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Tamarack Solar
288 F Street
Arcata, CA 95521

May 12, 2020
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Attn: Mr. David Katz

Subject: Tamarack 3.13 Rail, Ground Mounting System – 3 Module – Structural Analysis

Dear Sir:

We have analyzed the Tamarack 3.13 Rail for the subject solar module support system and determined that, for the configurations and criteria described below, it is in compliance with the applicable sections of the following Reference Documents:

Codes: ASCE/SEI 7-16 Min. Design Loads for Buildings & Other Structures
International Building Code 2018 Edition

Other: AC428, Acceptance Criteria for Modular Framing Systems Used to Support PV
Modules, dated Effective November 1, 2012 by ICC-ES
Aluminum Design Manual, 2015 Edition (ADM)
Exhibit GM-3M3R

The Tamarack 3.13 Rail is an extruded aluminum section with an overall depth of 3.13 in. and a net area of 0.797sq.in. The rails are used to support solar PV modules where the modules are attached to the rails by the Tamarack mounting clamps. The rails are mounted to a simple pipe beam and pipe column structure which utilizes 2 inch ASTM A53 Grade B standard weight (schedule 40) steel pipes (O.D. = 2.83in & Wall Thickness = 0.154in). The pipe columns (posts) are connected in the East-West direction by the pipe beams (cross pipe) which cantilever over and past the end piers. The 3.13 Rails span across the cross pipes and connect the structure in the North-South direction (along the slope) and are attached to the cross pipes using the Tamarack Pipe Mount Assembly. Please refer to Exhibit GM-3M3R for the array geometry and approved material properties for all associated hardware and the structural pipe.

The structure is either considered a cantilever system or a braced framed system when diagonal braces are provided for lateral loads. For the transfer of gravity loads, the posts and foundations receive the load through the rails and cross pipes which act as simple beams. The effect of seismic loads for all design categories A-F have been determined to be less than the effect due to wind loads in all load conditions and combinations.

Therefore, the maximum allowable East-West spans for common load cases are shown in the tables below. The tables take into consideration the slope, wind load, and snow load for the structural design of the system and the spans are either governed by the capacity of the cross pipes or the capacity of the post.

The user of this certification letter shall obtain the following criteria to utilize Tables S1-S6 and F1-F12:

- Wind Speed
- Ground Snow Load
- Exposure Category
- Soil Classification (Soil Class 3 or Soil Class 4)

The wind speed, ground snow load, and exposure category may be obtained from the Authority Having Jurisdiction (AJH) in their local area. The AHJ may be the local building department, county building department, or government entity responsible for planning and development. Once all the design criteria has been selected, the user shall submit the first 4 pages of this document, along with the appropriate Table corresponding to the design criteria above, and Exhibits to the AHJ as part of the permit application.

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Design Assumptions:

The following assumptions have been utilized in the analysis and development of the span tables and foundation tables herein. For any conditions that fall outside of the parameters listed below, please contact Tamarack for further assistance.

Notes for Span Tables – S1 through S6:

1. Dead Load (Weight) = 3 psf
2. Maximum PV Module Dimension = 80" x 40"
3. Wind speed is based on ASCE 7-16 Fig. 26.5-1A (Risk Category I).
4. Snow load is based on ground snow load ASCE 7-16 Fig. 7.2-1. Snow drift, unbalanced snow, or ponding snow has not been considered.
5. Topographic Factor (Kzt) = 1.0 (no topographic effects). Code required topographic effects have not been considered. Arrays are considered to be on relatively flat ground with no significant terrain changes.
6. Ground Elevation Factor (Ke) = 1.0. No elevation effects have been considered.
7. Shaded region with numbers denotes the requirement of (3) three 3.13 Rails.
8. Splices not permitted in outer 2/3 of end spans, the middle 1/3 of interior spans based on the installed pier spacing, or at end cantilever span. See Figure A below.
9. End cantilever span of pipe rails = 0.40 x maximum span from the below tables.

