION.
14. THE FOLLOWING DESIGN CRITERIA IS EXCLUDED FROM THE RACKING AND FOUNDATION DESIGN: FLOOD LOADING, DEBRIS LOADING, DYNAMIC ANALYSIS, ACTS OF GOD (TORNADO, HURRICANE, WATER INUNDATION LOADING, ETC.), EROSION, EXPANSIVE SOILS, FROST HEAVE, SOIL LIQUEFACTION, DYNAMIC LOADING FROM SEISMIC EVENTS AND CONDITIONS. IF REQUIRED, THESE SERVICES CAN BE PERFORMED AT AN ADDITIONAL EXPENSE TO THE CLIENT.
15. DESIGN CRITERIA PER ASCE 7-05 OR ASCE 7-10:
    - DESIGN WIND SPEED = VARIES (SEE STATE SPECIFIC LETTER)
    - GROUND SNOW LOAD = VARIES (SEE STATE SPECIFIC LETTER)
    - ICE THICKNESS = VARIES (SEE STATE SPECIFIC LETTER)
    - ICE LOAD WIND SPEED = VARIES (SEE STATE SPECIFIC LETTER)
    - SEISMIC Ss = VARIES (SEE STATE SPECIFIC LETTER)
    - SEISMIC S1 = VARIES (SEE STATE SPECIFIC LETTER)
    - SOIL SITE CLASS = D
    - WIND EXPOSURE CATEGORY = B OR C (SEE LETTER)
    - HURRICANE ZONE = SEE LETTER
    - OCCUPANCY CATEGORY = SEE LETTER
    - MINIMUM OF 20' OFFSET FROM NEAREST ADJACENT BUILDING (TO AVOID SNOW DRIFT.)

    IMPORTANCE FACTORS BASED ON OCCUPANCY CATEGORY I OR CATEGORY II FOR CALIFORNIA.
    *DESIGN WIND PRESSURES PER ASCE 7-05, SECTION 6.5.13, "WIND LOADS ON OPEN BUILDINGS WITH MONOSLOPE, PITCHED OR TROUGHED ROOFS", AND SECTION 6.5.13.3, "COMPONENTS AND CLADDING" FOR MONOSLOPE FREE ROOFS OR ASCE 7-10, SECTION 27.4.3, "WIND LOAD ON OPEN BUILDING WITH MONOSLOPE, PITCHED OR TROUGHTED ROOFS", AND SECTION 30.8.2, "COMPONENTS AND CLADDING" FOR MONOSLOPED PITCHED OR TROUGHED ROOFS.
16. SOLAR REQUIREMENTS (FROM OWNER)
17. CORROSION PROTECTION REQUIREMENTS:
    - COLD-FORMED STEEL MEMBERS = G180 MINIMUM (ASTM A653)
    - HARDWARE = STAINLESS STEEL/DELTA PROTEKT
18. ABOVE GRADE CORROSION PROTECTION WILL SUFFICE FOR MOST ENVIRONMENTAL CONDITIONS. BELOW GRADE CORROSION PROTECTION WILL SUFFICE FOR MOST SOILS WITH RESISTIVITY VALUES GREATER THAN 10,000 OHM/CEM. IT IS THE OWNER'S RESPONSIBILITY TO DETERMINE IF THE SOILS ARE MORE CORROSIVE AND FURTHER CORROSION PROTECTION WILL BE REQUIRED.
19. THE DGFT BILL OF MATERIAL (BOM) TOOL GIVES THE OPTION FOR IDEAL OR OPTIMIZED TABLE DESIGN. IDEAL USES ONLY FULL LENGTH EAST-WEST ALUMINUM BEAMS TO COMPLETE A TABLE AND EXCESS MATERIAL CAN BE CUT AND DISCARDED. OPTIMIZED TABLE DESIGNS UTILIZE LONGER BEAMS TO COMPLETE THE THIRD OR FOURTH EAST-WEST BEAM WITH AN ADDITIONAL SPLICE. REGARDLESS OF THE TABLE DESIGN USED, IT IS THE CONTRACTOR'S RESPONSIBILITY TO SPICE EAST-WEST BEAMS (AS REQUIRED) TO COMPLETE THE TABLE AND AVOID SPLICE CONFLICTS SPECIFIED IN DETAIL 502 ON SHEET SD-500.

SPECIAL INSPECTION:

STRUCTURAL ONLY: SPECIAL INSPECTION IS TO BE PROVIDED FOR THE ITEMS LISTED BELOW IN ADDITION TO THE INSPECTIONS CONDUCTED BY THE BUILDING JURISDICTION. "SPECIAL STRUCTURAL INSPECTION" SHALL NOT RELIEVE THE OWNER OR THEIR AGENT FROM REQUESTING THE BUILDING JURISDICTION INSPECTIONS REQUIRED.

1. DRIVEN DEEP ELEMENTS: PERIODICALLY DURING THE PLACEMENT OF ALL DRIVEN DEEP FOUNDATION ELEMENTS ON STRUCTURAL DRAWINGS.
   A. VERIFICATION OF ELEMENT MATERIALS, SIZES AND LENGTHS.
   B. PERIODIC OBSERVATION AND DOCUMENTATION OF DRIVING OPERATIONS. PERIODIC DEFINED AS AT LEAST ONE VISIT ON EACH DAY OF WORK. A MINIMUM OF 10% OF PILE INSTALLATIONS SHALL BE INSPECTED.
   C. VERIFICATION OF PLACEMENT LOCATIONS AND PLUMBNESS, SIZE AND TYPE OF HAMMER, ELEVATION OF TIP AND BUTT, ANY DAMAGE TO FOUNDATION ELEMENT, ETC.
2. HIGH STRENGTH BOLTING: VERIFICATION OF TORQUE PER TORQUE TABLE SHOWN.

ALUMINUM:

1. ALL ALUMINUM EAST-WEST BEAM MEMBERS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE "ALUMINUM DESIGN MANUAL" BY THE ALUMINUM DESIGN ASSOCIATION, CURRENT ADDITION.
2. ALL ALUMINUM EAST-WEST BEAMS CONFORM TO ONE OF THE FOLLOWING:
   - ALLOY: 6005A TEMPER: T61 (Ftu = 38 KSI, Fcy = 35 KSI)
   - ALLOY: 6351 TEMPER: T5 (Ftu = 38 KSI, Fcy = 35 KSI)
   - ALLOY: 6061 TEMPER: T6 (Ftu = 38 KSI, Fcy = 35 KSI)
3. ALL ALUMINUM EAST-WEST BEAMS HAVE A MILL FINISH.
4. WELDING IS NOT REQUIRED OR PERMITTED UNLESS SPECIFICALLY APPROVED BY UNIRAC AND THE ENGINEER OF RECORD.
5. FIELD CUTTING OF ALUMINUM MEMBERS IS PERMITTED WHEN REQUIRED TO ACCOMMODATE PROJECT SPECIFIC MODULE WIDTHS.

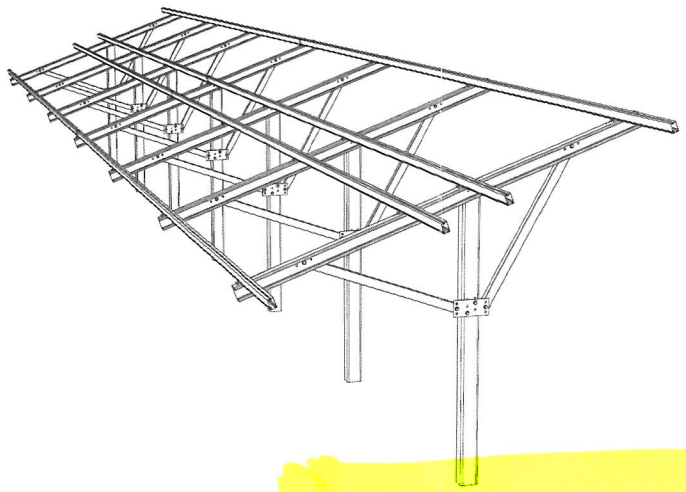
HARDWARE:

1. ALL 1/4"Ø HARDWARE SHALL CONFORM TO 18/8 STAINLESS STEEL (AISI 300 SERIES STAINLESS, 304) OF DIMENSIONS PER ASME B18.2.1.
2. ALL 1/4"Ø SELF DRILLING SCREW HARDWARE SHALL CONFORM TO GRADE 5 SAE J429 AND ASTM A449.
3. ALL 5/8"Ø AND 3/4"Ø BOLTS SHALL CONFORM TO GRADE 2 SAE J429 OR ASTM A307.
4. ALL 5/8"Ø AND 3/4"Ø SERRATED FLANGE NUTS SHALL CONFORM TO ASME B.18.16.4.
5. ALL 5/8"Ø AND 3/4"Ø WASHERS SHALL CONFORM TO USS TYPE A WIDE OR ANSI TYPE A WIDE.
6. UNIRAC T-BOLTS, MID CLAMPS, AND END CLAMPS ARE PROPRIETARY. TECHNICAL DATA SHEETS WITH TESTED CAPACITIES CAN BE PROVIDED UPON REQUEST.
7. CORROSION PROTECTION FOR HARDWARE CAN BE FOUND IN THE GENERAL NOTES SECTION OF THIS DOCUMENT, NOTE 15.
8. ALL HARDWARE RECEIVED ON SITE SHALL BE CHECKED BY CONTRACTOR AGAINST THE SPECIFICATIONS ON THIS SHEET SD-100, DIAMETERS AND LENGTHS CALLED OUT ON RACKING DETAILS SHEET SD-500, AS WELL AS THE PROJECT BILL OF MATERIAL. ANY CONFLICTS, DISCREPANCIES, OR OMISSIONS MUST BE RESOLVED WITH THE RACKING DISTRIBUTOR AS SOON AS POSSIBLE AND PRIOR TO PROCEEDING.

TORQUE REQUIREMENTS FOR THIS SPECIFIC PROJECT:
1/4"Ø HARDWARE = 9 - 11 FT-LBS
5/8"Ø HARDWARE = 54 - 66 FT-LBS
3/4"Ø HARDWARE = 99 - 121 FT-LBS

UNIRAC GFT

GROUND FIXED TILT



SOLAR DESIGN:

UNIRAC IS NOT THE SOLAR DESIGN ENGINEER OF RECORD AND IS NOT RESPONSIBLE FOR ANY SOLAR DESIGN, OUTPUT EFFICIENCIES, SHADING, ETC.

ELECTRICAL DESIGN:

UNIRAC IS NOT THE ELECTRICAL ENGINEER OF RECORD AND IS NOT RESPONSIBLE FOR THE ELECTRICAL DESIGN FOR THIS PROJECT. THE UNIRAC GFT RACKING SYSTEM IS CERTIFIED TO UL-2703 WHEN PROPERLY INSTALLED. SEE THE GFT INSTALLATION GUIDE FOR MORE DETAIL.

CIVIL/GRADING/SITE WORK:

UNIRAC IS NOT THE CIVIL ENGINEER OF RECORD FOR THIS PROJECT AND IS NOT RESPONSIBLE FOR ANY SITE, GRADING, OR EROSION CONTROL PLANS.

MATERIAL MANAGEMENT:

PRIOR TO INSTALLATION, ALL MATERIALS MUST BE STORED PROPERLY. THIS MEANS MATERIALS REMAINING IN ONE PLACE FOR MORE THAN ONE WEEK MUST BE IN OPEN AIR CONDITIONS (I.E. UP AND ABOVE THE GROUND AND WATER TABLE). IF TARPS OR OTHER PROTECTIVE COVERS ARE USED, THEN ENDS SHALL BE LEFT OPEN FOR VENTILATION. TIGHT FITTING COVERINGS ARE NOT RECOMMENDED, SINCE THEY CAN TRAP MOISTURE. IF LONG GOODS ARE TO BE STORED HORIZONTALLY FOR MORE THAN ONE WEEK, PLACE BLOCKING OF SUFFICIENT HEIGHT BENEATH THE STACK ON PROPER INTERVALS TO MINIMIZE DEFORMATION AND TO LESSEN MOISTURE GAIN FROM THE GROUND.

FOUNDATION NOTES:

1. THE FOLLOWING DESIGN CRITERIA IS EXCLUDED FROM DESIGN: FLOOD LOADING, DEBRIS LOADING, DYNAMIC ANALYSIS, ACTS OF GOD (TORNADO, HURRICANE, WATER INUNDATION LOADING, ETC.), EROSION, EXPANSIVE SOILS, FROST HEAVE, SOIL LIQUEFACTION, SOIL DYNAMIC LOADING FROM SEISMIC EVENTS AND CONDITIONS.
2. SEE THE "COLD FORMED STEEL" SECTION FOR STEEL AND GALVANIZATION REQUIREMENTS FOR FOUNDATIONS.
3. UNIRAC SHALL NOT BE HELD LIABLE FOR ANY UTILITY LINES DAMAGED DURING FOUNDATION INSTALLATION. IT SHALL BE THE RESPONSIBILITIES OF OTHERS TO DETERMINE THE PLACEMENT OF EXISTING AND NEW UTILITY LINES.
4. PILES ARE DESIGNED TO SOIL CONDITIONS STATED IN IBC 2012. IT IS THE CLIENTS RESPONSIBILITY TO VERIFY SOILS MEET THE MINIMUM REQUIREMENTS. UNIRAC AND OR THE ENGINEER OF RECORD WILL NOT BE HELD RESPONSIBLE FOR FOUNDATIONS INSTALLED IN SOILS WITH LOWER CAPACITY OR FOR IMPROPER FOUNDATION INSTALLATION OR CHOICE.

NOTE: SEE GFT INSTALLATION GUIDE FOR SYSTEM ADJUSTMENTS AND TOLERANCES

12. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT VIBRATIONS FROM DRIVING EQUIPMENT AND PILE INSTALLATION DO NOT AFFECT ANY ADJACENT PROPERTY STRUCTURES. THE CONTRACTOR SHALL BE HELD LIABLE FOR DAMAGE TO THE ADJACENT PROPERTY IF DAMAGE OCCURS.
13. ANY EXCAVATIONS NEAR THE PILE SHALL NOT BE MADE CLOSER THAN 3 FEET FROM PILE FACE OR DEEPER THAN 3 FEET FROM GRADE. THESE EXCAVATIONS SHALL BE TEMPORARY AND SHALL BE COMPACTED PER THE ENGINEER OF RECORD'S RECOMMENDATIONS. IF EXCAVATIONS EXCEED THESE DIMENSIONAL REQUIREMENTS FOR FROST HEAVE OR OTHER REASONS, THE CONTRACTOR SHALL NOTIFY UNIRAC. THE ENGINEER OF RECORD SHALL BE INFORMED OF ANY EXCAVATION AND COMPACTION EFFORTS ON THE SITE.
14. PILES MAY NOT BE ALTERED IN ANY WAY WITHOUT UNIRAC WRITTEN APPROVAL. PILES HAVE BEEN DESIGNED FOR STATIC LOADING. ABOVE GRADE PILES HAVE BEEN ANALYZED STATICALLY.

QUALITY ASSURANCE AND SPECIAL INSPECTION:

1. TESTING LABORATORY: RETAINED BY OWNER AND SATISFACTORY TO ENGINEER OF RECORD (THROUGH UNIRAC) AND GOVERNING CODE AUTHORITY TO PERFORM REQUIRED TESTS AND INSPECTIONS OF THIS CONTRACT AND APPLICABLE CODE. THE TYPE AND FREQUENCY OF SPECIAL INSPECTION, STRUCTURAL TESTING AND SUBSEQUENT REPORTING SHALL CONFORM TO THE REQUIREMENTS OF THE 2009 INTERNATIONAL BUILDING CODE (IBC).

