



DOTec CORP.

Customized Engineering Solutions

November 30, 2016

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)

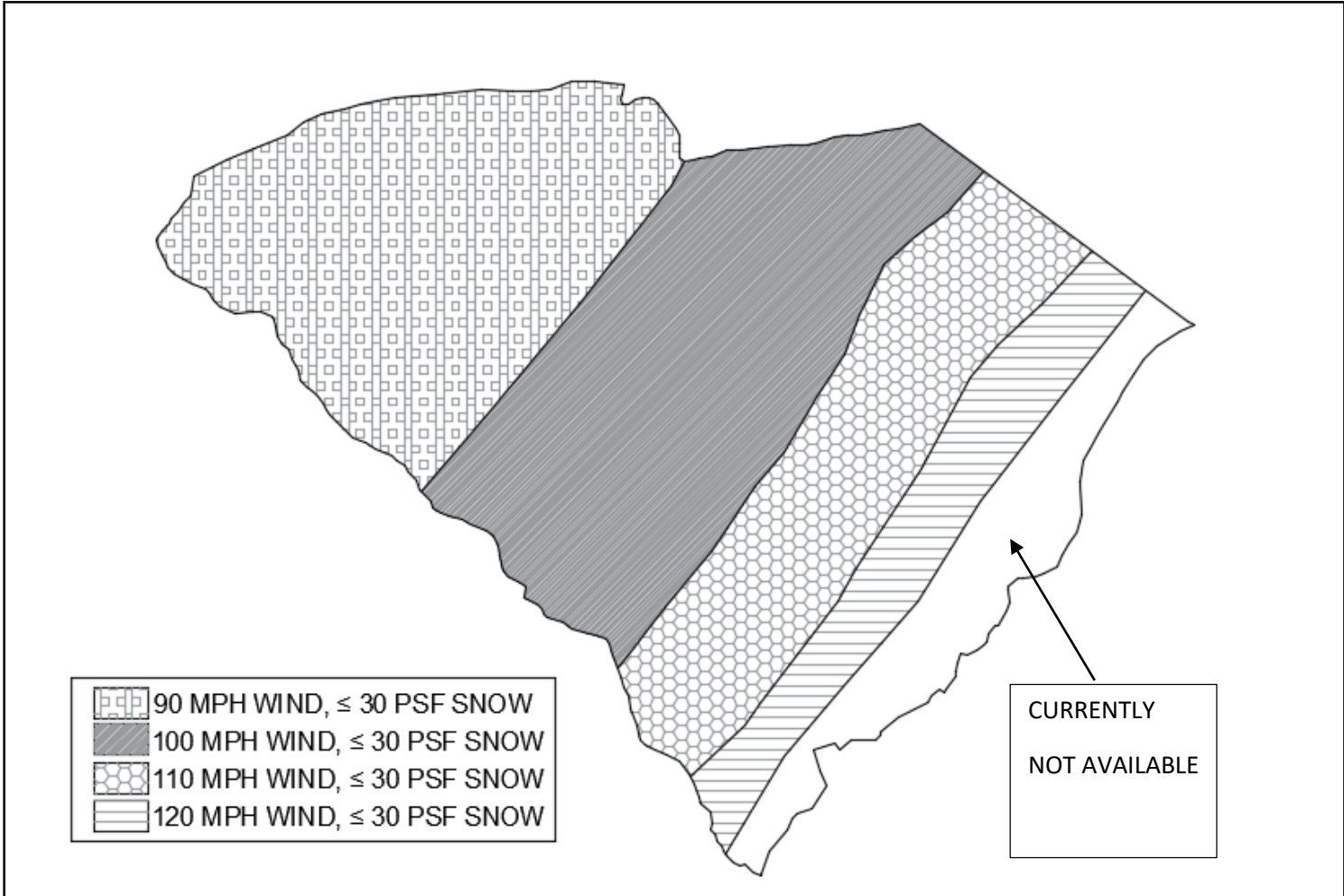
DOTec Engineering, Inc. has reviewed Unirac's DGFT design tool and design methodology. This approved design tool was utilized to develop the design tables listed below. The design methodology is acceptable for a code compliant, ground mount racking structure, supporting photovoltaic (PV) solar modules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