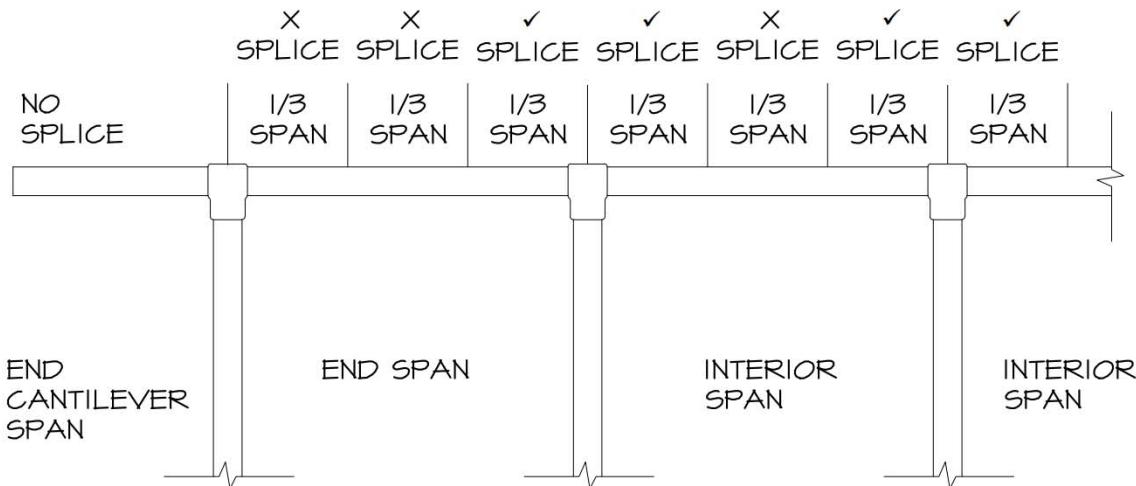


Figure A: Allowable Splice Location

Notes for Foundation Tables – F1 through F12:

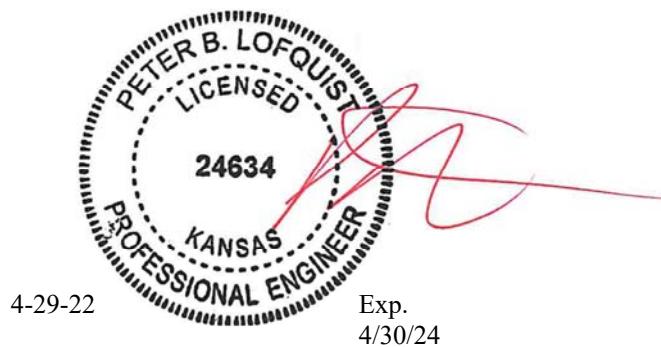
1. Concrete Weight = 145 pcf
2. Concrete Compressive Strength f_c = 2500 psi
3. Skin Friction per 2018 IBC 1810.3.3.1.4 & 1810.3.3.1.5
4. Top 1'-0" of soil neglected for Skin Friction
5. Snow Load is taken as 0 psf for the foundation values below for Snow Loads greater than 0 psf. Lateral wind and uplift pressures are maximized without resistance due to Snow Loading.
6. Embedment depth shall be considered from top of finished grade. Concrete pier shall be below grade.
7. Provide Air Entraining Admixture for freeze and thaw cycles as required for colder climates.
8. Additional foundation requirements are needed where * is indicated. Contact Tamarack.
9. Resistance to corrosion and/or sulfate attack, along with possible adverse effects due to expansive soils has not been considered in these foundation recommendations. SML Engineers assumes no liability with regard to these items.
10. Soil classification shall be determined and verified by the end user of this certification letter.

Our analysis assumes that the rails, including the connections and associated hardware, are installed in a workmanlike manner in accordance with the "Tamarack Ground Mount Installation Manual" and generally accepted standards of construction practice. Additional information is available at the Tamarack web site, tamaracksolar.com. Verification of PV Module capacity to support the loads associated with the given array shall be the responsibility of the Contractor or Owner and not Tamarack or Starling Madison Lofquist.

Please feel free to contact me at your convenience if you have any questions.