CONCRETE:

1. ALL ASPECTS OF WORK PERTAINING TO THE CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH ACI 318-08, "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" AND THE LATEST EDITION OF "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS" ACI 301, WITH MODIFICATIONS AS NOTED ON THE PROJECT DRAWINGS AND/OR SPECIFICATIONS.
2. HOT WEATHER CONCRETING SHALL CONFORM TO ACI 305, "HOT WEATHER CONCRETING".
3. COLD WEATHER CONCRETING SHALL CONFORM TO ACI 306, "COLD WEATHER CONCRETING".
4. ALL MIX DESIGNS SHALL BE DESIGNED BY A QUALIFIED TESTING LABORATORY AND SHALL BE WET STAMPED BY A CIVIL ENGINEER LICENSED IN THE JURISDICTION OF THE PROJECT, BASE DESIGN MIX BASED ON FIELD EXPERIENCE OR TRIAL MIXTURES AS STIPULATED IN IBC SECTION 1905.3.
5. TYPE II PORTLAND CEMENT SHALL BE USED AT ALL CONCRETE ALTERNATE FOUNDATION LOCATIONS FOR THE RACKING SYSTEM - WHERE CONCRETE IS REQUIRED AS AN ALTERNATE SOLUTION. (TYPE V CEMENT SHALL BE USED WHERE THE CONCRETE IS IN CONTACT WITH SOIL CONTAINING SULFATES IN EXCESS OF 3000 PPM. CONCRETE THAT WILL BE EXPOSED TO SULFATE-CONTAINING SOLUTIONS SHALL COMPLY WITH IBC SECTION 1904.3 AND ACI 318-05 TABLE 4.3.1 SEVERE AND VERY SEVERE SULFATE EXPOSURES AS IDENTIFIED IN THE PROJECT GEOTECHNICAL REPORT, THE WATER CEMENT RATIO SHALL NOT EXCEED 0.44.)
6. IN THE PRESENCE OF REACTIVE AGGREGATE, CLASS F FLY ASH OR OTHER ASR MITIGATING ADMIXTURE SHALL BE INCORPORATED IN THE MIX SUCH THAT THE EXPANSION PRODUCED BY THE MORTAR-BAR METHOD (ASTM C1567) USING BLENDED AGGREGATES IS LESS THAN 0.1% AT 14 DAYS IMMERSED IN SOLUTION. WHERE CLASS F FLY ASH IS SELECTED AS A SUPPLEMENTAL ADMIXTURE. THE LOSS OF IGNITION SHALL BE LIMITED TO 2%. THE CONTRACTOR SHALL SUBMIT ALL CERTIFICATES SHOWING THE FLY ASH IS IN ACCORDANCE WITH ASTM 6618.
7. DO NOT USE CONCRETE OR GROUT CONTAINING CHLORIDES. WATER SHALL CONTAIN A CHLORIDE CONTENT LESS THAN 1000 PPM AS C1. DO NOT USE CONCRETE CONTAINING ALKALI-CARBONATE AND BIOCHARBONATES PRESENT IN AGGREGATE IN EXCESS OF 1000 PPM. TESTS FOR THEIR EFFECT ON SETTING TIME AND 28 DAY STRENGTH SHALL BE EVALUATED.
8. HARD ROCK CONCRETE AGGREGATE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF THE ASTM C33 CLASS DESIGNATION 35 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH APPROVAL OF THE STRUCTURAL ENGINEER. PROVIDE CONCRETE MIX DESIGN WITH PROVEN SHRINKAGE CHARACTERISTICS OF LESS THAN 0.0005 INCHES/INCH.
9. MAXIMUM SIZED AGGREGATE OF 0.75".
10. SLUMP RANGE OF 3" ± 1" PER ASTM C143.
11. CONCRETE PLACEMENT SHALL BE IN ACCORDANCE WITH ACI STANDARD 304 AND PROJECT SPECIFICATIONS.
12. THE UNIRAC PILE SHALL BE CENTERED IN THE HOLE TO MAXIMIZE CONCRETE COVER AND THE HOLE SHALL BE CENTERED IN THE SPECIFIED LOCATION TO ALLOW FOR RACKING INSTALLABILITY.
13. THE TOP OF THE CONCRETE SHALL BE SMOOTHED AND SLOPED AT 2% TO FACILITATE POSITIVE DRAINAGE AWAY FROM THE UNIRAC PILE.
14. CONCRETE CHLORIDE PERMEABILITY SHALL BE CLASSIFIED AS HAVING "NEGLIGIBLE" TO "VERY LOW" CHLORIDE ION PERMEABILITY PER ASTM C1202.
15. CONCRETE SHOULD BE PLACED IN A CONTINUOUS FLOW WITHOUT SEGREGATING THE CONCRETE. DO NOT ALLOW CONCRETE TO FREE FALL MORE THAN 5 FEET UNLESS MEASURES ARE TAKEN TO ENSURE THAT CONCRETE DOES NOT HIT THE SIDES OF THE EXCAVATION DURING FREE FALL.
16. MECHANICALLY VIBRATE THE CONCRETE AT EACH PIER.
17. PRECAUTIONS SHOULD BE TAKEN DURING THE INSTALLATION OF PIERS TO MINIMIZE THE POSSIBILITY OF CAVING. PIER EXCAVATIONS SHOULD BE FILLED WITH CONCRETE AS SOON AFTER DRILLING AND INSPECTION AS POSSIBLE. SONOTUBES (OR EQUIVALENT) CAN BE UTILIZED, AS REQUIRED, ONLY IN THE UPPER 2 FT. OF THE AUGERED/DRILLED HOLE.
18. CONCRETE MIXING OPERATION SHALL CONFORM TO ASTM C-94.
19. AGGREGATE FOR HARDROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF THE ASTM C-33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH THE PERMISSION OF THE ENGINEER OF RECORD.
20. THE MAXIMUM DENSITY OF CONCRETE SHALL BE 150 PCF. THE 28 DAY STRENGTH OF CONCRETE SHALL BE 4000 PSI WITH A MAXIMUM WATER-CEMENT RATIO OF 0.40.

COLD FORMED STEEL:

1. ALL COLD FORMED STRUCTURAL STEEL MEMBER CONSTRUCTION SHALL BE IN ACCORDANCE WITH AISI "SPECIFICATIONS FOR DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS" CURRENT EDITION.
2. ALL COLD-FORMED STRUCTURAL MEMBERS SHALL BE PER ICC-ER-4943P.
3. ALL COLD-FORMED STEEL CONFORMS TO ONE OF THE FOLLOWING:
   - A653 HSLAS 50 (Fy = 50 KSI, Fu = 60 KSI)
   - A653 SS 50 CLASS 4 (Fy = 50 KSI, Fu = 60 KSI)
4. ALL COLD-FORMED STEEL MEMBERS THAT ARE 10 GAGE OR HIGHER ARE GALVANIZED TO G90 MINIMUM. ALL COLD-FORMED STEEL MEMBERS THAT ARE LOWER THAN 10 GAGE WILL BE G235 MINIMUM PER ASTM A653 (MOST RECENT EDITION).
5. WELDING IS NOT REQUIRED OR PERMITTED UNLESS SPECIFICALLY APPROVED BY UNIRAC AND/OR THE ENGINEER OF RECORD.
6. FIELD CUTTING OF COLD-FORMED STEEL MEMBERS IS NOT REQUIRED OR PERMITTED UNLESS SPECIFICALLY APPROVED BY UNIRAC AND/OR THE ENGINEER OF RECORD.
7. ALL CALCULATED COLD-FORMED MEMBER PROPERTIES PER AISI SPECIFICATIONS ARE BASED ON THE FOLLOWING MINIMUM THICKNESSES:
   - 14 GAGE (0.070" OR 70 MILS)
   - 11 GAGE (0.120" OR 120 MILS)
   - 9 GAGE (0.148" OR 148 MILS)

UNIRAC CUSTOM RACKING MEMBER SECTIONS

RACKING MEMBER	DEPTH	WIDTH	THICKNESS	MIN. CORROSION PROTECT
ALUMINUM BEAM	3.25 IN.	2.0 IN.	0.063-0.125 IN	AAMA 611-12
ALUMINUM SPLICE	3.061 IN.	1.818 IN.	0.800-0.110 IN	AA-M12
TOP CHORD CHANNEL	4.1 IN.	3.42 IN.	14 GAGE	G180
DIAGONAL BRACE	3 IN.	2 IN.	14 GAGE	G180
C-PILE	6 IN.	4.5 IN.	11 GAGE	G235

DRIVEN STEEL PILE NOTES:

1. STEEL PILES HAVE BEEN DESIGNED IN ACCORDANCE WITH THE DESIGN CRITERIA STATED IN THE GENERAL NOTES.
2. PILES SHALL BE INSTALLED SO THAT PILE TOLERANCES ARE MET (SEE UNIRAC GFT INSTALLATION GUIDE), AND THE PILE DOES NOT DEFORM EXCESSIVELY. EXCESSIVE DEFORMATION IS DEFINED AS DISTORTION SO THAT THE RACKING CANNOT CONNECT TO THE PILE.
3. FOUNDATIONS MUST NOT BE INSTALLED IN ORGANIC SOILS OR IN AREAS WITH GROUND WATER NEAR THE SURFACE.
4. IT IS THE OWNER OR CONTRACTORS RESPONSIBILITY TO DETERMINE WHICH FROST ZONE THEIR PROJECT IS LOCATED IN.
5. IF PILE REFUSAL IS ENCOUNTERED, AN ALTERNATE FOUNDATION DESIGN ON SHEET SR-400 SHALL BE UTILIZED.
6. DRAINAGE SHALL BE DIRECTED AWAY FROM PILES. PILES SHALL NOT BE PLACED IN SWALES, DRAINAGE AREAS OR WHERE WATER MAY BE ALLOWED TO FLOW OR STAND. ALL POSSIBLE EFFORTS SHALL BE MADE TO PREVENT WATER FROM FLOWING OR PONDING AROUND OR NEAR TO THE PILES.
7. PILES MAY NOT BE PAINTED PRIOR TO INSTALLATION OF THE RACKING SYSTEM. AFTER INSTALLATION OF THE COMPLETE RACKING SYSTEM, PILES MAY BE PAINTED AT THE CONTRACTORS/CLIENTS DISCRETION. NO ADJUSTMENTS MAY BE MADE AFTER THE PILES HAVE BEEN PAINTED.
8. PILES DRIVEN TOO SHALLOW OR TOO DEEP WILL NEED TO BE ALTERED AT THE CONTRACTORS EXPENSE. UNIRAC HAS PROVIDED TOLERANCES IN THE GFT INSTALLATION GUIDE THAT SHALL BE FOLLOWED.
9. IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE THE MEANS AND METHODS FOR DRIVING PILES. IN ORDER TO MATCH THE PILE INSTALLATION METHOD UTILIZED DURING ONSITE PILE TESTING, THE CONTRACTOR MUST INSTALL PILES UTILIZING A PILE DRIVING RIG WITH A PERCUSSION HAMMER.
10. THE RACKING DISTRIBUTOR SHALL NOT BE HELD RESPONSIBLE FOR DAMAGE TO THE PILE AFTER IT ARRIVES TO THE SITE OR THE POINT OF AGREED DROP OFF.
11. IF DAMAGE OCCURS WHERE GALVANIZATION IS REMOVED FROM THE PILE, THE PILE SHALL BE TOUCHED UP WITH GALVANIZATION OF EQUAL THICKNESS PRIOR TO INSTALLATION AT THE CONTRACTOR'S EXPENSE.

SHEET INDEX

REVISION BLOCK		
MARK	DATE	DESCRIPTION
1	10/19/16	NOTE & BRACE REVISIONS
2	1/06/2017	ADDED SD-200
3	2/02/2017	REVED NOTES
4	2/13/2017	REVED NOTES & SD-300
5	3/10/2017	UPDATED LINE TYPES

OWNER/CLIENT:

ENGINEERING CONSULTANT:
Design Optimization Technologies
424 Jefferson Street
St. Charles, Mo 63301
Phone: (636) 724-9872
www.DOTecEngineering.com

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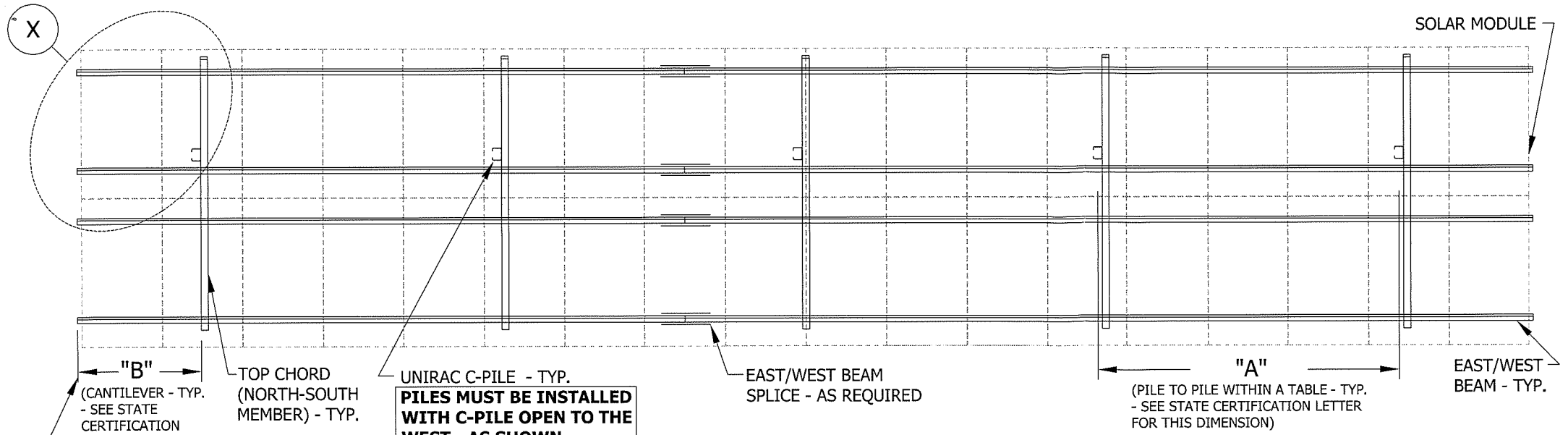
PROJECT NUMBER:	DGFT
ENGINEERED BY:	Jon S
DRAFTED BY:	Jeff H
REVIEWED BY:	Jeff H
ORIGINAL RELEASE DATE:	9/30/2016
DRAWING SHEET SIZE:	'D' - 24x36

SHEET TITLE
GENERAL STRUCTURAL RACKING NOTES

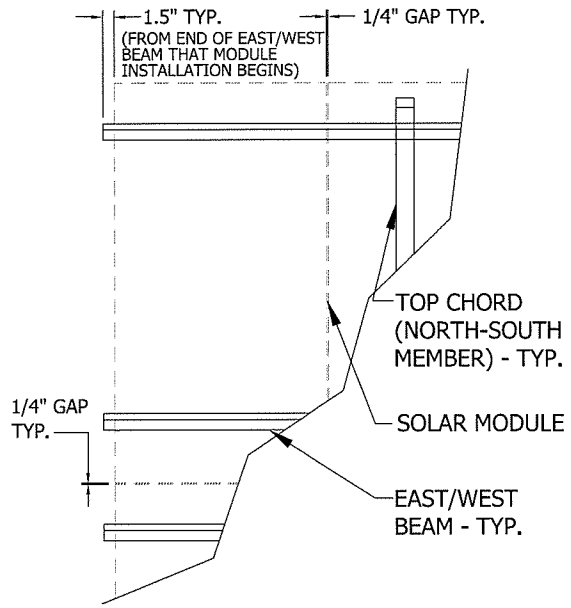
SHEET NUMBER
SD-100
SHEET 1 of 5



PLAN VIEW OF TABLE

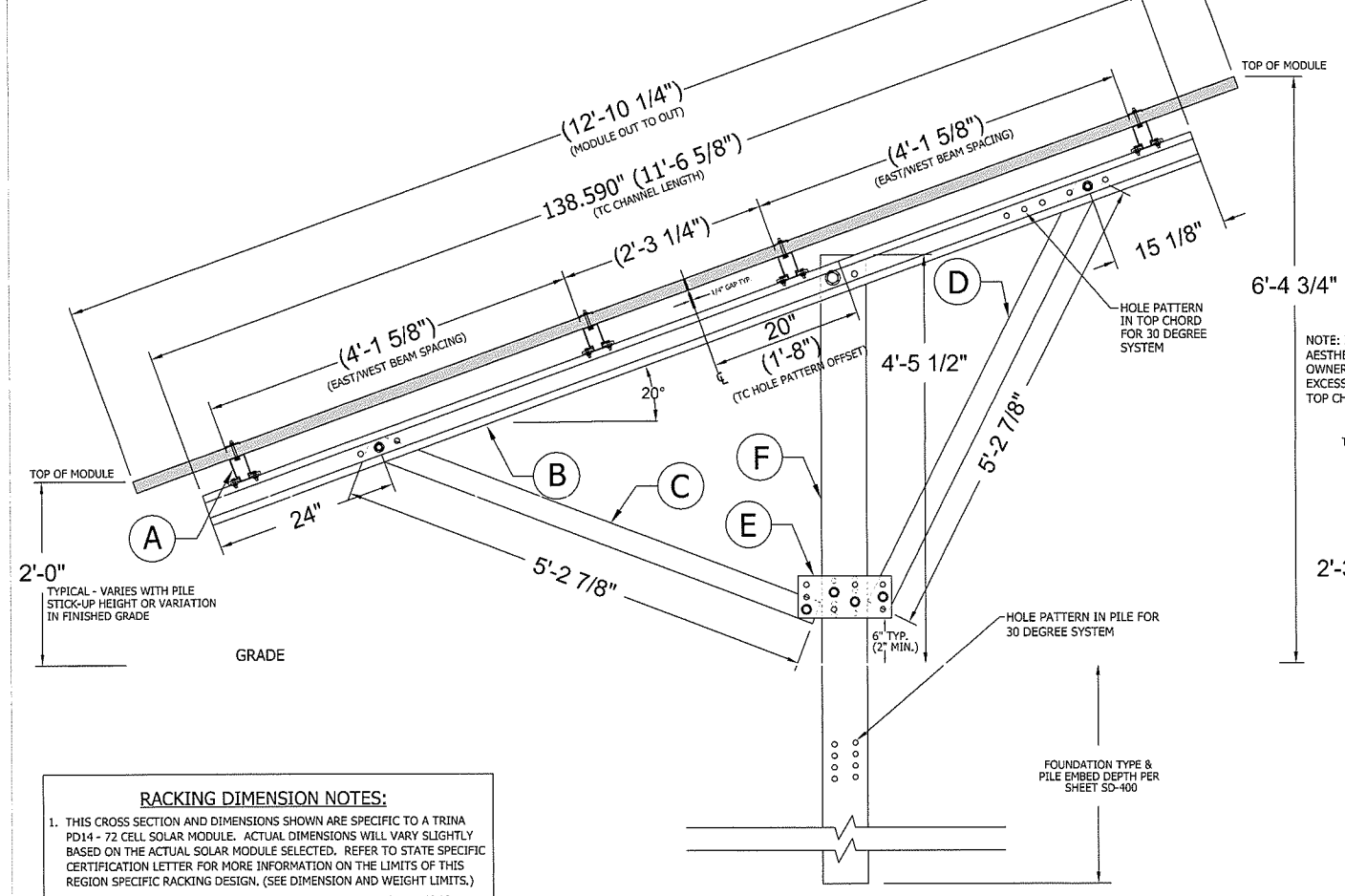
SEE LETTER FOR PILE QUANTITY REQUIREMENT PER TABLE SIZE

NOTE:
FOR INFORMATION REGARDING T-BOLT (MID-CLAMP) SETBACKS AT EAST/WEST BEAM SPLICE LOCATIONS, REFER TO DETAIL 502 ON SHEET SD-500.