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

1. 2009 International Building Code and 2012 International Building Code, by International Code Council, Inc., 2009 and 2012
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 TABLE/PILE REQUIREMENTS FOR A 60 CELL SOLAR PANEL.
2. REFER TO SHEET SD-300 FOR TABLE CROSS SECTIONAL DIMENSIONS AND PARTS LIST.
3. 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 GFT INSTALLATION. THIS IS THE RESPONSIBILITY OF THE INSTALLER/PROJECT OWNER.
4. SEE SHEET SD-100 FOR RACKING DESIGN CRITERIA
5. SOLAR REQUIREMENTS (FROM OWNER): TABLE TILT ANGLE = 30 DEGREES LEADING EDGE HEIGHT = 30 IN (FROM TOP OF SOLAR PANEL TO GRADE) ROW TO ROW SPACING = VERIFY WITH SOLAR DRAWINGS SOLAR PANEL = BY OTHERS (SEE DIMENSION/WEIGHT LIMITS BELOW) SOLAR PANEL DIM. = 76.5" TO 78.46" LENGTH, 38.6" TO 39.4" WIDTH, 1.37" TO 1.50" THICKNESS SOLAR PANEL WEIGHT = 47.8 LBS TO 60 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.

90 MPH 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"	5	10' - 3"	4' - 4 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"	6	10' - 3"	4' - 2 3/4"	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"	7	10' - 3"	4' - 0 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"	8	10' - 3"	3' - 10 5/8"	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 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	5	7' - 6"	3' - 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	5	8' - 3"	3' - 5 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"	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	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	7	8' - 9"	3' - 7 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"	5	12' - 6"	4' - 10 1/4"
2x19	7	9' - 3"	3' - 9"	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	8	9' - 3"	4' - 1"	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	10	9' - 6"	3' - 7 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:

- FOR DIMENSIONS A & B SEE 'PLAN VIEW OF TABLE' ON SHEET SD-300. THESE DIMENSIONS SHALL NOT BE EXCEEDED BY 2".
- DESIGN LOADS SHOWN ABOVE AND FINAL DESINGS ARE BASED ON ASCE 7-05.
- EXPOSURE B SHALL APPLY WHERE THE GROUND SURFACE ROUGHNESS CONDITION B PREVAILS FOR A DISTANCE OF 1,500 FEET.
- 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.
- 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.
- 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.