Respectfully yours,

Peter Lofquist, P.E.
Principal



Exposure Category	Unbraced Maximum Post Spacing (in)			Wind Speed (mph)									
	Snow Load (psf)	Slope (deg)		90	95	100	105	110	120	130	140	150	160
B	0	0	144	144	144	144	144	139	130	123	116	110	104
		5	144	144	144	144	144	139	130	123	116	110	104
		10	144	144	141	136	131	122	114	107	101	95	90
		15	145	143	137	132	127	118	111	104	97	92	87
		20	142	136	131	126	121	112	100	86	75	66	59
		25	137	130	117	106	97	81	69	60	52	46	41
		30	106	95	86	78	71	60	51	44	38	34	30
		35	90	81	73	66	60	51	43	37	32	28	25
		40	76	69	62	56	51	43	37	32	28	24	21
		45	65	58	53	48	44	37	31	27	23	21	18
	10	0	127	127	127	127	127	124	120	115	111	106	102
		5	127	127	127	127	127	124	120	115	111	107	103
		10	128	128	126	123	120	115	110	105	100	95	90
		15	128	128	125	122	119	113	108	103	97	92	87
		20	130	127	123	120	117	111	100	86	75	66	59
		25	130	126	117	106	97	81	69	60	52	46	41
		30	106	95	86	78	71	60	51	44	38	34	30
		35	90	81	73	66	60	51	43	37	32	28	25
		40	76	69	62	56	51	43	37	32	28	24	21
		45	65	58	53	48	44	37	31	27	23	21	18
	20	0	109	109	109	109	109	107	104	101	98	95	92
		5	109	109	109	109	109	107	104	101	98	95	92
		10	109	109	108	106	105	101	97	94	91	87	84
		15	110	110	108	106	104	100	96	93	89	86	83
		20	113	111	108	106	104	100	96	86	75	66	59
		25	115	112	110	106	97	81	69	60	52	46	41
		30	106	95	86	78	71	60	51	44	38	34	30
		35	90	81	73	66	60	51	43	37	32	28	25
		40	76	69	62	56	51	43	37	32	28	24	21
		45	65	58	53	48	44	37	31	27	23	21	18
	30	0	102	102	102	102	102	100	98	95	93	90	88
		5	102	102	102	102	102	100	98	95	93	90	88
		10	102	102	101	100	98	95	92	89	87	84	81
		15	103	103	101	99	98	95	92	89	86	83	80
		20	106	104	103	101	99	95	92	86	75	66	59
		25	109	106	104	102	97	81	69	60	52	46	41
		30	106	95	86	78	71	60	51	44	38	34	30
		35	90	81	73	66	60	51	43	37	32	28	25
		40	76	69	62	56	51	43	37	32	28	24	21
		45	65	58	53	48	44	37	31	27	23	21	18
	40	0	93	93	93	93	93	92	90	88	86	84	82
		5	93	93	93	93	93	92	90	88	86	84	82
		10	93	93	93	92	90	88	86	83	81	79	77
		15	94	94	93	91	90	88	85	83	80	78	76
		20	98	96	95	93	92	89	86	83	75	66	59
		25	101	99	97	95	94	81	69	60	52	46	41
		30	104	95	86	78	71	60	51	44	38	34	30
		35	90	81	73	66	60	51	43	37	32	28	25
		40	76	69	62	56	51	43	37	32	28	24	21
		45	65	58	53	48	44	37	31	27	23	21	18
	50	0	85	85	85	85	85	84	82	80	79	77	75
		5	85	85	85	85	85	84	82	80	79	77	75
		10	85	85	85	85	84	82	80	78	76	74	73
		15	86	86	86	85	84	82	80	78	76	74	72
		20	91	90	88	87	86	84	81	79	75	66	59
		25	94	93	91	90	88	85	83	80	78	76	74
		30	98	95	86	78	71	60	51	44	38	34	30
		35	90	81	73	66	60	51	43	37	32	28	25
		40	76	69	62	56	51	43	37	32	28	24	21
		45	65	58	53	48	44	37	31	27	23	21	18
	60	0	78	78	78	78	78	78	77	76	74	73	72
		5	78	78	78	78	78	78	77	76	74	73	72
		10	78	78	78	78	78	77	76	74	73	71	69
		15	79	79	79	79	79	77	76	74	72	70	69
		20	84	84	83	82	81	79	77	75	73	66	59
		25	89	88	86	85	84	81	69	60	52	46	41
		30	93	91	86	78	71	60	51	44	38	34	30
		35	90	81	73	66	60	51	43	37	32	28	25
		40	76	69	62	56	51	43	37	32	28	24	21
		45	65	58	53	48	44	37	31	27	23	21	18
	70	0	72	72	72	72	72	72	72	72	71	69	67
		5	72	72	72	72	72	72	72	72	71	70	68
		10	73	73	73	73	73	72	71	69	68	66	64
		15	74	74	74	74	74	73	72	70	69	67	66
		20	78	78	78	78	77	75	74	72	70	66	59
		25	83	83	82	81	80	78	69	60	52	46	41
		30	88	87	86	78	71	60	51	44	38	34	30
		35	90	81	73	66	60	51	43	37	32	28	25
		40	76	69	62	56	51	43	37	32	28	24	21
		45	65	58	53	48	44	37	31	27	23	21	18