X DETAILED VIEW

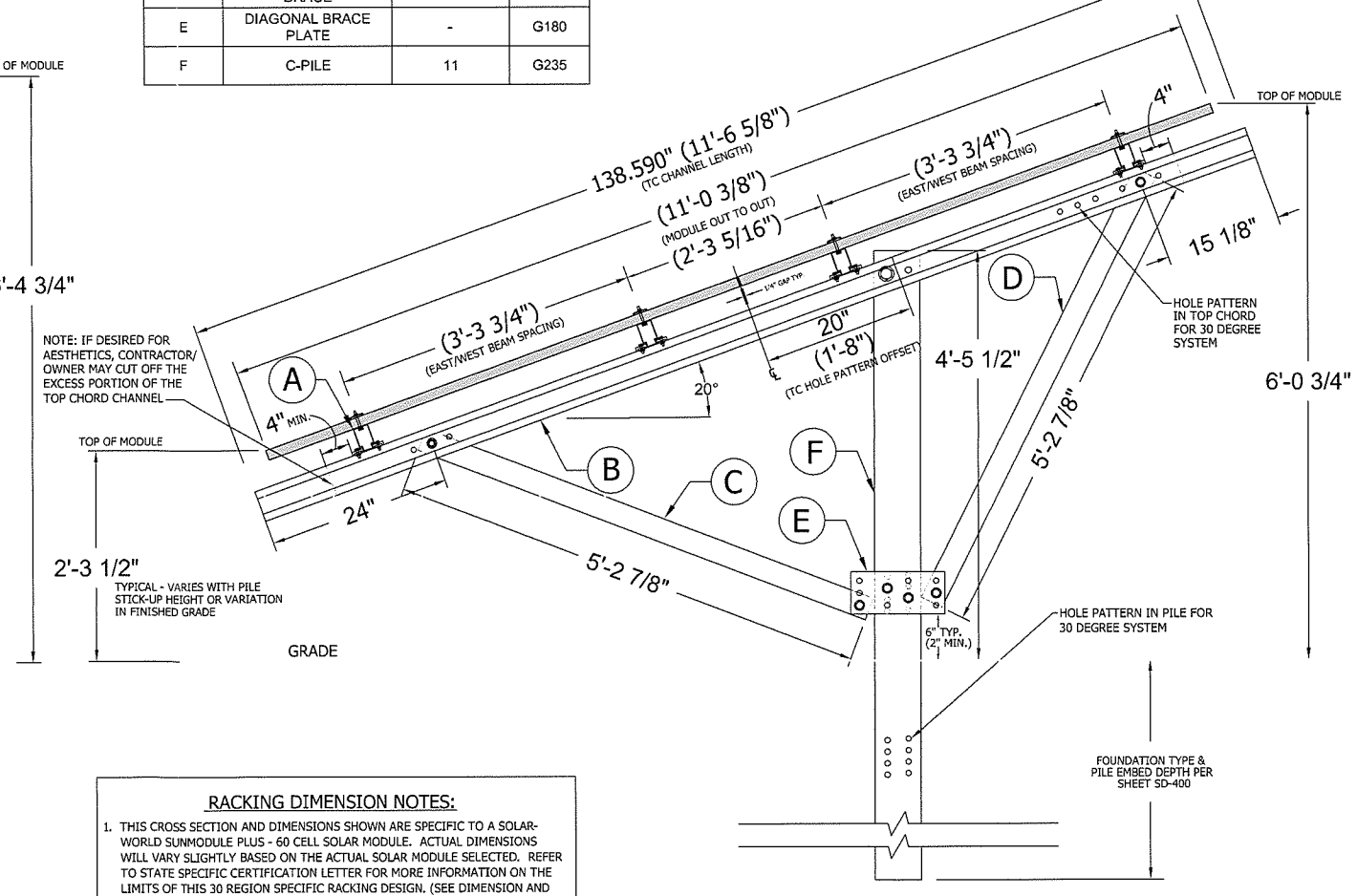
GFT PARTS LIST			
REF NUMBER	PART DESCRIPTION	GUAGE/ THICKNESS	FINISH
A	ALUMINUM E-W BEAM	-	MILL
B	TOP CHORD CHANNEL	14	G180
C	FRONT DIAGONAL BRACE	14	G180
D	REAR DIAGONAL BRACE	14	G180
E	DIAGONAL BRACE PLATE	-	G180
F	C-PILE	11	G235



RACKING DIMENSION NOTES:

1. THIS CROSS SECTION AND DIMENSIONS SHOWN ARE SPECIFIC TO A TRINA PD14 - 72 CELL SOLAR MODULE. ACTUAL DIMENSIONS WILL VARY SLIGHTLY BASED ON THE ACTUAL SOLAR MODULE SELECTED. REFER TO STATE SPECIFIC CERTIFICATION LETTER FOR MORE INFORMATION ON THE LIMITS OF THIS REGION SPECIFIC RACKING DESIGN. (SEE DIMENSION AND WEIGHT LIMITS.)
2. EAST/WEST BEAM SPACING IS BASED ON A COMBINATION OF CLAMPING RANGES SPECIFIED IN THE INSTALLATION MANUALS FOR THE TRINA PD14 AND SOLARWORLD XL 72 CELL SOLAR MODULES. FINE TUNE ADJUSTMENTS IN THE EAST/WEST BEAM TO TOP CHORD CHANNEL CONNECTIONS EXIST. SEE SHEET SD-500 FOR ALL RACKING CONNECTION DETAILS. REFER TO THE DGFT INSTALLATION GUIDE FOR ADDITIONAL INFORMATION.

SECTION VIEW OF DGFT TABLE - 20° TILT
(72 CELL SOLAR PANELS)



RACKING DIMENSION NOTES:

1. THIS CROSS SECTION AND DIMENSIONS SHOWN ARE SPECIFIC TO A SOLAR-WORLD SUNMODULE PLUS - 60 CELL SOLAR MODULE. ACTUAL DIMENSIONS WILL VARY SLIGHTLY BASED ON THE ACTUAL SOLAR MODULE SELECTED. REFER TO STATE SPECIFIC CERTIFICATION LETTER FOR MORE INFORMATION ON THE LIMITS OF THIS 30 REGION SPECIFIC RACKING DESIGN. (SEE DIMENSION AND WEIGHT LIMITS.)
2. EAST/WEST BEAM SPACING IS BASED ON A COMBINATION OF CLAMPING RANGES SPECIFIED IN THE INSTALLATION MANUALS FOR THE SOLARWORLD SUNMODULE PLUS AND TRINA PD05 - 60 CELL SOLAR MODULES. FINE TUNE ADJUSTMENTS IN THE EAST/WEST BEAM TO TOP CHORD CHANNEL CONNECTIONS EXIST. SEE SHEET SD-500 FOR ALL RACKING CONNECTION DETAILS. REFER TO THE DGFT INSTALLATION GUIDE FOR ADDITIONAL INFORMATION.

SECTION VIEW OF DGFT TABLE - 20° TILT
(60 CELL SOLAR PANELS)

REVISION BLOCK		
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1	10/19/16	NOTE & BRACE REVISIONS
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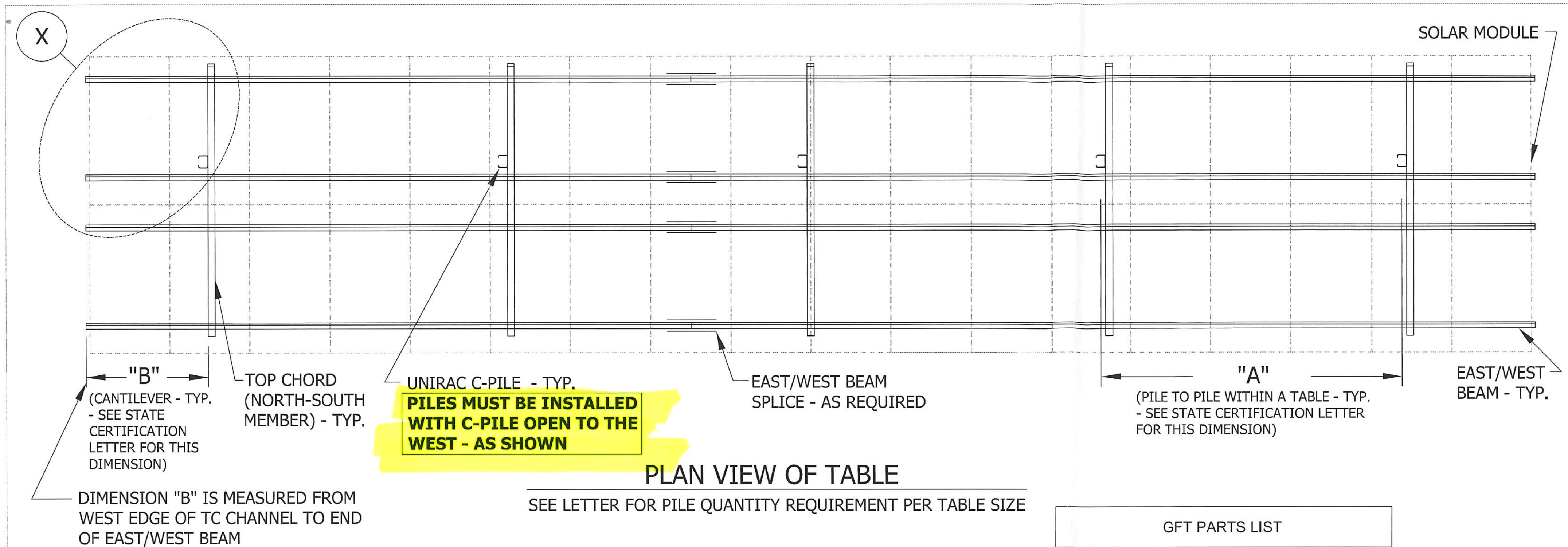
PROJECT NUMBER:	DGFT
ENGINEERED BY:	Jon S
DRAFTED BY:	Jeff H
REVIEWED BY:	Jeff H
ORIGINAL RELEASE DATE:	9/30/2016
DRAWING SHEET SIZE:	'D' - 24x36

SHEET TITLE
DGFT TABLE CROSS-SECTION AND PARTS LIST (20 DEGREE TILT)

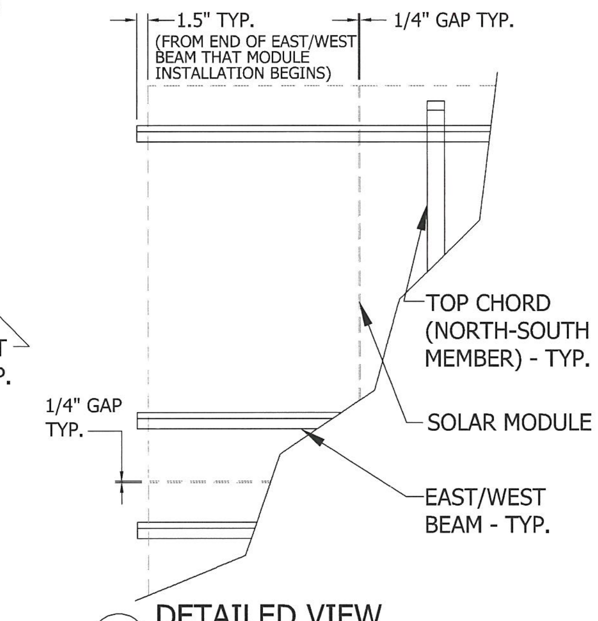
SHEET NUMBER
SD-200
SHEET 2 of 5



PLAN VIEW OF TABLE

SEE LETTER FOR PILE QUANTITY REQUIREMENT PER TABLE SIZE

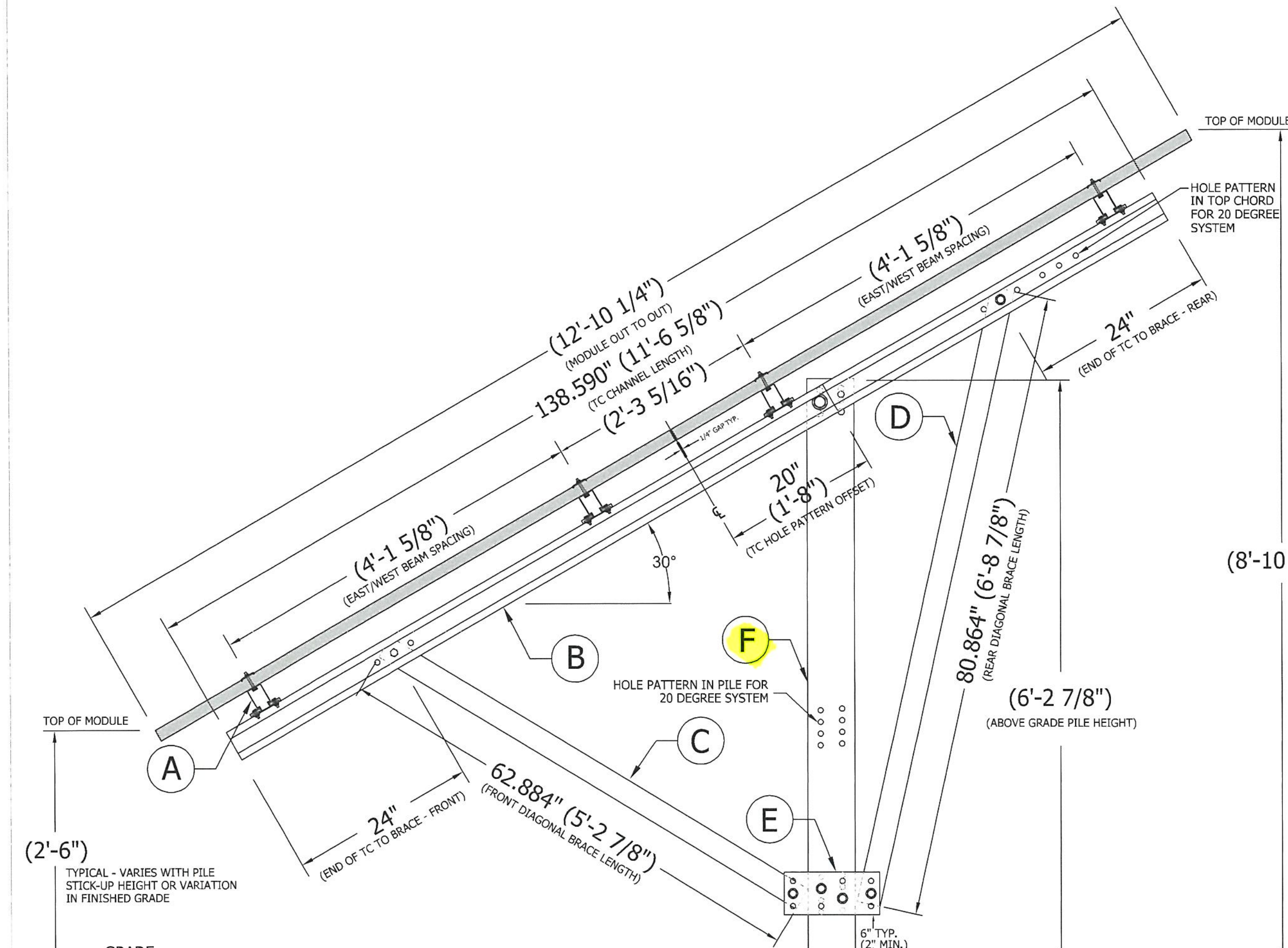
NOTE:
FOR INFORMATION REGARDING T-BOLT (MID-CLAMP) SETBACKS AT EAST/WEST BEAM SPLICE LOCATIONS, REFER TO DETAIL 502 ON SHEET SD-500.



DETAILED VIEW

GFT PARTS LIST

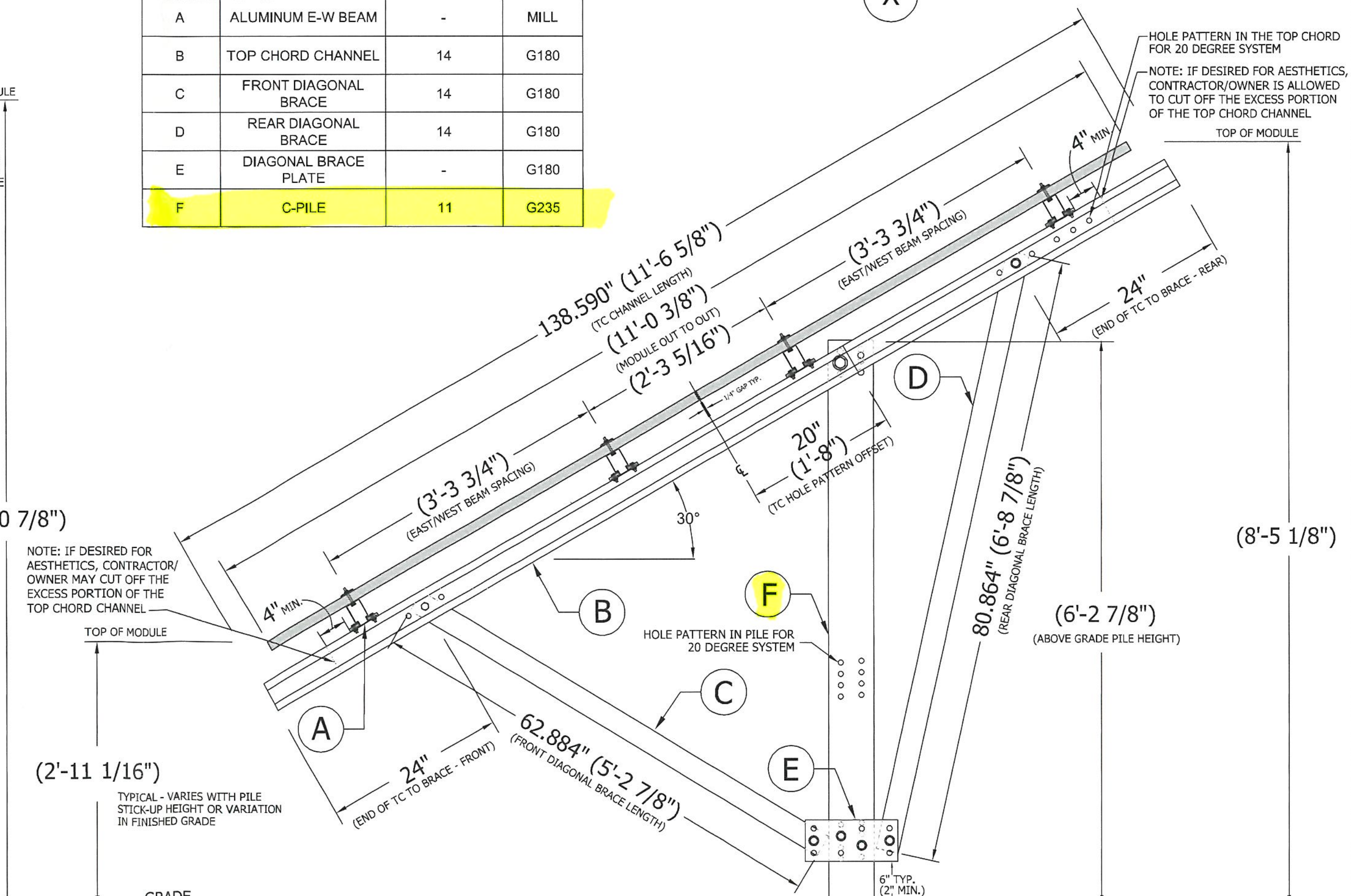
REF NUMBER	PART DESCRIPTION	GUAGE/ THICKNESS	FINISH
A	ALUMINUM E-W BEAM	-	MILL
B	TOP CHORD CHANNEL	14	G180
C	FRONT DIAGONAL BRACE	14	G180
D	REAR DIAGONAL BRACE	14	G180
E	DIAGONAL BRACE PLATE	-	G180
F	C-PILE	11	G235



RACKING DIMENSION NOTES:

1. THIS CROSS SECTION AND DIMENSIONS SHOWN ARE SPECIFIC TO A SOLAR WORLD SUNPOWER XL - 72 CELL SOLAR MODULE. ACTUAL DIMENSIONS WILL VARY SLIGHTLY BASED ON THE ACTUAL SOLAR MODULE SELECTED. REFER TO STATE SPECIFIC CERTIFICATION LETTER FOR MORE INFORMATION ON THE LIMITS OF THIS REGION SPECIFIC DGFT RACKING DESIGN. (SEE DIMENSION AND WEIGHT LIMITS.)
2. EAST/WEST BEAM SPACING IS BASED ON A COMBINATION OF CLAMPING RANGES SPECIFIED IN THE INSTALLATION MANUALS FOR THE SOLARWORLD XL 72 CELL SOLAR MODULES. FINE TUNE ADJUSTMENTS IN THE EAST/WEST BEAM TO TOP CHORD CHANNEL CONNECTIONS EXIST. SEE SHEET SD-500 FOR ALL RACKING CONNECTION DETAILS. REFER TO THE DGFT INSTALLATION GUIDE FOR ADDITIONAL INFORMATION.