100 MPH 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 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"

110 MPH 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' - 7"	2	9' - 9"	3' - 7"
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"	4	6' - 0"	2' - 8 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"	4	7' - 0"	2' - 10"	3	9' - 6"	3' - 10"
2x9	5	6' - 3"	2' - 5 3/4"	5	6' - 3"	2' - 5 3/4"	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"	4	8' - 9"	3' - 6 1/8"
2x11	7	5' - 3"	2' - 6 1/2"	5	7' - 6"	3' - 3 1/2"	5	7' - 6"	3' - 3 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	8	5' - 6"	2' - 4 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"	7	6' - 9"	2' - 11 7/8"	6	8' - 0"	3' - 2 7/8"	5	9' - 9"	3' - 8 7/8"
2x15	9	5' - 9"	1' - 10 3/4"	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"	8	6' - 9"	2' - 11 1/8"	6	9' - 0"	4' - 0 5/8"	5	11' - 0"	4' - 6 5/8"
2x17	10	5' - 9"	2' - 3 7/8"	8	7' - 3"	2' - 9 7/8"	7	8' - 3"	3' - 5 3/8"	6	9' - 9"	3' - 9 7/8"
2x18	11	5' - 6"	2' - 4 1/4"	9	6' - 9"	2' - 10 1/4"	7	8' - 9"	3' - 7 1/4"	6	10' - 3"	4' - 2 3/4"
2x19	11	5' - 9"	2' - 9"	9	7' - 3"	2' - 6"	8	8' - 0"	3' - 6"	6	10' - 9"	4' - 7 1/2"
2x20	12	5' - 6"	2' - 10 7/8"	10	6' - 9"	2' - 9 3/8"	8	8' - 6"	3' - 4 7/8"	7	9' - 9"	3' - 10 7/8"
2x21	12	6' - 0"	1' - 9 3/4"	10	7' - 0"	3' - 3 3/4"	8	9' - 0"	3' - 3 3/4"	7	10' - 3"	4' - 0 3/4"
2x22	13	5' - 9"	1' - 11 1/2"	11	6' - 9"	2' - 8 1/2"	9	8' - 3"	3' - 5 1/2"	7	10' - 9"	4' - 2 1/2"
2x23	13	6' - 0"	2' - 1 3/8"	11	7' - 0"	3' - 1 3/8"	9	8' - 9"	3' - 1 3/8"	8	9' - 9"	3' - 11 7/8"
2x24	14	5' - 9"	2' - 4 5/8"	11	7' - 3"	3' - 6 1/8"	9	9' - 0"	3' - 9 1/8"	8	10' - 3"	3' - 10 5/8"
2x25	14	6' - 0"	2' - 5"	12	7' - 0"	2' - 11"	10	8' - 6"	3' - 2"	8	10' - 6"	4' - 8"
2x26	15	5' - 9"	2' - 9 7/8"	12	7' - 3"	3' - 2 3/8"	10	8' - 9"	3' - 8 3/8"	8	11' - 0"	4' - 6 7/8"
2x27	15	6' - 0"	2' - 8 5/8"	12	7' - 6"	3' - 5 5/8"	10	9' - 0"	4' - 2 5/8"	9	10' - 3"	3' - 8 5/8"
2x28				13	7' - 3"	2' - 10 1/2"	11	8' - 6"	3' - 10 1/2"	9	10' - 6"	4' - 4 1/2"
2x29				13	7' - 6"	3' - 0 1/4"	11	8' - 9"	4' - 3 1/4"	10	9' - 9"	4' - 1 3/4"
2x30				14	7' - 3"	2' - 6 5/8"	12	8' - 6"	2' - 11 1/8"	10	10' - 0"	4' - 8 1/8"

110 MPH 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"	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 1/4"	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	5	8' - 3"	3' - 5 1/4"	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"	5	10' - 3"	4' - 4 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	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	8	7' - 9"	2' - 8 3/4"	6	10' - 3"	4' - 2 3/4"	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"	7	10' - 3"	4' - 0 3/4"	6	12' - 0"	4' - 9 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"	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"	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"	7	13' - 3"	4' - 11 5/8"
2x28	12	7' - 9"	3' - 9"	10	9' - 6"	3' - 7 1/2"	8	11' - 9"	5' - 3"	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"	11	9' - 3"	3' - 5 1/8"	9	11' - 3"	4' - 8 1/8"	8	12' - 9"	5' - 0 5/8"