Notes – See Page 4

Exposure Category	Unbraced Maximum Post Spacing (in)			Wind Speed (mph)									
	Snow Load (psf)	Slope (deg)		90	95	100	105	110	120	130	140	150	160
C	0	0	144	142	137	132	127	118	110	103	97	92	87
		5	144	143	137	132	127	118	110	103	97	92	87
		10	131	125	120	115	111	103	96	89	84	79	75
		15	127	122	117	112	107	100	93	87	80	70	62
		20	121	115	110	103	94	79	67	58	51	44	39
		25	97	87	79	71	65	55	47	40	35	31	27
		30	71	64	58	52	48	40	34	29	26	23	20
		35	60	54	49	44	40	34	29	25	22	19	17
		40	51	46	42	38	34	29	25	21	18	16	N/A
		45	44	39	35	32	29	25	21	18	N/A	N/A	N/A
	10	0	127	126	123	120	118	112	107	102	97	92	87
		5	127	126	123	121	118	112	107	102	97	92	87
		10	120	117	114	111	108	102	96	89	84	79	75
		15	119	115	112	109	106	100	93	87	80	70	62
		20	117	113	110	103	94	79	67	58	51	44	39
		25	97	87	79	71	65	55	47	40	35	31	27
		30	71	64	58	52	48	40	34	29	26	23	20
		35	60	54	49	44	40	34	29	25	22	19	17
		40	51	46	42	38	34	29	25	21	18	16	N/A
		45	44	39	35	32	29	25	21	18	N/A	N/A	N/A
	20	0	109	108	106	104	102	99	95	92	88	85	82
		5	109	108	106	104	103	99	95	92	89	85	82
		10	105	102	100	98	96	92	88	84	81	77	74
		15	104	101	99	97	95	91	86	83	79	70	62
		20	104	101	99	96	94	79	67	58	51	44	39
		25	97	87	79	71	65	55	47	40	35	31	27
		30	71	64	58	52	48	40	34	29	26	23	20
		35	60	54	49	44	40	34	29	25	22	19	17
		40	51	46	42	38	34	29	25	21	18	16	N/A
		45	44	39	35	32	29	25	21	18	N/A	N/A	N/A
	30	0	102	101	100	98	97	93	90	87	85	82	79
		5	102	101	100	98	97	94	91	88	85	82	79
		10	98	97	95	93	91	88	84	81	78	75	72
		15	98	96	94	92	90	87	83	80	76	70	62
		20	99	97	94	92	90	79	67	58	51	44	39
		25	97	87	79	71	65	55	47	40	35	31	27
		30	71	64	58	52	48	40	34	29	26	23	20
		35	60	54	49	44	40	34	29	25	22	19	17
		40	51	46	42	38	34	29	25	21	18	16	N/A
		45	44	39	35	32	29	25	21	18	N/A	N/A	N/A
	40	0	93	93	91	90	89	86	84	82	79	77	75
		5	93	93	91	90	89	87	84	82	79	77	75
		10	90	89	88	86	85	82	79	76	74	71	69
		15	90	89	87	86	84	81	78	75	73	70	62
		20	92	90	88	86	85	79	67	58	51	44	39
		25	94	87	79	71	65	55	47	40	35	31	27
		30	71	64	58	52	48	40	34	29	26	23	20
		35	60	54	49	44	40	34	29	25	22	19	17
		40	51	46	42	38	34	29	25	21	18	16	N/A
		45	44	39	35	32	29	25	21	18	N/A	N/A	N/A
	50	0	85	85	85	84	83	81	79	77	75	73	71
		5	85	85	85	84	83	81	79	77	75	73	71
		10	84	83	82	81	79	77	75	72	70	68	66
		15	84	83	82	80	79	77	74	72	69	67	62
		20	86	85	83	82	80	77	67	58	51	44	39
		25	88	87	79	71	65	55	47	40	35	31	27
		30	71	64	58	52	48	40	34	29	26	23	20
		35	60	54	49	44	40	34	29	25	22	19	17
		40	51	46	42	38	34	29	25	21	18	16	N/A
		45	44	39	35	32	29	25	21	18	N/A	N/A	N/A
	60	0	78	78	78	78	76	75	73	71	69	68	68
		5	78	78	78	78	76	75	73	71	70	68	68
		10	78	78	77	76	75	73	71	69	67	65	63
		15	79	78	77	76	75	73	71	69	66	64	62
		20	81	80	79	77	76	74	67	58	51	44	39
		25	84	82	79	71	65	55	47	40	35	31	27
		30	71	64	58	52	48	40	34	29	26	23	20
		35	60	54	49	44	40	34	29	25	22	19	17
		40	51	46	42	38	34	29	25	21	18	16	N/A
		45	44	39	35	32	29	25	21	18	N/A	N/A	N/A
	70	0	72	72	72	72	72	71	69	68	66	65	65
		5	72	72	72	72	72	71	70	68	66	67	65
		10	73	73	73	72	71	70	68	66	64	63	61
		15	74	74	73	72	71	69	68	66	64	62	60
		20	77	76	75	74	73	71	67	58	51	44	39
		25	80	79	77	71	65	55	47	40	35	31	27
		30	71	64	58	52	48	40	34	29	26	23	20
		35	60	54	49	44	40	34	29	25	22	19	17
		40	51	46	42	38	34	29	25	21	18	16	N/A
		45	44	39	35	32	29	25	21	18	N/A	N/A	N/A