SECTION VIEW OF DGFT TABLE - 30° TILT
(72 CELL SOLAR PANELS)



RACKING DIMENSION NOTES:

1. THIS CROSS SECTION AND DIMENSIONS SHOWN ARE SPECIFIC TO A SOLAR-WORLD SUNMODULE PLUS - 60 CELL SOLAR MODULE. ACTUAL DIMENSIONS WILL VARY SLIGHTLY BASED ON THE ACTUAL SOLAR MODULE SELECTED. REFER TO STATE SPECIFIC CERTIFICATION LETTER FOR MORE INFORMATION ON THE LIMITS OF THIS REGION SPECIFIC DGFT RACKING DESIGN. (SEE DIMENSION AND WEIGHT LIMITS.)
2. EAST/WEST BEAM SPACING IS BASED ON A COMBINATION OF CLAMPING RANGES SPECIFIED IN THE INSTALLATION MANUALS FOR THE SOLARWORLD SUNMODULE PLUS AND TRINA PD05 - 60 CELL SOLAR MODULES. FINE TUNE ADJUSTMENTS IN THE EAST/WEST BEAM TO TOP CHORD CHANNEL CONNECTIONS EXIST. SEE SHEET SD-500 FOR ALL RACKING CONNECTION DETAILS. REFER TO THE DGFT INSTALLATION GUIDE FOR ADDITIONAL INFORMATION.

SECTION VIEW OF DGFT TABLE - 30° TILT
(60 CELL SOLAR PANELS)

REVISION BLOCK

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REVIEWED BY:	Jeff H
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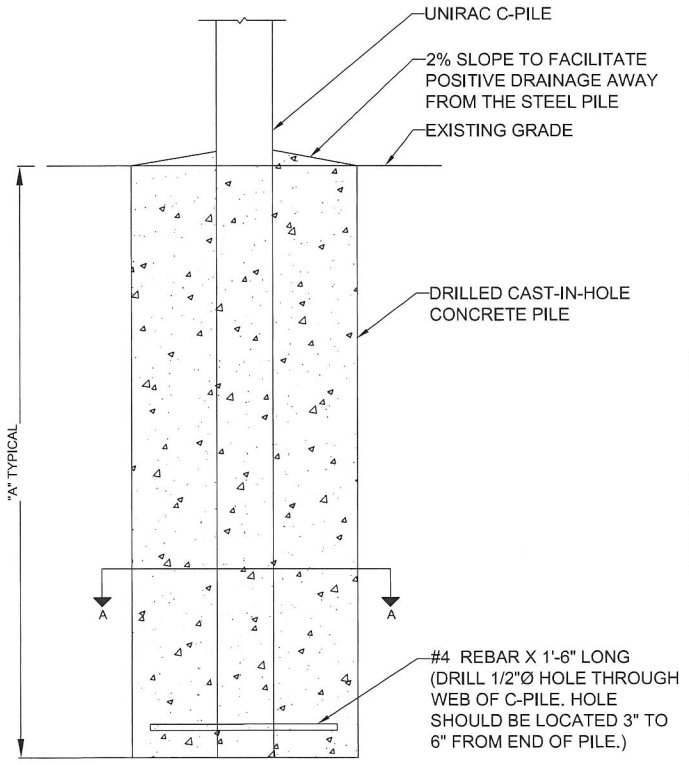
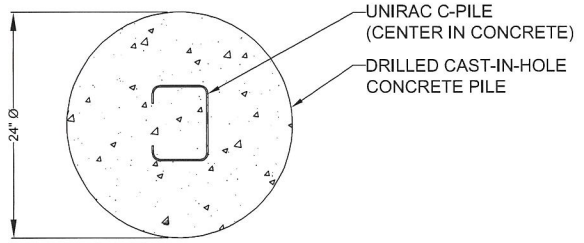
SHEET TITLE
DGFT TABLE CROSS-SECTION AND PARTS LIST (30 DEGREE TILT)

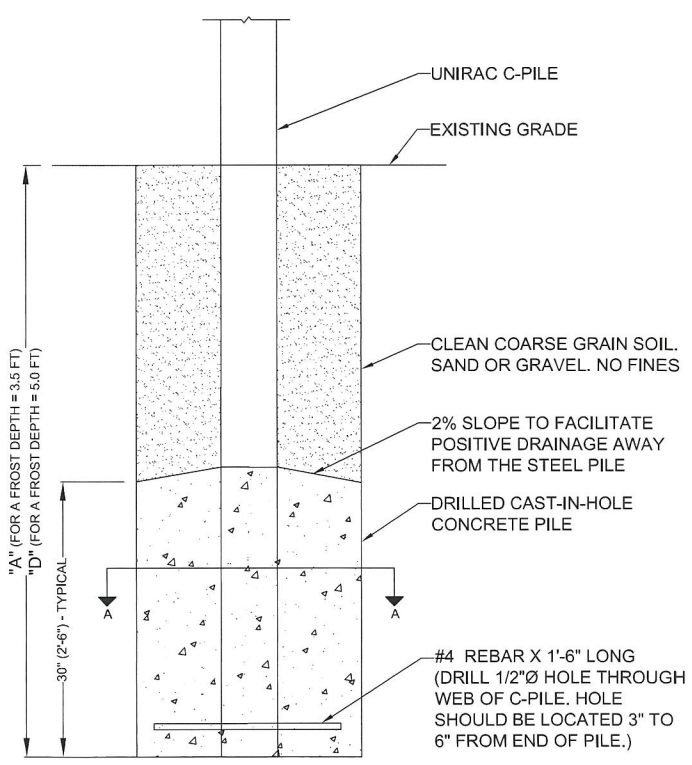
SHEET NUMBER
SD-300

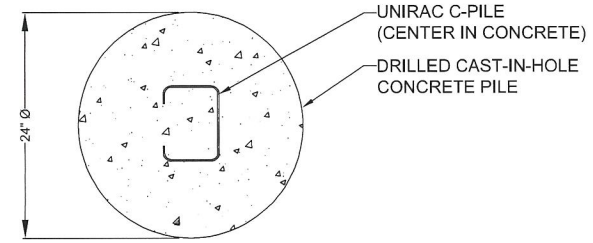




SECTION A-A
TOP VIEW

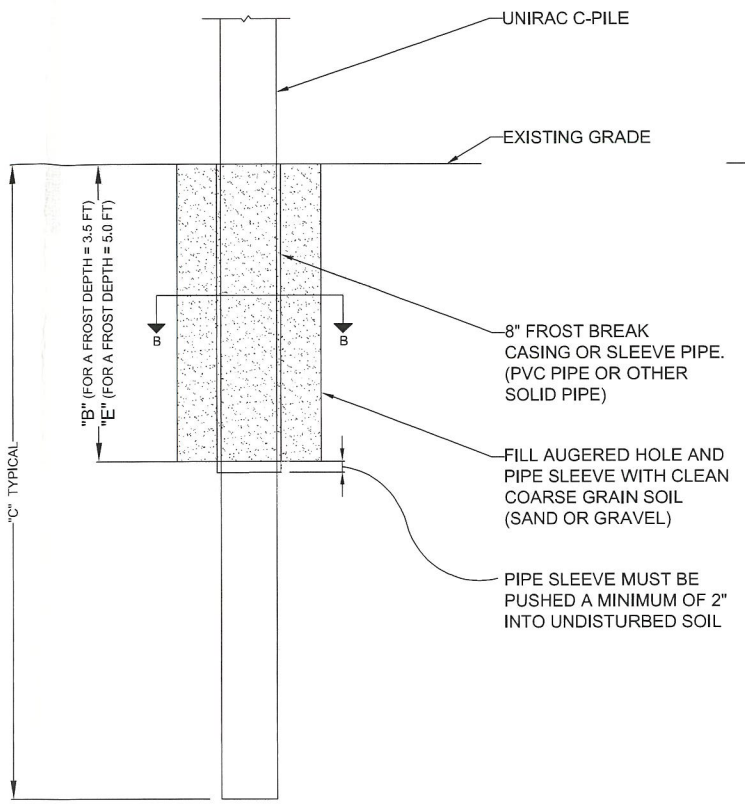
400 DRILLED CAST-IN-HOLE CONCRETE PILE FOUNDATION
(ALTERNATE OPTION) NOT TO SCALE

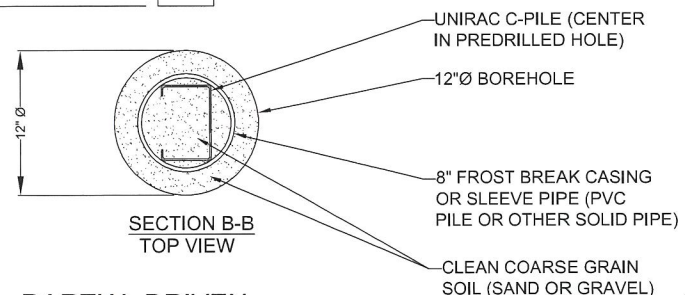




SECTION A-A
TOP VIEW

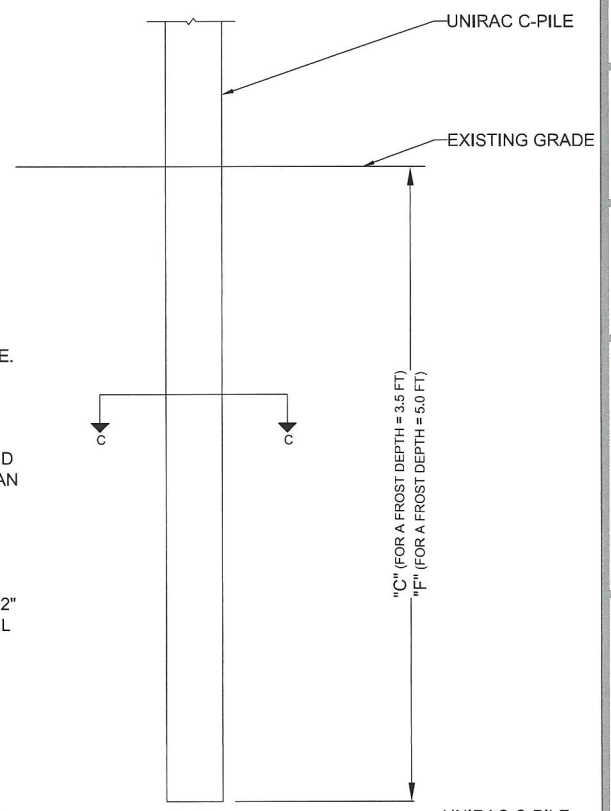
401 DRILLED "PARTIAL" CAST-IN-HOLE CONCRETE PILE FOUNDATION
(ALTERNATE OPTION) NOT TO SCALE

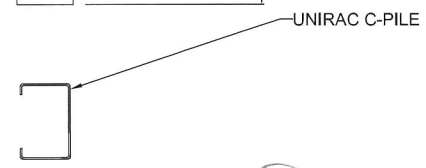




SECTION B-B
TOP VIEW

402 PARTIAL DRIVEN PILE WITH CLEAN COARSE BACKFILL
(ALTERNATE OPTION) NOT TO SCALE





SECTION C-C
TOP VIEW

403 FULLY DRIVEN PILE
(ALTERNATE OPTION) NOT TO SCALE

FOUNDATION 400: DRILLED CAST-IN-HOLE CONCRETE PILE FOUNDATION
1. THE FOUNDATION MUST BE EXCAVATED WITH LITTLE TO NO LOOSE MATERIAL IN THE BOTTOM.
2. IF THE FOUNDATION IS BELOW THE GROUND WATER LEVEL, THERE MUST BE A TEMPORARY CASING IN PLACE TO STABILIZE THE EXCAVATION.
3. THE PILE SHALL HAVE A #4 REBAR PLACED THROUGH THE BOTTOM OF THE PILE.
4. THE PILE MUST BE CENTERED IN THE HOLE WITH EQUAL AMOUNTS OF CONCRETE AROUND THE CASING.
5. CONCRETE SHALL CONFORM TO THE CONCRETE SPECIFICATIONS LISTED ON DR-100.
6. CONCRETE DEPTH SHALL CONFIRM TO THE DEPTHS LISTED IN THE TABLE ON THIS SHEET.
7. THE TOP OF THE CONCRETE MUST BE ABOVE GARDE.
8. THE CORE OF THE CONCRETE CAST-IN-DRILLED HOLE PILE WILL CONSIST OF THE UNIRAC C- PILES AS DEPICTED IN THE FIGURE.

FOUNDATION 401: DRILLED "PARTIAL" CAST-IN-HOLE CONCRETE PILE FOUNDATION
1. THE FOUNDATION MUST BE EXCAVATED WITH LITTLE TO NO LOOSE MATERIAL IN THE BOTTOM.
2. IF THE FOUNDATION IS BELOW THE GROUND WATER LEVEL, THERE MUST BE A TEMPORARY CASING IN PLACE TO STABILIZE THE EXCAVATION.
3. THE PILE SHALL HAVE A #4 REBAR PLACED THROUGH THE BOTTOM OF THE PILE.
4. THE PILE MUST BE CENTERED IN THE HOLE WITH EQUAL AMOUNTS OF CONCRETE AROUND THE CASING.
5. CONCRETE SHALL CONFORM TO THE CONCRETE SPECIFICATIONS LISTED ON DR-100.
6. CONCRETE DEPTH SHALL CONFIRM TO THE DEPTHS LISTED IN THE TABLE ON THIS SHEET.
7. THE TOP OF THE CONCRETE MUST BE BELOW THE DEPTH OF THE FROST ZONE.
8. THE CORE OF THE CONCRETE CAST-IN-DRILLED HOLE PILE WILL CONSIST OF THE UNIRAC C- PILES AS DEPICTED IN THE FIGURE.
9. THE BACKFILL MATERIAL MUST CONSIST OF MEDIUM TO COARSE SAND OR GRAVEL. NO CLAY OR ORGANICS MAY BE USED IN THE BACKFILL.

FOUNDATION 402: PARTIAL DRIVEN PILE WITH CLEAN COARSE BACKFILL.
1. EACH PILE LOCATION MUST BE EXCAVATED TO A MINIMUM OF THE DIMENSION SHOWN.
2. THE PILE MUST BE CENTERED IN THE HOLE WITH THE FROST BREAK CASING PLACED AROUND THE PILE PRIOR TO BACKFILLING THE EXCAVATION.
3. THE FROST BREAK CASING MUST NOT HAVE ANY CRACKS OR HOLES THAT MAY ALLOW WATER TO SEEP IN. THE CASING MUST BE SET A MINIMUM OF 2 INCHES INTO THE NATIVE SOIL IN THE BOTTOM OF THE EXCAVATION. THE CASING TOP MUST EXTEND TO THE GROUND SURFACE.
4. THE FILL MATERIAL MUST CONSIST OF MEDIUM TO COARSE SAND OR GRAVEL WITH LITTLE SILT CONTENT. NO CLAY OR ORGANICS MAY BE USED IN THE BACKFILL MATERIAL.
5. THE PILE MUST BE INSTALLED TO THE FULL DEPTH INDICATED. PILES NOT DRIVEN TO THE FULL DEPTH ARE CONSIDERED FAILED AND THE CONCRETE OPTION MUST BE UTILIZED.
6. THE CASING MUST BE FILLED WITH THE SAME FILL MATERIAL AFTER THE PILE IS INSTALLED TO THE CORRECT DEPTH.
7. THE FILL SHALL BE FORMED IN A WAY TO DIRECT WATER AWAY FROM THE FOUNDATION.
8. IF THE CASING IS AFFECTED BY FROST HEAVE, THE CASING SHALL BE ATTEMPTED TO BE RE-EMBEDED TO THE PROPER DEPTH IN ORDER TO PROTECT THE C-PILE FROM FUTURE FROST HEAVE.