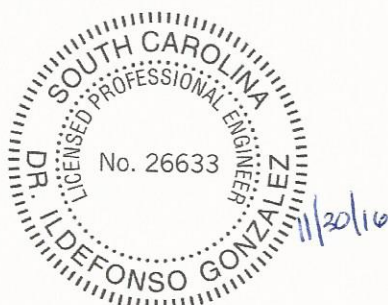
120 MPH Wind; ≤30 PSF Snow; 72 Cell Module												
Table Size	Exposure C						Exposure B					
	Driven			Concrete			Driven			Concrete		
	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B	# of Piles	Dim A	Dim B
2x4	3	4' - 9"	1' - 11 5/8"	3	4' - 9"	1' - 11 5/8"	2	8' - 0"	2' - 8 5/8"	2	8' - 0"	2' - 8 5/8"
2x5	4	4' - 6"	1' - 7 1/2"	3	6' - 0"	2' - 4 1/2"	3	6' - 0"	2' - 4 1/2"	2	9' - 9"	3' - 6"
2x6	4	5' - 3"	2' - 1 7/8"	4	5' - 3"	2' - 1 7/8"	3	7' - 0"	3' - 0 3/8"	3	7' - 0"	3' - 0 3/8"
2x7	5	4' - 9"	2' - 2 1/8"	4	6' - 0"	2' - 8 1/8"	4	6' - 0"	2' - 8 1/8"	3	8' - 3"	3' - 5 1/8"
2x8	6	4' - 6"	2' - 1"	5	5' - 6"	2' - 4"	4	7' - 0"	2' - 10"	3	9' - 6"	3' - 10"
2x9	6	5' - 3"	1' - 10 1/4"	5	6' - 3"	2' - 5 3/4"	4	7' - 9"	3' - 4 1/4"	4	7' - 9"	3' - 4 1/4"
2x10	7	5' - 0"	1' - 7 5/8"	6	5' - 9"	2' - 3 1/8"	5	7' - 0"	2' - 7 5/8"	4	8' - 9"	3' - 6 1/8"
2x11	8	4' - 9"	1' - 8"	6	6' - 3"	2' - 8"	5	7' - 6"	3' - 3 1/2"	4	9' - 6"	4' - 0 1/2"
2x12	8	5' - 0"	2' - 5 1/4"	7	5' - 9"	2' - 8 1/4"	6	6' - 9"	3' - 0 3/4"	5	8' - 3"	3' - 5 1/4"
2x13	9	5' - 0"	1' - 7 1/8"	7	6' - 3"	2' - 10 1/8"	6	7' - 6"	2' - 10 1/8"	5	9' - 0"	3' - 7 1/8"
2x14	10	4' - 9"	1' - 10 3/8"	8	6' - 0"	2' - 2 7/8"	7	6' - 9"	2' - 11 7/8"	6	8' - 0"	3' - 2 7/8"
2x15	11	4' - 6"	2' - 4 3/4"	9	5' - 9"	1' - 10 3/4"	7	7' - 3"	3' - 1 3/4"	6	8' - 6"	3' - 7 3/4"
2x16	11	5' - 0"	1' - 6 5/8"	9	6' - 0"	2' - 6 5/8"	8	6' - 9"	2' - 11 1/8"	6	9' - 0"	4' - 0 5/8"
2x17	12	4' - 9"	2' - 0 7/8"	10	5' - 9"	2' - 3 7/8"	8	7' - 3"	2' - 9 7/8"	7	8' - 3"	3' - 5 3/8"
2x18	12	5' - 0"	2' - 4 1/4"	10	6' - 0"	2' - 10 1/4"	9	6' - 9"	2' - 10 1/4"	7	8' - 9"	3' - 7 1/4"
2x19	13	5' - 0"	1' - 6"	11	5' - 9"	2' - 9"	9	7' - 3"	2' - 6"	7	9' - 3"	3' - 9"
2x20	14	4' - 9"	2' - 3 3/8"	12	5' - 6"	2' - 10 7/8"	9	7' - 6"	3' - 1 7/8"	8	8' - 6"	3' - 4 7/8"
2x21	14	5' - 0"	2' - 3 3/4"	12	6' - 0"	1' - 9 3/4"	10	7' - 0"	3' - 3 3/4"	8	9' - 0"	3' - 3 3/4"
2x22	15	5' - 0"	1' - 5 1/2"	12	6' - 3"	2' - 1"	10	7' - 6"	2' - 8 1/2"	9	8' - 3"	3' - 5 1/2"
2x23	16	4' - 9"	2' - 5 7/8"	13	6' - 0"	2' - 1 3/8"	11	7' - 0"	3' - 1 3/8"	9	8' - 9"	3' - 1 3/8"
2x24	16	5' - 0"	2' - 3 1/8"	13	6' - 3"	2' - 3 1/8"	11	7' - 3"	3' - 6 1/8"	9	9' - 0"	3' - 9 1/8"
2x25				14	6' - 0"	2' - 5"	12	7' - 0"	2' - 11"	10	8' - 6"	3' - 2"
2x26				14	6' - 3"	2' - 5 3/8"	12	7' - 3"	3' - 2 3/8"	10	8' - 9"	3' - 8 3/8"
2x27				15	6' - 0"	2' - 8 5/8"	12	7' - 6"	3' - 5 5/8"	10	9' - 0"	4' - 2 5/8"
2x28				15	6' - 3"	2' - 7 1/2"	13	7' - 3"	2' - 10 1/2"	11	8' - 6"	3' - 10 1/2"
2x29				16	6' - 0"	3' - 0 1/4"	13	7' - 6"	3' - 0 1/4"	11	8' - 9"	4' - 3 1/4"
2x30				16	6' - 3"	2' - 9 5/8"	14	7' - 3"	2' - 6 5/8"	11	9' - 3"	3' - 5 1/8"