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Unbraced Maximum Post Spacing (in)			Wind Speed (mph)										
Exposure Category	Snow Load (psf)	Slope (deg)	90	95	100	105	110	120	130	140	150	160	170
D	0	0	138	132	127	122	117	109	101	95	89	84	80
		5	138	132	127	122	117	109	101	95	89	84	80
		10	121	116	111	106	102	94	88	82	77	72	68
		15	118	112	107	103	99	91	85	76	66	58	51
		20	111	104	94	85	78	65	56	48	42	37	32
		25	80	72	65	59	54	45	38	33	29	25	22
		30	59	53	48	43	39	33	28	24	21	19	16
	10	35	50	45	40	37	33	28	24	21	18	16	14
		40	42	38	34	31	28	24	20	17	15	N/A	N/A
		45	36	32	29	26	24	20	17	N/A	N/A	N/A	N/A
		0	124	121	117	114	112	106	101	95	89	84	80
		5	124	121	118	115	112	106	101	95	89	84	80
		10	114	111	108	104	101	94	88	82	77	72	68
		15	113	109	106	102	99	91	85	76	66	58	51
	20	20	110	104	94	85	78	65	56	48	42	37	32
		25	80	72	65	59	54	45	38	33	29	25	22
		30	59	53	48	43	39	33	28	24	21	19	16
		35	50	45	40	37	33	28	24	21	18	16	14
		40	42	38	34	31	28	24	20	17	15	N/A	N/A
		45	36	32	29	26	24	20	17	N/A	N/A	N/A	N/A
		0	107	104	102	100	98	94	91	87	84	80	77
	30	5	107	105	103	101	99	95	91	87	84	81	77
		10	101	98	96	94	91	87	83	79	76	72	68
		15	100	97	95	92	90	86	82	76	66	58	51
		20	99	97	94	85	78	65	56	48	42	37	32
		25	80	72	65	59	54	45	38	33	29	25	22
		30	59	53	48	43	39	33	28	24	21	19	16
		35	50	45	40	37	33	28	24	21	18	16	14
	40	40	42	38	34	31	28	24	20	17	15	N/A	N/A
		45	36	32	29	26	24	20	17	N/A	N/A	N/A	N/A
		0	100	98	97	95	93	90	87	83	80	77	75
		5	100	98	97	95	93	90	87	84	80	78	75
		10	95	93	91	89	87	83	80	76	73	70	67
		15	94	92	90	88	86	82	79	75	66	58	51
		20	95	92	90	85	78	65	56	48	42	37	32
	50	25	80	72	65	59	54	45	38	33	29	25	22
		30	59	53	48	43	39	33	28	24	21	19	16
		35	50	45	40	37	33	28	24	21	18	16	14
		40	42	38	34	31	28	24	20	17	15	N/A	N/A
		45	36	32	29	26	24	20	17	N/A	N/A	N/A	N/A
		0	85	84	83	82	81	78	76	74	72	70	68
		5	85	84	83	82	81	79	76	74	72	70	68
	60	10	82	81	79	78	77	74	72	69	67	65	62
		15	82	80	79	78	76	74	71	68	66	58	51
		20	83	82	80	78	77	65	56	48	42	37	32
		25	80	72	65	59	54	45	38	33	29	25	22
		30	59	53	48	43	39	33	28	24	21	19	16
		35	50	45	40	37	33	28	24	21	18	16	14
		40	42	38	34	31	28	24	20	17	15	N/A	N/A
	70	45	36	32	29	26	24	20	17	N/A	N/A	N/A	N/A
		0	78	78	78	77	76	74	72	70	69	67	65
		5	78	78	78	77	76	74	72	71	69	67	65
		10	77	76	75	74	73	71	68	66	64	62	60
		15	77	76	75	74	73	70	68	66	63	58	51
		20	79	78	76	75	73	65	56	48	42	37	32
		25	80	72	65	59	54	45	38	33	29	25	22
Notes – See Page 4													