FOUNDATION 403: FULLY DRIVEN PILE:
1. DRIVEN PILE FOUNDATIONS MAY ONLY BE USE IN SOILS THAT ARE NOT FROST SUSCEPTIBLE OR WHERE GROUND WATER IS NOT WITHIN 12 FEET OF THE SURFACE UNLESS APPROVED BY A GEOTECHNICAL ENGINEER. FROST SUSCEPTIBLE SOILS CONSIST OF ANY SOIL THAT IS NOT MEDIUM TO COARSE GRAIN SAND OR GRAVEL. DRIVEN PILE FOUNDATIONS ABSOLUTELY MAY NOT BE USED IN SOILS THAT CONTAIN SILT OR CLAY OR GROUNDWATER WITHIN 12 FEET OF THE SURFACE UNLESS APPROVED BY A GEOTECHNICAL ENGINEER.
2. PILES MUST BE INSTALLED TO THE FULL DEPTH. PILES NOT DRIVEN TO FULL DEPTH ARE CONSIDERED FAILED PILES AND A DIFFERENT FOUNDATION MUST BE UTILIZED.

NOTE:
FOR PILE QUANTITY BASED ON TABLE SIZE, SEE TABLES ON THE STATE SPECIFIC CERTIFICATION LETTER. ALSO
FOR PILE EMBEDMENT DEPTH AND TOTAL PILE LENGTH, SEE TABLES ON STATE SPECIFIC CERTIFICATION LETTER.

20 DEGREE UNIRAC STEEL C-PILE FOUNDATION DEPTHS

FOUNDATION TYPE	DETAIL NUMBER	FROST DEPTH = 3.5 FT OR LESS			FROST DEPTH = 5.0 FT		
		DIMENSION "A"	DIMENSION "B"	DIMENSION "C"	DIMENSION "D"	DIMENSION "E"	DIMENSION "F"
FULL CAST IN-PLACE CONCRETE	400	8'-0"	--	--	8'-0"	--	--
CAST IN-PLACE CONCRETE	401	8'-0"	--	--	8'-0"	--	--
PARTIAL DRIVEN PILE WITH FROST BREAK	402	--	3'-6"	10'-6"	--	5'-0"	--
FULLY DRIVEN PILE*	403	--	--	10'-6"	--	--	10'-6"

*SHALLOWER PILE EMBEDMENT MAY BE USED IF APPROVED BY A GEOTECHNICAL ENGINEER.

30 DEGREE UNIRAC STEEL C-PILE FOUNDATION DEPTHS

FOUNDATION TYPE	DETAIL NUMBER	FROST DEPTH = 3.5 FT OR LESS			FROST DEPTH = 5.0 FT		
		DIMENSION "A"	DIMENSION "B"	DIMENSION "C"	DIMENSION "D"	DIMENSION "E"	DIMENSION "F"
FULL CAST IN-PLACE CONCRETE	400	6'-0"	--	--	6'-0"	--	--
CAST IN-PLACE CONCRETE	401	6'-0"	--	--	7'-6"	--	--
PARTIAL DRIVEN PILE WITH FROST BREAK	402	--	3'-6"	8'-6"	--	5'-0"	--
FULLY DRIVEN PILE	403	--	--	8'-6"	--	--	8'-6"

*SHALLOWER PILE EMBEDMENT MAY BE USED IF APPROVED BY A GEOTECHNICAL ENGINEER.

REVISION BLOCK		
MARK	DATE	DESCRIPTION
1	10/19/16	NOTE & BRACE REVISIONS
2	1/06/2017	ADDED SD-200
3	2/02/2017	REVED NOTES
4	2/13/2017	REVED NOTES & SD-300
5	3/10/2017	UPDATED LINE TYPES

OWNER/CLIENT:

ENGINEERING CONSULTANT:
Design Optimization Technologies
424 Jefferson Street
St. Charles, Mo 63301
Phone: (636) 724-9872
www.DOTecEngineering.com

PROFESSIONAL SEAL

SEE STATE SPECIFIC STAMPED & SIGNED GFT CERTIFICATION LETTER

UNIRAC'S DGFT DISTRIBUTION GROUND FIXED TILT STRUCTURAL RACKING DRAWINGS

UNIRAC®
1411 Broadway Boulevard NE
Albuquerque, New Mexico 87102
Phone: (505) 242-6411
Fax: (505) 242-6412
www.unirac.com

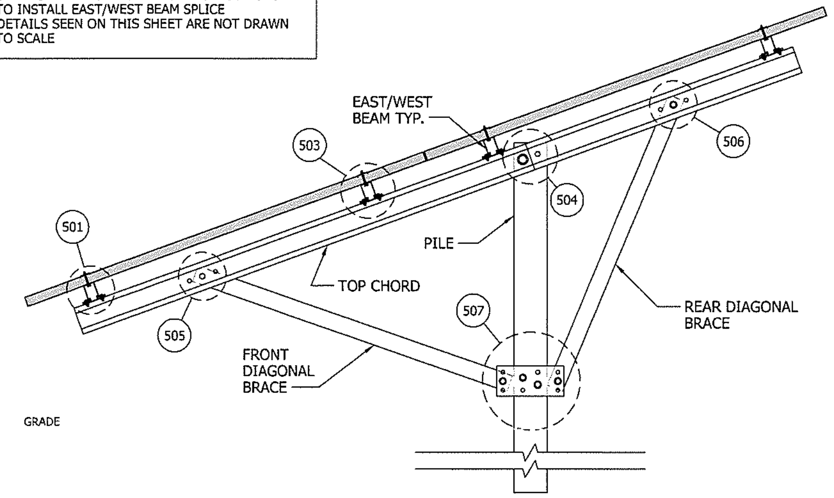
PROJECT NUMBER:	DGFT
ENGINEERED BY:	Jon S
DRAFTED BY:	Jeff H
REVIEWED BY:	Jeff H
ORIGINAL RELEASE DATE:	9/30/2016
DRAWING SHEET SIZE:	'D' - 24x36

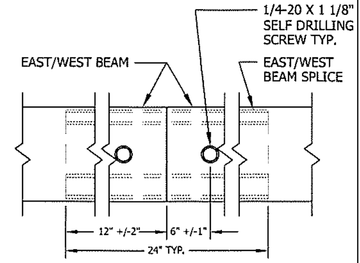
SHEET TITLE
FOUNDATION EMBEDMENT AND FOUNDATION DETAILS

SHEET NUMBER SD-400 SHEET 4 of 5

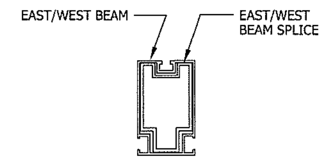
RACKING DETAIL NOTES:

1. SEE INSTALLATION GUIDE FOR PILE TOLERANCES
2. SEE INSTALLATION GUIDE FOR CONNECTION ADJUSTMENT INSTRUCTIONS
3. SEE INSTALLATION GUIDE FOR INSTRUCTIONS TO INSTALL EAST/WEST BEAM SPLICE
4. DETAILS SEEN ON THIS SHEET ARE NOT DRAWN TO SCALE

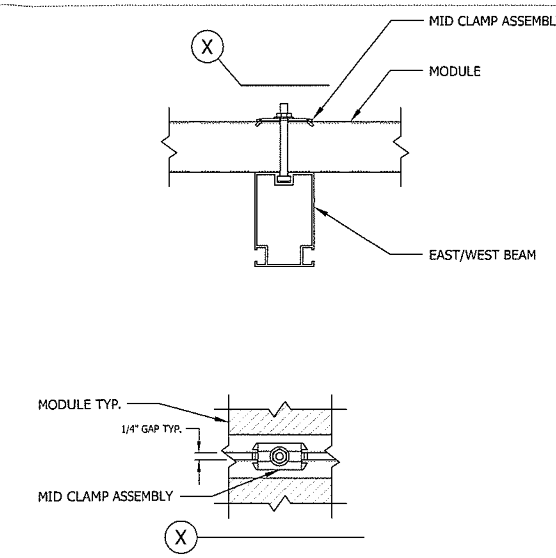




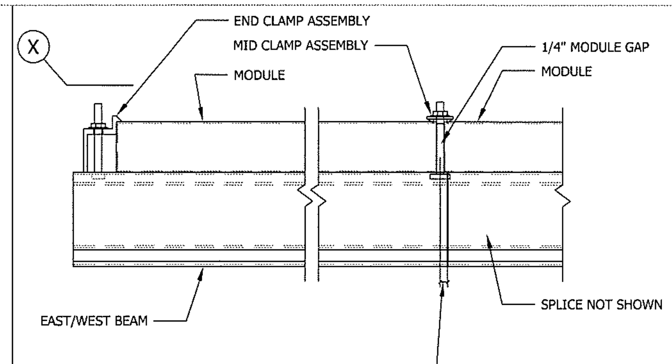
EAST/WEST BEAM WITH SPLICE
(TYPICAL ELEVATION)



EAST/WEST BEAM WITH SPLICE
(TYPICAL SECTION)

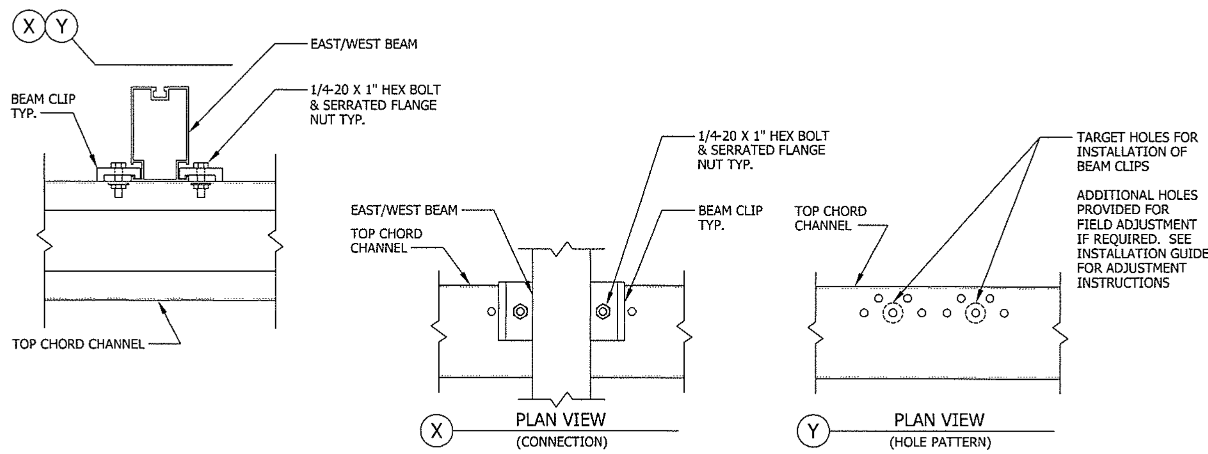


501 MODULE TO EAST/WEST BEAM CONNECTION
(BONDING MID CLAMP)



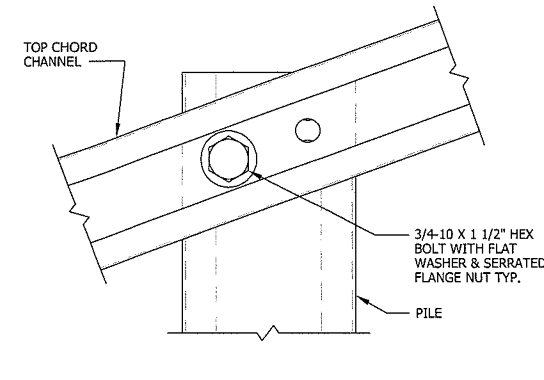
NOTE:
CENTERLINE OF T-BOLT SHALL NOT BE CLOSER THAN 1/4" FROM AN EAST/WEST BEAM SPLICE. SHIFT FIRST MODULE LOCATION ON EAST/WEST BEAM AS REQ'D TO AVOID THIS SPLICE CONFLICT.

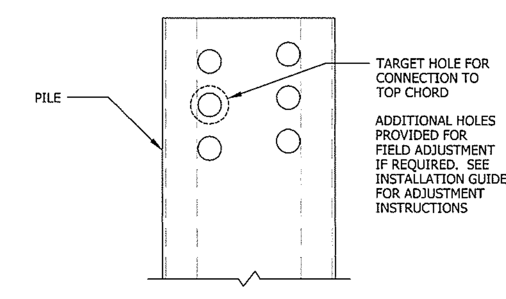
502 MODULE TO EAST/WEST BEAM CONNECTION
(END CLAMP)



503 EAST/WEST BEAM TO TOP CHORD CONNECTION

NOTE:
1. BOLT HEAD AND WASHER ALWAYS TO BE INSTALLED ON SIDE OF CONNECTION WITH MEMBER HAVING THE THINNER GAUGE

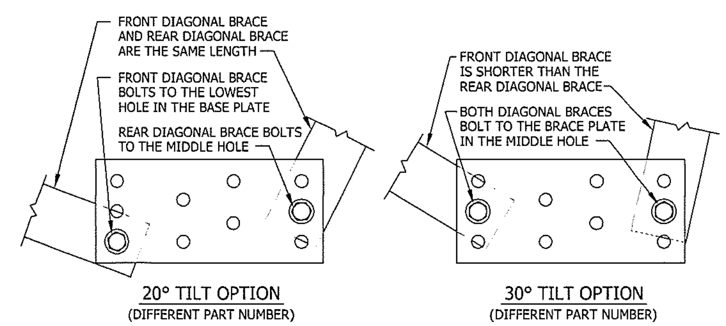




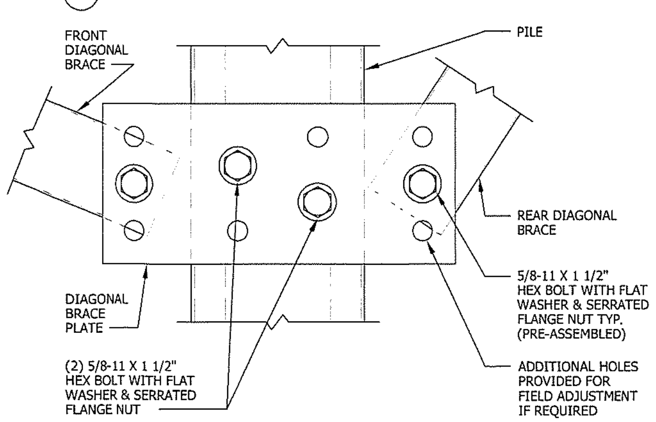
ELEVATION VIEW
(HOLE PATTERN)

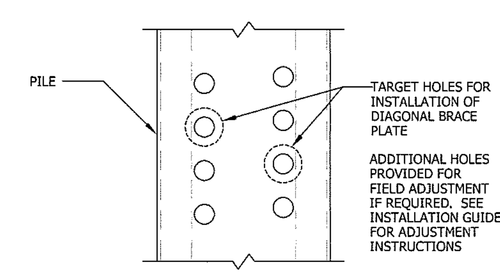
504 TOP CHORD TO PILE CONNECTION

NOTE:
1. BOLT HEAD AND WASHER ALWAYS TO BE INSTALLED ON SIDE OF CONNECTION WITH MEMBER HAVING THE THINNER GAUGE



DIFFERENCES IN DIAGONAL BRACE ASSEMBLIES

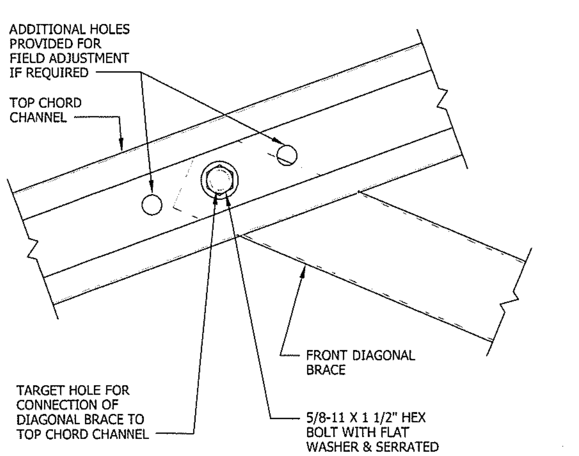




ELEVATION VIEW
(HOLE PATTERN)

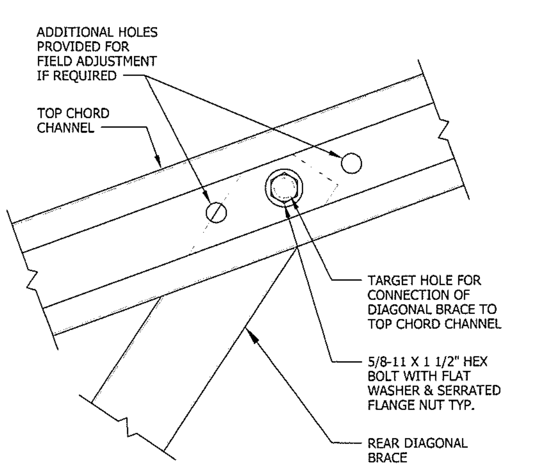
507 DIAGONAL BRACE TO PILE CONNECTION

NOTE:
1. BOLT HEAD AND WASHER ALWAYS TO BE INSTALLED ON SIDE OF CONNECTION WITH MEMBER HAVING THE THINNER GAUGE



505 TOP CHORD TO DIAGONAL BRACE CONNECTION
(FRONT BRACE)

NOTE:
1. BOLT HEAD AND WASHER ALWAYS TO BE INSTALLED ON SIDE OF CONNECTION WITH MEMBER HAVING THE THINNER GAUGE



506 TOP CHORD TO DIAGONAL BRACE CONNECTION
(REAR BRACE)

REVISION BLOCK		
MARK	DATE	DESCRIPTION
1	10/19/16	NOTE & BRACE REVISIONS
2	1/06/2017	ADDED SD-200
3	2/02/2017	REVED NOTES
4	2/13/2017	REVED NOTES & SD-300
5	3/10/2017	UPDATED LINE TYPES

OWNER/CLIENT:

ENGINEERING CONSULTANT:
Design Optimization Technologies
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St. Charles, Mo 63301
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PROFESSIONAL SEAL

SEE STATE SPECIFIC STAMPED & SIGNED GFT CERTIFICATION LETTER

UNIRAC'S DGFT DISTRIBUTION GROUND FIXED TILT STRUCTURAL RACKING DRAWINGS

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PROJECT NUMBER:	DGFT
ENGINEERED BY:	Jon S
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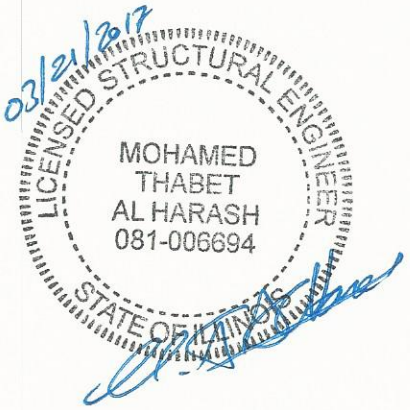
REVIEWED BY:	Jeff H
ORIGINAL RELEASE DATE:	9/30/2016
DRAWING SHEET SIZE:	'D' - 24x36

SHEET TITLE
RACKING DETAILS

SHEET NUMBER SD-500
SHEET 5 of 5

DOTEC CORP.