120 MPH 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	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	3	7' - 0"	3' - 0 3/8"	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	4	7' - 0"	2' - 10"	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	5	7' - 0"	2' - 7 5/8"	4	8' - 9"	3' - 6 1/8"	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	6	6' - 9"	3' - 0 3/4"	5	8' - 3"	3' - 5 1/4"	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	7	6' - 9"	2' - 11 7/8"	6	8' - 0"	3' - 2 7/8"	5	9' - 9"	3' - 8 7/8"	4	12' - 3"	4' - 10 3/8"
2x15	8	6' - 3"	3' - 0 1/4"	6	8' - 6"	3' - 7 3/4"	5	10' - 3"	4' - 4 3/4"	5	10' - 3"	4' - 4 3/4"
2x16	8	6' - 9"	2' - 11 1/8"	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"	7	8' - 3"	3' - 5 3/8"	6	9' - 9"	3' - 9 7/8"	5	11' - 9"	4' - 8 3/8"
2x18	9	6' - 9"	2' - 10 1/4"	7	8' - 9"	3' - 7 1/4"	6	10' - 3"	4' - 2 3/4"	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	10	6' - 9"	2' - 9 3/8"	8	8' - 6"	3' - 4 7/8"	7	9' - 9"	3' - 10 7/8"	6	11' - 6"	4' - 4 7/8"
2x21	11	6' - 6"	2' - 3 3/4"	9	8' - 0"	2' - 9 3/4"	7	10' - 3"	4' - 0 3/4"	6	12' - 0"	4' - 9 3/4"
2x22	11	6' - 9"	2' - 8 1/2"	9	8' - 3"	3' - 5 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	12	6' - 9"	2' - 7 5/8"	10	8' - 0"	3' - 9 1/8"	8	10' - 3"	3' - 10 5/8"	7	11' - 9"	4' - 6 1/8"
2x25	13	6' - 6"	2' - 5"	10	8' - 6"	3' - 2"	9	9' - 6"	3' - 5"	7	12' - 3"	4' - 8"
2x26	13	6' - 9"	2' - 6 7/8"	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"	11	8' - 3"	3' - 5 5/8"	10	9' - 0"	4' - 2 5/8"	8	11' - 6"	4' - 5 5/8"
2x28	14	6' - 9"	2' - 6"	11	8' - 6"	3' - 10 1/2"	10	9' - 6"	3' - 7 1/2"	9	10' - 6"	4' - 4 1/2"
2x29	15	6' - 6"	2' - 6 1/4"	12	8' - 0"	4' - 0 1/4"	10	9' - 9"	4' - 1 3/4"	9	11' - 0"	4' - 0 1/4"
2x30	15	6' - 9"	2' - 5 1/8"	12	8' - 6"	2' - 11 1/8"	10	10' - 0"	4' - 8 1/8"	9	11' - 3"	4' - 8 1/8"

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
South Carolina #26633
DOTec Engineering, Inc.
St. Charles, MO



Dr. Ildefonso Gonzalez, P.E., PhD