Customized Engineering Solutions



March 17, 2017

Unirac, Inc.
1411 Broadway Boulevard NE
Albuquerque, New Mexico 87102-1545
TEL: (505) 248-2702 (Technical Support)

Attn.: Engineering Department,

Re: Engineering Certification for Unirac's DGFT (Distribution Ground Fixed Tilt)

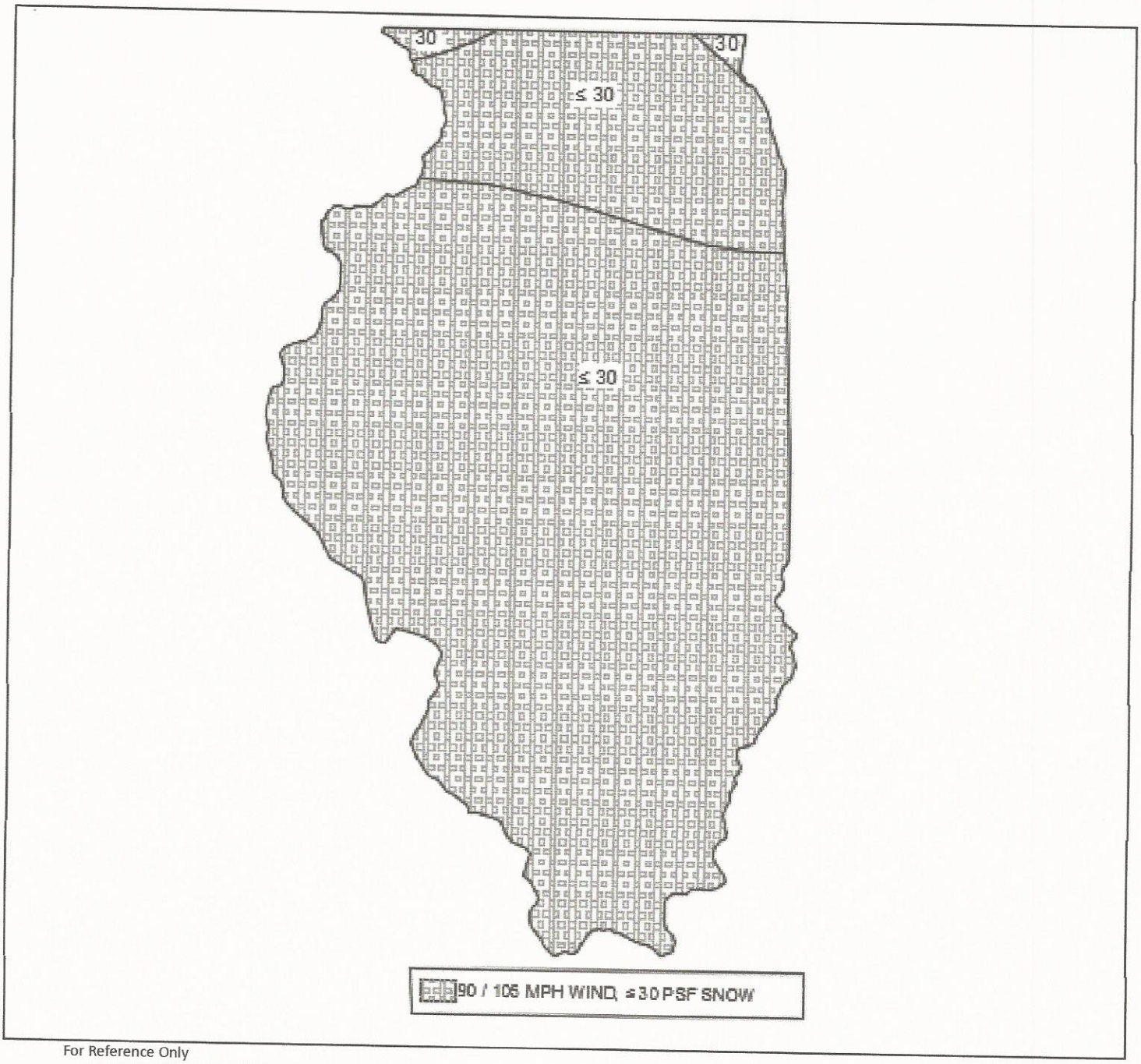
DOTec Engineering, Inc. has reviewed Unirac's DGFT design tool and design methodology. This approved design tool was utilized to develop the design tables listed below. The design methodology is acceptable for a code compliant, ground mount racking structure, supporting photovoltaic (PV) solar modules for residential/commercial.

All analysis and information included in the following DGFT design tables comply with the following:

1. 2009 International Building Code, 2012 International Building Code, and 2015 International Building Code, by International Code Council, Inc., 2009, 2012, and 2015
2. ASCE/SEI 7-05 and ASCE/SEI 7-10 Minimum Design Loads and other Structures, by ASCE, 2006 and 2013
3. 2005 Aluminum Design Manual and 2010 Aluminum Design Manual (ADM), by the Aluminum Association, 2005 and 2010

This letter certifies that the structural analysis of the racking members, connections, and foundation designs (as listed in the following design tables) are in compliance with the above Codes.

See design tables on the following pages;



For Reference Only

NOTES:

1. SEE SHEET SD-100 FOR RACKING DESIGN CRITERIA.
2. REFER TO SHEET SD-200 FOR TABLE CROSS SECTIONAL DIMENSIONS AND PARTS LIST FOR 20 DEGREE TILT.
3. REFER TO SHEET SD-300 FOR TABLE CROSS SECTIONAL DIMENSIONS AND PARTS LIST FOR 30 DEGREE TILT.
4. SEE DETAILS AND NOTES ON SHEETS SD-100 AND SD-400 FOR ADDITIONAL INFORMATION ON SOIL TYPES AND SELECTION OF PROPER FOUNDATION TYPE FOR EACH DGFT INSTALLATION. THIS IS THE RESPONSIBILITY OF THE INSTALLER/PROJECT OWNER.
5. SOLAR REQUIREMENTS (FROM OWNER):
   TABLE TILT ANGLE = 20 OR 30 DEGREES
   LEADING EDGE HEIGHT = 24 IN FOR 20 DEGREE AND 30 IN FOR 30 DEGREE TILT (FROM TOP OF SOLAR PANEL TO GRADE)
   ROW TO ROW SPACING = VERIFY WITH SOLAR DRAWINGS
   SOLAR PANEL = BY OTHERS (SEE DIMENSION/WEIGHT LIMITS BELOW)
   72 CELL SOLAR PANEL DIM. = 70.0" TO 78.5" LENGTH, 37" TO 39.5" WIDTH, 1.30 TO 1.98" THICKNESS, 47.5 LBS TO 60 LBS
   60 CELL SOLAR PANEL DIM. = 64.0" TO 66.0" LENGTH, 36" TO 39.5" WIDTH, 1.30 TO 1.98" THICKNESS, 38.0 LBS TO 45 LBS

NOTE: UNIRAC AND THE ENGINEER OF RECORD ARE NOT RESPONSIBLE FOR THE SOLAR DESIGN, PERFORMANCE, SHADING, ETC. OF THE SOLAR SYSTEM. THIS BELONGS TO THE SOLAR ENGINEER OF RECORD.

20 Degree Tilt

90 MPH ASCE 7-05 / 105 MPH ASCE 7-10 Wind; 20 PSF Snow; 72 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"
2x6	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"
2x8	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	2	15' - 6"	5' - 7"	2	15' - 6"	5' - 7"
2x9	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"
2x12	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"	3	14' - 3"	5' - 8 1/4"	3	14' - 3"	5' - 8 1/4"
2x13	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"
2x16	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"	4	14' - 0"	5' - 6 5/8"	4	14' - 0"	5' - 6 5/8"
2x17	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"
2x18	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"
2x19	6	10' - 9"	4' - 7 1/2"	6	10' - 9"	4' - 7 1/2"	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"
2x20	6	11' - 6"	4' - 4 7/8"	6	11' - 6"	4' - 4 7/8"	5	13' - 9"	5' - 7 7/8"	5	13' - 9"	5' - 7 7/8"
2x21	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"
2x22	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"
2x23	7	11' - 3"	4' - 4 3/8"	7	11' - 3"	4' - 4 3/8"	6	13' - 0"	5' - 7 3/8"	6	13' - 0"	5' - 7 3/8"
2x24	7	11' - 9"	4' - 6 1/8"	7	11' - 9"	4' - 6 1/8"	6	13' - 9"	5' - 4 5/8"	6	13' - 9"	5' - 4 5/8"
2x25	7	12' - 3"	4' - 8"	7	12' - 3"	4' - 8"	6	14' - 3"	5' - 9 1/2"	6	14' - 3"	5' - 9 1/2"
2x26	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"
2x27	8	11' - 6"	4' - 5 5/8"	8	11' - 6"	4' - 5 5/8"	7	13' - 3"	4' - 11 5/8"	7	13' - 3"	4' - 11 5/8"
2x28	8	11' - 9"	5' - 3"	8	11' - 9"	5' - 3"	7	13' - 6"	5' - 10 1/2"	7	13' - 6"	5' - 10 1/2"
2x29	8	12' - 3"	5' - 1 3/4"	8	12' - 3"	5' - 1 3/4"	7	14' - 0"	6' - 0 1/4"	7	14' - 0"	6' - 0 1/4"
2x30	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"

90 MPH ASCE 7-05 / 105 MPH ASCE 7-10 Wind; 20 PSF Snow; 60 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"
2x6	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"
2x8	2	15' - 6"	5' - 7"	2	15' - 6"	5' - 7"	2	15' - 6"	5' - 7"	2	15' - 6"	5' - 7"
2x9	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"
2x12	3	14' - 3"	5' - 8 1/4"	3	14' - 3"	5' - 8 1/4"	3	14' - 3"	5' - 8 1/4"	3	14' - 3"	5' - 8 1/4"
2x13	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"
2x16	4	14' - 0"	5' - 6 5/8"	4	14' - 0"	5' - 6 5/8"	4	14' - 0"	5' - 6 5/8"	4	14' - 0"	5' - 6 5/8"
2x17	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"	4	14' - 9"	6' - 0 7/8"	4	14' - 9"	6' - 0 7/8"
2x18	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"
2x19	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"
2x20	5	13' - 9"	5' - 7 7/8"	5	13' - 9"	5' - 7 7/8"	5	13' - 9"	5' - 7 7/8"	5	13' - 9"	5' - 7 7/8"
2x21	5	14' - 6"	5' - 9 3/4"	5	14' - 6"	5' - 9 3/4"	5	14' - 6"	5' - 9 3/4"	5	14' - 6"	5' - 9 3/4"
2x22	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"
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2x24	6	13' - 9"	5' - 4 5/8"	6	13' - 9"	5' - 4 5/8"	6	13' - 9"	5' - 4 5/8"	6	13' - 9"	5' - 4 5/8"
2x25	6	14' - 3"	5' - 9 1/2"	6	14' - 3"	5' - 9 1/2"	6	14' - 3"	5' - 9 1/2"	6	14' - 3"	5' - 9 1/2"
2x26	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"
2x27	7	13' - 3"	4' - 11 5/8"	7	13' - 3"	4' - 11 5/8"	7	13' - 3"	4' - 11 5/8"	7	13' - 3"	4' - 11 5/8"
2x28	7	13' - 6"	5' - 10 1/2"	7	13' - 6"	5' - 10 1/2"	7	13' - 6"	5' - 10 1/2"	7	13' - 6"	5' - 10 1/2"
2x29	8	12' - 3"	5' - 1 3/4"	8	14' - 0"	5' - 1 3/4"	7	14' - 0"	6' - 0 1/4"	7	14' - 0"	6' - 0 1/4"
2x30	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"

NOTES:

1. FOR DIMENSIONS A & B SEE 'PLAN VIEW OF TABLE' ON SHEET SD-300. THESE DIMENSIONS SHALL NOT BE EXCEEDED BY 2".
2. *DESIGN LOADS SHOWN ABOVE AND FINAL DESINGS ARE BASED ON ASCE 7-05 and ASCE 7-10.*
3. EXPOSURE B SHALL APPLY WHERE THE GROUND SURFACE ROUGHNESS CONDITION B PREVAILS FOR A DISTANCE OF 1,500 FEET.
4. SURFACE ROUGHNESS B IS DEFINED AS URBAN AND SUBURBAN AREAS, WOODED AREAS, OR OTHER TERRAIN WITH NUMEROUS CLOSELY SPACED OBSTRUCTIONS HAVING THE SIZE OF SINGLE-FAMILY DWELLINGS OR LARGER.
5. EXPOSURE C SHALL BE USED WHEN EXPOSURE B DOES NOT APPLY OR MEETS THE CRITERIA FOR SURFACE ROUGHNESS C PERTAINING TO OPEN TERRAIN WITH SCATTERED OBSTRUCTIONS.
6. CONCRETE PILES AND PARTIAL CONCRETE CAN UTILIZE THE 12.5 FOOT TOTAL LENGTH PILE. DRIVEN PILES AND PARTIAL DRIVEN PILES REQUIRE THE 15.0 FOOT TOTAL LENGTH PILE.

20 Degree Tilt

110 MPH ASCE 7-05 / 120 MPH ASCE 7-10 Wind; 20 PSF Snow; 72 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"
2x6	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"
2x8	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"
2x9	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	4	8' - 9"	3' - 6 1/8"	4	8' - 9"	3' - 6 1/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	4	9' - 6"	4' - 0 1/2"	4	9' - 6"	4' - 0 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"
2x12	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"
2x13	5	9' - 0"	3' - 7 1/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	5	9' - 9"	3' - 8 7/8"	5	9' - 9"	3' - 8 7/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	5	10' - 3"	4' - 4 3/4"	5	10' - 3"	4' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"
2x16	6	9' - 0"	4' - 0 5/8"	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"
2x17	6	9' - 9"	3' - 9 7/8"	6	9' - 9"	3' - 9 7/8"	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"
2x18	6	10' - 3"	4' - 2 3/4"	6	10' - 3"	4' - 2 3/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"
2x19	6	10' - 9"	4' - 7 1/2"	6	10' - 9"	4' - 7 1/2"	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"
2x20	7	9' - 9"	3' - 10 7/8"	7	9' - 9"	3' - 10 7/8"	5	13' - 9"	5' - 7 7/8"	5	13' - 9"	5' - 7 7/8"
2x21	7	10' - 3"	4' - 0 3/4"	7	10' - 3"	4' - 0 3/4"	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"
2x22	7	10' - 9"	4' - 2 1/2"	7	10' - 9"	4' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"
2x23	8	9' - 9"	3' - 11 7/8"	8	9' - 9"	3' - 11 7/8"	6	13' - 0"	5' - 7 3/8"	6	13' - 0"	5' - 7 3/8"
2x24	8	10' - 3"	3' - 10 5/8"	8	10' - 3"	3' - 10 5/8"	7	11' - 9"	4' - 6 1/8"	7	11' - 9"	4' - 6 1/8"
2x25	8	10' - 6"	4' - 8"	8	10' - 6"	4' - 8"	7	12' - 3"	4' - 8"	7	12' - 3"	4' - 8"
2x26	9	9' - 9"	4' - 0 7/8"	8	11' - 0"	4' - 6 7/8"	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"
2x27	9	10' - 3"	3' - 8 5/8"	9	10' - 3"	3' - 8 5/8"	7	13' - 3"	4' - 11 5/8"	7	13' - 3"	4' - 11 5/8"
2x28	9	10' - 6"	4' - 4 1/2"	9	10' - 6"	4' - 4 1/2"	8	11' - 9"	5' - 3"	8	11' - 9"	5' - 3"
2x29	10	9' - 9"	4' - 1 3/4"	9	11' - 0"	4' - 0 1/4"	8	12' - 3"	5' - 1 3/4"	8	12' - 3"	5' - 1 3/4"
2x30	10	10' - 0"	4' - 8 1/8"	9	11' - 3"	4' - 8 1/8"	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"

110 MPH ASCE 7-05 / 120 MPH ASCE 7-10 Wind; 20 PSF Snow; 60 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"
2x6	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"
2x8	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	2	15' - 6"	5' - 7"	2	15' - 6"	5' - 7"
2x9	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	4	9' - 6"	4' - 0 1/2"	4	9' - 6"	4' - 0 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"
2x12	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"	3	14' - 3"	5' - 8 1/4"	3	14' - 3"	5' - 8 1/4"
2x13	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	5	10' - 3"	4' - 4 3/4"	5	10' - 3"	4' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"
2x16	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"	4	14' - 0"	5' - 6 5/8"	4	14' - 0"	5' - 6 5/8"
2x17	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"	4	14' - 9"	6' - 0 7/8"	4	14' - 9"	6' - 0 7/8"
2x18	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"
2x19	6	10' - 9"	4' - 7 1/2"	6	10' - 9"	4' - 7 1/2"	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"
2x20	6	11' - 6"	4' - 4 7/8"	6	11' - 6"	4' - 4 7/8"	5	13' - 9"	5' - 7 7/8"	5	13' - 9"	5' - 7 7/8"
2x21	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"	5	14' - 6"	5' - 9 3/4"	5	14' - 6"	5' - 9 3/4"
2x22	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"
2x23	7	11' - 3"	4' - 4 3/8"	7	11' - 3"	4' - 4 3/8"	6	13' - 0"	5' - 7 3/8"	6	13' - 0"	5' - 7 3/8"
2x24	7	11' - 9"	4' - 6 1/8"	7	11' - 9"	4' - 6 1/8"	6	13' - 9"	5' - 4 5/8"	6	13' - 9"	5' - 4 5/8"
2x25	7	12' - 3"	4' - 8"	7	12' - 3"	4' - 8"	6	14' - 3"	5' - 9 1/2"	6	14' - 3"	5' - 9 1/2"
2x26	8	11' - 0"	4' - 6 7/8"	8	11' - 0"	4' - 6 7/8"	7	12' - 9"	4' - 9 7/8"	6	14' - 9"	6' - 2 3/8"
2x27	8	11' - 6"	4' - 5 5/8"	8	11' - 6"	4' - 5 5/8"	7	13' - 3"	4' - 11 5/8"	7	13' - 3"	4' - 11 5/8"
2x28	8	11' - 9"	5' - 3"	8	11' - 9"	5' - 3"	7	13' - 6"	5' - 10 1/2"	7	13' - 6"	5' - 10 1/2"
2x29	9	11' - 0"	4' - 0 1/4"	9	11' - 0"	4' - 0 1/4"	8	12' - 3"	5' - 1 3/4"	7	14' - 0"	6' - 0 1/4"
2x30	9	11' - 3"	4' - 8 1/8"	9	11' - 3"	4' - 8 1/8"	8	12' - 9"	5' - 0 5/8"	7	14' - 6"	6' - 2 1/8"

NOTES:

1. FOR DIMENSIONS A & B SEE 'PLAN VIEW OF TABLE' ON SHEET SD-200 OR SD-300. THESE DIMENSIONS SHALL NOT BE EXCEEDED BY 2".
2. *DESIGN LOADS SHOWN ABOVE AND FINAL DESINGS ARE BASED ON ASCE 7-05 and ASCE 7-10.*
3. EXPOSURE B SHALL APPLY WHERE THE GROUND SURFACE ROUGHNESS CONDITION B PREVAILS FOR A DISTANCE OF 1,500 FEET.
4. SURFACE ROUGHNESS B IS DEFINED AS URBAN AND SUBURBAN AREAS, WOODED AREAS, OR OTHER TERRAIN WITH NUMEROUS CLOSELY SPACED OBSTRUCTIONS HAVING THE SIZE OF SINGLE-FAMILY DWELLINGS OR LARGER.
5. EXPOSURE C SHALL BE USED WHEN EXPOSURE B DOES NOT APPLY OR MEETS THE CRITERIA FOR SURFACE ROUGHNESS C PERTAINING TO OPEN TERRAIN WITH SCATTERED OBSTRUCTIONS.
6. CONCRETE PILES AND PARTIAL CONCRETE CAN UTILIZE THE 12.5 FOOT TOTAL LENGTH PILE. DRIVEN PILES AND PARTIAL DRIVEN PILES REQUIRE THE 15.0 FOOT TOTAL LENGTH PILE.

30 Degree Tilt

90 MPH ASCE 7-05 / 105 MPH ASCE 7-10 Wind; ≤ 30 psf Snow ; 72 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	3	6' - 0"	2' - 4 1/2"	2	9' - 9"	3' - 6"	2	9' - 9"	3' -6"	2	9' - 9"	3' - 6"
2x6	3	7' - 0"	3' - 0 3/8"	3	7' - 0"	3' - 0 3/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"	2	13' - 9"	4' - 9 5/8"
2x8	4	7' - 0"	2' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"
2x9	4	7' - 9"	3' - 4 2/8"	4	7' - 9"	3' - 4 1/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	5	7' - 0"	2' - 7 5/8"	4	8' - 9"	3' - 6 1/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	5	7' - 6"	3' - 3 1/2"	4	9' - 6"	4' - 0 1/2"	4	9' - 6"	4' - 0 1/2"	3	13' - 0"	5' - 3 1/2"
2x12	6	6' - 9"	3' - 0 3/4"	5	8' - 3"	3' - 5 1/4"	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"
2x13	6	7' - 6"	2' - 10 1/8"	5	9' - 0"	3' - 7 1/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	6	8' - 0"	3' - 2 7/8"	5	9' - 9"	3' - 8 7/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	7	7' - 3"	3' - 1 3/4"	6	8' - 6"	3' - 7 3/4"	5	10' - 3"	4' - 4 3/4"	4	13' - 0"	5' - 4 3/4"
2x16	7	7' - 9"	3' - 3 5/8"	6	9' - 0"	4' - 0 5/8"	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"
2x17	8	7' - 3"	2' - 9 7/8"	6	9' - 9"	3' - 9 7/8"	6	9' - 9"	3' - 9 7/8"	5	11' - 9"	4' - 8 3/8"
2x18	8	7' - 9"	2' - 8 3/4"	7	8' - 9"	3' - 7 1/4"	6	10' - 3"	4' - 2 3/4"	5	12' - 6"	4' - 10 1/4"
2x19	8	8' - 0"	3' - 6"	7	9' - 3"	3' - 9"	6	10' - 9"	4' - 7 1/2"	5	13' - 0"	5' - 6"
2x20	9	7' - 6"	3' - 1 7/8"	7	9' - 9"	3' - 10 7/8"	6	11' - 6"	4' - 4 7/8"	6	11' - 6"	4' - 4 7/8"
2x21	9	8' - 0"	2' - 9 3/4"	8	9' - 0"	3' - 3 3/4"	7	10' - 3"	4' - 0 3/4"	6	12' - 0"	4' - 9 3/4"
2x22	10	7' - 6"	2' - 8 1/2"	8	9' - 3"	4' - 1"	7	10' - 9"	4' - 2 1/2"	6	12' - 6"	5' - 2 1/2"
2x23	10	7' - 9"	3' - 2 7/8"	8	9' - 9"	3' - 11 7/8"	7	11' - 3"	4' - 4 3/8"	7	11' - 3"	4' - 4 3/8"
2x24	11	7' - 3"	3' - 6 1/8"	9	9' - 0"	3' - 9 1/8"	8	10' - 3"	3' - 10 5/8"	7	11' - 9"	4' - 6 1/8"
2x25	11	7' - 9"	2' - 8"	9	9' - 6"	3' - 5"	8	10' - 6"	4' - 8"	7	12' - 3"	4' - 8"
2x26	11	8' - 0"	3' - 0 7/8"	9	9' - 9"	4' - 0 7/8"	8	11' - 0"	4' - 6 7/8"	7	12' - 9"	4' - 9 7/8"
2x27	12	7' - 6"	3' - 5 5/8"	10	9' - 0"	4' - 2 5/8"	8	11' - 6"	4' - 5 5/8"	8	11' - 6"	4' - 5 5/8"
2x28	12	7' - 9"	3' - 9"	10	9' - 6"	3' - 7 1/2"	9	10' - 6"	4' - 4 1/2"	8	11' - 9"	5' - 3"
2x29	13	7' - 6"	3' - 0 1/4"	10	9' - 9"	4' - 1 3/4"	9	11' - 0"	4' - 0 1/4"	8	12' - 3"	5' - 1 3/4"
2x30	13	7' - 9"	3' - 2 1/8"	10	10' - 0"	4' - 8 1/8"	9	11' - 3"	4' - 8 1/8"	8	12' - 9"	5' - 0 5/8"

90 MPH ASCE 7-05 / 105 MPH ASCE 7-10 Wind; ≤ 30 psf Snow; 60 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"
2x6	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	3	8' - 3"	3' - 5 1/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"
2x8	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	2	15' - 6"	5' - 7"
2x9	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	4	8' - 9"	3' - 6 1/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	4	9' - 6"	4' - 0 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"
2x12	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"	3	14' - 3"	5' - 8 1/4"	3	14' - 3"	5' - 8 1/4"
2x13	5	9' - 0"	3' - 7 1/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	5	9' - 9"	3' - 8 7/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	5	10' - 3"	4' - 4 3/4"	5	10' - 4"	4' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"
2x16	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"	4	14' - 0"	5' - 6 5/8"	4	14' - 0"	5' - 6 5/8"
2x17	6	9' - 9"	3' - 9 7/8"	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"
2x18	6	10' - 3"	4' - 2 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"
2x19	6	10' - 9"	4' - 7 1/2"	6	10' - 9"	4' - 7 1/2"	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"
2x20	7	9' - 9"	3' - 10 7/8"	6	11' - 6"	4' - 4 7/8"	5	13' - 9"	5' - 7 7/8"	5	13' - 9"	5' - 7 7/8"
2x21	7	10' - 3"	4' - 0 3/4"	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"
2x22	7	10' - 9"	4' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"
2x23	8	9' - 9"	3' - 11 7/8"	7	11' - 3"	4' - 4 3/8"	6	13' - 0"	5' - 7 3/8"	6	13' - 0"	5' - 7 3/8"
2x24	8	10' - 3"	3' - 10 5/8"	7	11' - 9"	4' - 6 1/8"	6	13' - 9"	5' - 4 5/8"	6	13' - 9"	5' - 4 5/8"
2x25	8	10' - 6"	4' - 8"	7	12' - 3"	4' - 8"	6	14' - 3"	5' - 9 1/2"	6	14' - 3"	5' - 9 1/2"
2x26	9	9' - 9"	4' - 0 7/8"	8	11' - 0"	4' - 6 7/8"	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"
2x27	9	10' - 3"	3' - 8 5/8"	8	11' - 6"	4' - 5 5/8"	7	13' - 3"	4' - 11 5/8"	7	13' - 3"	4' - 11 5/8"
2x28	9	10' - 6"	4' - 4 1/2"	8	11' - 9"	5' - 3"	7	13' - 6"	5' - 10 1/2"	7	13' - 6"	5' - 10 1/2"
2x29	10	9' - 9"	4' - 1 3/4"	9	11' - 0"	4' - 0 1/4"	8	12' - 3"	5' - 1 3/4"	7	14' - 0"	6' - 0 1/4"
2x30	10	10' - 0"	4' - 8 1/8"	9	11' - 3"	4' - 8 1/8"	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"

NOTES:

1. FOR DIMENSIONS A & B SEE 'PLAN VIEW OF TABLE' ON SHEET SD-300. THESE DIMENSIONS SHALL NOT BE EXCEEDED BY 2".
2. DESIGN LOADS SHOWN ABOVE AND FINAL DESINGS ARE BASED ON ASCE 7-05 and ASCE 7-10.
3. *EXPOSURE B SHALL APPLY WHERE THE GROUND SURFACE ROUGHNESS CONDITION B PREVAILS FOR A DISTANCE OF 1,500 FEET.*
4. SURFACE ROUGHNESS B IS DEFINED AS URBAN AND SUBURBAN AREAS, WOODED AREAS, OR OTHER TERRAIN WITH NUMEROUS CLOSELY SPACED OBSTRUCTIONS HAVING THE SIZE OF SINGLE-FAMILY DWELLINGS OR LARGER.
5. EXPOSURE C SHALL BE USED WHEN EXPOSURE B DOES NOT APPLY OR MEETS THE CRITERIA FOR SURFACE ROUGHNESS C PERTAINING TO OPEN TERRAIN WITH SCATTERED OBSTRUCTIONS.
6. CONCRETE PILES AND PARTIAL CONCRETE CAN UTILIZE THE 12.5 FOOT TOTAL LENGTH PILE. DRIVEN PILES AND PARTIAL DRIVEN PILES REQUIRE THE 15.0 FOOT TOTAL LENGTH PILE.

30 Degree Tilt

100 MPH ASCE 7-05 / 115 MPH ASCE 7-10 Wind; ≤ 30 PSF Snow; 72 Cell Module

Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	3	4' - 9"	1' - 11 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	3	6' - 0"	2' - 4 1/2"	3	6' - 0"	2' - 4 1/2"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"
2x6	4	5' - 3"	2' - 1 7/8"	3	7' - 0"	3' - 0 3/8"	3	7' - 0"	3' - 0 3/8"	2	11' - 9"	4' - 1 7/8"
2x7	4	6' - 0"	2' - 8 1/8"	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"
2x8	5	5' - 6"	2' - 4"	4	7' - 0"	2' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"
2x9	5	6' - 3"	2' - 5 3/4"	4	7' - 9"	3' - 4 1/4"	4	7' - 9"	3' - 4 1/4"	3	10' - 9"	4' - 2 3/4"
2x10	6	5' - 9"	2' - 3 1/8"	5	7' - 0"	2' - 7 5/8"	4	8' - 9"	3' - 6 1/8"	3	11' - 9"	4' - 10 5/8"
2x11	6	6' - 3"	2' - 8"	5	7' - 6"	3' - 3 1/2"	4	9' - 6"	4' - 0 1/2"	4	9' - 6"	4' - 0 1/2"
2x12	7	5' - 9"	2' - 8 1/4"	6	6' - 9"	3' - 0 3/4"	5	8' - 3"	3' - 5 1/4"	4	10' - 6"	4' - 2 1/4"
2x13	7	6' - 3"	2' - 10 1/8"	6	7' - 6"	2' - 10 1/8"	5	9' - 0"	3' - 7 1/8"	4	11' - 3"	4' - 8 5/8"
2x14	8	6' - 0"	2' - 2 7/8"	6	8' - 0"	3' - 2 7/8"	5	9' - 9"	3' - 8 7/8"	5	9' - 9"	3' - 8 7/8"
2x15	8	6' - 3"	3' - 0 1/4"	7	7' - 3"	3' - 1 3/4"	6	8' - 6"	3' - 7 3/4"	5	10' - 3"	4' - 4 3/4"
2x16	9	6' - 0"	2' - 6 5/8"	7	7' - 9"	3' - 3 5/8"	6	9' - 0"	4' - 0 5/8"	5	11' - 0"	4' - 6 5/8"
2x17	9	6' - 6"	2' - 2 3/8"	8	7' - 3"	2' - 9 7/8"	6	9' - 9"	3' - 9 7/8"	5	11' - 9"	4' - 8 3/8"
2x18	10	6' - 0"	2' - 10 1/4"	8	7' - 9"	2' - 8 3/4"	7	8' - 9"	3' - 7 1/4"	6	10' - 3"	4' - 2 3/4"
2x19	10	6' - 6"	2' - 3"	8	8' - 0"	3' - 6"	7	9' - 3"	3' - 9"	6	10' - 9"	4' - 7 1/2"
2x20	11	6' - 0"	3' - 1 7/8"	9	7' - 6"	3' - 1 7/8"	7	9' - 9"	3' - 10 7/8"	6	11' - 6"	4' - 4 7/8"
2x21	12	6' - 0"	1' - 9 3/4"	9	8' - 0"	2' - 9 3/4"	8	9' - 0"	3' - 3 3/4"	7	10' - 3"	4' - 0 3/4"
2x22	12	6' - 3"	2' - 1"	10	7' - 6"	2' - 8 1/2"	8	9' - 3"	4' - 1"	7	10' - 9"	4' - 2 1/2"
2x23	12	6' - 6"	2' - 4 3/8"	10	7' - 9"	3' - 2 7/8"	8	9' - 9"	3' - 11 7/8"	7	11' - 3"	4' - 4 3/8"
2x24	13	6' - 3"	2' - 3 1/8"	10	8' - 0"	3' - 9 1/8"	9	9' - 0"	3' - 9 1/8"	7	11' - 9"	4' - 6 1/8"
2x25	13	6' - 6"	2' - 5"	11	7' - 9"	2' - 8"	9	9' - 6"	3' - 5"	8	10' - 6"	4' - 8"
2x26	14	6' - 3"	2' - 5 3/8"	11	8' - 0"	3' - 0 7/8"	9	9' - 9"	4' - 0 7/8"	8	11' - 0"	4' - 6 7/8"
2x27	14	6' - 6"	2' - 5 5/8"	12	7' - 6"	3' - 5 5/8"	10	9' - 0"	4' - 2 5/8"	8	11' - 6"	4' - 5 5/8"
2x28	15	6' - 3"	2' - 7 1/2"	12	7' - 9"	3' - 9"	10	9' - 6"	3' - 7 1/2"	8	11' - 9"	5' - 3"
2x29	15	6' - 6"	2' - 6 1/4"	13	7' - 6"	3' - 0 1/4"	10	9' - 9"	4' - 1 3/4"	9	11' - 0"	4' - 0 1/4"
2x30	16	6' - 3"	2' - 9 5/8"	13	7' - 9"	3' - 2 1/8"	11	9' - 3"	3' - 5 1/8"	9	11' - 3"	4' - 8 1/8"

100 MPH ASCE 7-05 / 115 MPH ASCE 7-10 Wind; ≤ 30 PSF Snow; 60 Cell Module

Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	3	6' - 0"	2' - 4 1/2"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"
2x6	3	7' - 0"	3' - 0 3/8"	3	7' - 0"	3' - 0 3/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"
2x8	4	7' - 0"	2' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"
2x9	4	7' - 9"	3' - 4 1/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	4	8' - 9"	3' - 6 1/8"	4	8' - 9"	3' - 6 1/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	5	7' - 6"	3' - 3 1/2"	4	9' - 6"	4' - 0 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"
2x12	5	8' - 3"	3' - 5 1/4"	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"
2x13	6	7' - 6"	2' - 10 1/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	6	8' - 0"	3' - 2 7/8"	5	9' - 9"	3' - 8 7/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	6	8' - 6"	3' - 7 3/4"	5	10' - 3"	4' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"
2x16	7	7' - 9"	3' - 3 5/8"	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"	4	14' - 0"	5' - 6 5/8"
2x17	7	8' - 3"	3' - 5 3/8"	6	9' - 9"	3' - 9 7/8"	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"
2x18	7	8' - 9"	3' - 7 1/4"	6	10' - 3"	4' - 2 3/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"
2x19	8	8' - 0"	3' - 6"	6	10' - 9"	4' - 7 1/2"	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"
2x20	8	8' - 6"	3' - 4 7/8"	7	9' - 9"	3' - 10 7/8"	6	11' - 6"	4' - 4 7/8"	5	13' - 9"	5' - 7 7/8"
2x21	9	8' - 0"	2' - 9 3/4"	7	10' - 3"	4' - 0 3/4"	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"
2x22	9	8' - 3"	3' - 5 1/2"	7	10' - 9"	4' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"
2x23	9	8' - 9"	3' - 1 3/8"	8	9' - 9"	3' - 11 7/8"	6	13' - 0"	5' - 7 3/8"	6	13' - 0"	5' - 7 3/8"
2x24	10	8' - 0"	3' - 9 1/8"	8	10' - 3"	3' - 10 5/8"	7	11' - 9"	4' - 6 1/8"	6	13' - 9"	5' - 4 5/8"
2x25	10	8' - 6"	3' - 2"	8	10' - 6"	4' - 8"	7	12' - 3"	4' - 8"	7	12' - 3"	4' - 8"
2x26	10	8' - 9"	3' - 8 3/8"	8	11' - 0"	4' - 6 7/8"	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"
2x27	11	8' - 3"	3' - 5 5/8"	9	10' - 3"	3' - 8 5/8"	8	11' - 6"	4' - 5 5/8"	7	13' - 3"	4' - 11 5/8"
2x28	11	8' - 6"	3' - 10 1/2"	9	10' - 6"	4' - 4 1/2"	8	11' - 9"	5' - 3"	8	11' - 9"	5' - 3"
2x29	12	8' - 0"	4' - 0 1/4"	10	9' - 9"	4' - 1 3/4"	8	12' - 3"	5' - 1 3/4"	8	12' - 3"	5' - 1 3/4"
2x30	12	8' - 6"	2' - 11 1/8"	10	10' - 0"	4' - 8 1/8"	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"

NOTES:

1. FOR DIMENSIONS A & B SEE 'PLAN VIEW OF TABLE' ON SHEET SD-300. THESE DIMENSIONS SHALL NOT BE EXCEEDED BY 2".
2. DESIGN LOADS SHOWN ABOVE AND FINAL DESINGS ARE BASED ON ASCE 7-05 and ASCE 7-10.
3. *EXPOSURE B SHALL APPLY WHERE THE GROUND SURFACE ROUGHNESS CONDITION B PREVAILS FOR A DISTANCE OF 1,500 FEET.*
4. SURFACE ROUGHNESS B IS DEFINED AS URBAN AND SUBURBAN AREAS, WOODED AREAS, OR OTHER TERRAIN WITH NUMEROUS CLOSELY SPACED OBSTRUCTIONS HAVING THE SIZE OF SINGLE-FAMILY DWELLINGS OR LARGER.
5. EXPOSURE C SHALL BE USED WHEN EXPOSURE B DOES NOT APPLY OR MEETS THE CRITERIA FOR SURFACE ROUGHNESS C PERTAINING TO OPEN TERRAIN WITH SCATTERED OBSTRUCTIONS.
6. CONCRETE PILES AND PARTIAL CONCRETE CAN UTILIZE THE 12.5 FOOT TOTAL LENGTH PILE. DRIVEN PILES AND PARTIAL DRIVEN PILES REQUIRE THE 15.0 FOOT TOTAL LENGTH PILE.

30 Degree Tilt

90 MPH ASCE 7-05 / 105 MPH ASCE 7-10 Wind; 40 psf Snow ; 72 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	3	6' - 0"	2' - 4 1/2"	2	9' - 9"	3' - 6"	2	9' - 9"	3' -6"	2	9' - 9"	3' - 6"
2x6	3	7' - 0"	3' - 0 3/8"	3	7' - 0"	3' - 0 3/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"	3	8' - 3"	3' - 5 1/8"
2x8	4	7' - 0"	2' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"
2x9	4	7' - 9"	3' - 4 2/8"	4	7' - 9"	3' - 4 1/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	5	7' - 0"	2' - 7 5/8"	4	8' - 9"	3' - 6 1/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	5	7' - 6"	3' - 3 1/2"	4	9' - 6"	4' - 0 1/2"	4	9' - 6"	4' - 0 1/2"	4	9' - 6"	4' - 0 1/2"
2x12	6	6' - 9"	3' - 0 3/4"	5	8' - 3"	3' - 5 1/4"	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"
2x13	6	7' - 6"	2' - 10 1/8"	5	9' - 0"	3' - 7 1/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	6	8' - 0"	3' - 2 7/8"	5	9' - 9"	3' - 8 7/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	7	7' - 3"	3' - 1 3/4"	6	8' - 6"	3' - 7 3/4"	5	10' - 3"	4' - 4 3/4"	5	10' - 3"	4' - 4 3/4"
2x16	7	7' - 9"	3' - 3 5/8"	6	9' - 0"	4' - 0 5/8"	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"
2x17	8	7' - 3"	2' - 9 7/8"	6	9' - 9"	3' - 9 7/8"	6	9' - 9"	3' - 9 7/8"	5	11' - 9"	4' - 8 3/8"
2x18	8	7' - 9"	2' - 8 3/4"	7	8' - 9"	3' - 7 1/4"	6	10' - 3"	4' - 2 3/4"	6	10' - 3"	4' - 2 3/4"
2x19	8	8' - 0"	3' - 6"	7	9' - 3"	3' - 9"	6	10' - 9"	4' - 7 1/2"	6	10' - 9"	4' - 7 1/2"
2x20	9	7' - 6"	3' - 1 7/8"	7	9' - 9"	3' - 10 7/8"	6	11' - 6"	4' - 4 7/8"	6	11' - 6"	4' - 4 7/8"
2x21	9	8' - 0"	2' - 9 3/4"	8	9' - 0"	3' - 3 3/4"	7	10' - 3"	4' - 0 3/4"	6	12' - 0"	4' - 9 3/4"
2x22	10	7' - 6"	2' - 8 1/2"	8	9' - 3"	4' - 1"	7	10' - 9"	4' - 2 1/2"	7	10' - 9"	4' - 2 1/2"
2x23	10	7' - 9"	3' - 2 7/8"	8	9' - 9"	3' - 11 7/8"	7	11' - 3"	4' - 4 3/8"	7	11' - 3"	4' - 4 3/8"
2x24	11	7' - 3"	3' - 6 1/8"	9	9' - 0"	3' - 9 1/8"	8	10' - 3"	3' - 10 5/8"	7	11' - 9"	4' - 6 1/8"
2x25	11	7' - 9"	2' - 8"	9	9' - 6"	3' - 5"	8	10' - 6"	4' - 8"	7	12' - 3"	4' - 8"
2x26	11	8' - 0"	3' - 0 7/8"	9	9' - 9"	4' - 0 7/8"	8	11' - 0"	4' - 6 7/8"	8	11' - 0"	4' - 6 7/8"
2x27	12	7' - 6"	3' - 5 5/8"	10	9' - 0"	4' - 2 5/8"	8	11' - 6"	4' - 5 5/8"	8	11' - 6"	4' - 5 5/8"
2x28	12	7' - 9"	3' - 9"	10	9' - 6"	3' - 7 1/2"	9	10' - 6"	4' - 4 1/2"	8	11' - 9"	5' - 3"
2x29	13	7' - 6"	3' - 0 1/4"	10	9' - 9"	4' - 1 3/4"	9	11' - 0"	4' - 0 1/4"	9	11' - 0"	4' - 0 1/4"
2x30	13	7' - 9"	3' - 2 1/8"	10	10' - 0"	4' - 8 1/8"	9	11' - 3"	4' - 8 1/8"	9	11' - 3"	4' - 8 1/8"

90 MPH ASCE 7-05 / 105 MPH ASCE 7-10 Wind; 40 psf Snow; 60 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"	2	9' - 9"	3' - 6"
2x6	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"	2	11' - 9"	4' - 1 7/8"
2x7	3	8' - 3"	3' - 5 1/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"	2	13' - 9"	4' - 9 5/8"
2x8	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"	3	9' - 6"	3' - 10"
2x9	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"	3	10' - 9"	4' - 2 3/4"
2x10	4	8' - 9"	3' - 6 1/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"	3	11' - 9"	4' - 10 5/8"
2x11	4	9' - 6"	4' - 0 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"	3	13' - 0"	5' - 3 1/2"
2x12	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"	4	10' - 6"	4' - 2 1/4"
2x13	5	9' - 0"	3' - 7 1/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"	4	11' - 3"	4' - 8 5/8"
2x14	5	9' - 9"	3' - 8 7/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"	4	12' - 3"	4' - 10 3/8"
2x15	5	10' - 3"	4' - 4 3/4"	5	10' - 4"	4' - 4 3/4"	4	13' - 0"	5' - 4 3/4"	4	13' - 0"	5' - 4 3/4"
2x16	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"	5	11' - 0"	4' - 6 5/8"
2x17	6	9' - 9"	3' - 9 7/8"	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"	5	11' - 9"	4' - 8 3/8"
2x18	6	10' - 3"	4' - 2 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"
2x19	6	10' - 9"	4' - 7 1/2"	6	10' - 9"	4' - 7 1/2"	5	13' - 0"	5' - 6"	5	13' - 0"	5' - 6"
2x20	7	9' - 9"	3' - 10 7/8"	6	11' - 6"	4' - 4 7/8"	6	11' - 6"	4' - 4 7/8"	6	11' - 6"	4' - 4 7/8"
2x21	7	10' - 3"	4' - 0 3/4"	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"	6	12' - 0"	4' - 9 3/4"
2x22	7	10' - 9"	4' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"	6	12' - 6"	5' - 2 1/2"
2x23	8	9' - 9"	3' - 11 7/8"	7	11' - 3"	4' - 4 3/8"	6	13' - 0"	5' - 7 3/8"	6	13' - 0"	5' - 7 3/8"
2x24	8	10' - 3"	3' - 10 5/8"	7	11' - 9"	4' - 6 1/8"	7	11' - 9"	4' - 6 1/8"	7	11' - 9"	4' - 6 1/8"
2x25	8	10' - 6"	4' - 8"	7	12' - 3"	4' - 8"	7	12' - 3"	4' - 8"	7	12' - 3"	4' - 8"
2x26	9	9' - 9"	4' - 0 7/8"	8	11' - 0"	4' - 6 7/8"	7	12' - 9"	4' - 9 7/8"	7	12' - 9"	4' - 9 7/8"
2x27	9	10' - 3"	3' - 8 5/8"	8	11' - 6"	4' - 5 5/8"	7	13' - 3"	4' - 11 5/8"	8	11' - 6"	4' - 5 5/8"
2x28	9	10' - 6"	4' - 4 1/2"	8	11' - 9"	5' - 3"	8	11' - 9"	5' - 3"	8	11' - 9"	5' - 3"
2x29	10	9' - 9"	4' - 1 3/4"	9	11' - 0"	4' - 0 1/4"	8	12' - 3"	5' - 1 3/4"	8	12' - 3"	5' - 1 3/4"
2x30	10	10' - 0"	4' - 8 1/8"	9	11' - 3"	4' - 8 1/8"	8	12' - 9"	5' - 0 5/8"	8	12' - 9"	5' - 0 5/8"

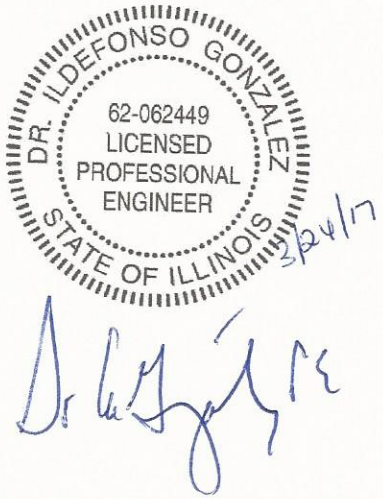
NOTES:

1. FOR DIMENSIONS A & B SEE 'PLAN VIEW OF TABLE' ON SHEET SD-300. THESE DIMENSIONS SHALL NOT BE EXCEEDED BY 2".
2. DESIGN LOADS SHOWN ABOVE AND FINAL DESINGS ARE BASED ON ASCE 7-05 and ASCE 7-10.
3. EXPOSURE B SHALL APPLY WHERE THE GROUND SURFACE ROUGHNESS CONDITION B PREVAILS FOR A DISTANCE OF 1,500 FEET.
4. SURFACE ROUGHNESS B IS DEFINED AS URBAN AND SUBURBAN AREAS, WOODED AREAS, OR OTHER TERRAIN WITH NUMEROUS CLOSELY SPACED OBSTRUCTIONS HAVING THE SIZE OF SINGLE-FAMILY DWELLINGS OR LARGER.
5. EXPOSURE C SHALL BE USED WHEN EXPOSURE B DOES NOT APPLY OR MEETS THE CRITERIA FOR SURFACE ROUGHNESS C PERTAINING TO OPEN TERRAIN WITH SCATTERED OBSTRUCTIONS.
6. CONCRETE PILES AND PARTIAL CONCRETE CAN UTILIZE THE 12.5 FOOT TOTAL LENGTH PILE. DRIVEN PILES AND PARTIAL DRIVEN PILES REQUIRE THE 15.0 FOOT TOTAL LENGTH PILE.

For more information on the above tables, see the DGFT construction drawings, sheets SD-100, SD-300, SD-400, and SD-500. The analysis does not include specific corrosion requirements.

If you have any questions on the above, please contact Unirac, Inc. or DOTec Engineering, Inc.

Certification by:
Dr. Ildefonso "Al" Gonzalez, P.E. PhD
Illinois 62-062449
DOTec Engineering, Inc.
St. Charles, MO



Illinois Solar for All
Comments on Site Suitability Guidelines

StraightUp Solar

Thank you for this opportunity to provide feedback on the draft Site Suitability Guidelines (Guidelines). These comments are being provided on behalf of StraightUp Solar (Bloomington, IL) and Hawk-Atollo (Peoria, IL), solar development and installation companies operating in central and southern Illinois. We viewed these guidelines with specific respect to faith-based and community service organization projects in Peoria that we are currently developing in partnership with Community Transformation Partnership Power, also located in Peoria, with the express intent to enter them into the IL Solar For All Program.

Our general review comments on the Guidelines are as follows:

1. We recognize the importance of ensuring that sites selected for solar PV development have appropriate roof, electrical, and structural integrity.
2. Geotech study results are used to engineer the ground array foundation, not as a go/no-go determiner. Performing a geotech study before a project has affirmed associated incentives (Ie REC contract) is not standard practice. Rather, it is among the first suite of due-diligence work that is performed once a project receives final approval to proceed (which includes financing certainty).
3. On p. 13 of the Guidelines is a check box item that states "Owner has selected not to proceed with roof repairs and PV installation." It is unclear under what circumstances this box would be checked. The administrator would not see the Site Suitability Report if the owner elects not to proceed.
4. It is not clear whether roof repair/structural mitigation work could be included as part of a lease or PPA, but separated from the overall minimum 50% savings requirement. If the two could be included in the same financial agreement, it would add flexibility and value for the customer.
5. The plan of action for fixing roof (or other) deficiencies includes the requirement that the person/company who will be completing the work must be identified. StraightUp Solar and Hawk-Atollo work with several different service providers and the specific company who may perform the work may not be known at the time of the Part I application.

Again, thank you for this opportunity to comment.

Best,

Shine On!
Shannon Fulton
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Bloomington - St. Louis - Swansea

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Illinois Solar for All
Comments on Site Suitability Guidelines

SunAir Systems LLC

Regarding the roof durability requirement for (15) years,

This is going to be a burdensome and unnecessary requirement, and effectively require about 90% of homeowners /businesses to hire roofers to re-roof their buildings. Think about standard new homeowner asphalt roofing materials that usually offer (15) year and (20) warranties. Statistically most homes will NOT have roofs newer than (5) years, and according to these proposed (15) year life requirements, nearly every one of my asphalt roofs will need a $3,000 - $5,000 roof job. It is hypocritical to always add "...should not be a financial burden" to your guidelines, when in fact, you are requiring most potential homeowners to re-roof their houses. It is unfair to require this (15) year mandate.

Also a feedback comment: I am not a qualified structural engineer and cannot realistically produce a re-roofing requirement to the homeowner. But again, if I have to hire a qualified engineering professional, this will cause a time delay ($) and add consulting cost$ to a project. AND I've found that if you ask a roofing company if the house will need a new roof within (15) years - they will most certainly always say yes because it is always in their financial interest. (I am assuming here by this requirement that the roofing industry has / is lobby(ed)ing very diligently here...).

Replace this burdensome demand instead by asking / requiring for an estimated range of 7 - 10 years roof life, realizing that most homes already will have roof lives left in that range. This range of 7 - 10 years will effectively weed out the real "worn" roof problems, and will give us "nonprofessional roof engineers" some needed wiggle room for judgment - yet not require a financial burden on anyone other than the real bad / replacement needed roofing situations.

One last note: I have been installing solar PV systems for almost (20) years now. Over (500) installations. I have been called upon to remove about (8) old solar PV systems (avg. 10 - 12 year old solar installations). Invariably, without exception, when we remove the solar panels, we find that the shingles under the old solar array looks almost like they did when we first installed the system many years ago. Good shingles. While the rest of the roof materials aged normally. The Solar PV system area itself *will not* be involved in the aging roof argument here. Therefore, my (20) year voice of wisdom is to greatly downplay this fear of roof replacement because of the perception that the roof will "wear out" and cause the PV system to fail. And thereby implying that it would compromise the (15) program life expectancy of a solar PV system. It won't.

My feedback as you requested....

Best Regards,

Dave Merrill

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