Exposure Category	Braced Maximum Post Spacing (in)			Wind Speed (mph)									
	Snow Load (psf)	Slope (deg)		90	95	100	105	110	120	130	140	150	160
B	0	0	144	144	144	144	144	139	130	123	116	110	104
		5	144	144	144	144	144	139	130	123	116	110	104
		10	144	144	141	136	131	122	114	107	101	95	90
		15	145	143	137	132	127	118	111	104	97	92	87
		20	142	136	131	126	121	112	105	98	92	87	82
		25	137	131	125	120	116	107	100	93	88	83	78
		30	131	126	120	115	111	103	96	89	84	79	75
		35	131	125	120	115	111	102	95	89	83	78	74
		40	132	126	121	116	111	103	96	89	84	79	75
	10	45	133	127	122	116	112	103	96	90	84	79	75
		0	127	127	127	127	127	124	120	115	111	106	102
		5	127	127	127	127	127	124	120	115	111	107	103
		10	128	128	126	123	120	115	110	105	100	95	90
		15	128	128	125	122	119	113	108	103	97	92	87
		20	130	127	123	120	117	111	105	98	92	87	82
		25	130	126	122	119	115	107	100	93	88	83	78
		30	130	125	120	115	111	103	96	89	84	79	75
		35	131	125	120	115	111	102	95	89	83	78	74
	20	40	132	126	121	116	111	103	96	89	84	79	75
		45	133	127	122	116	112	103	96	90	84	79	75
		0	109	109	109	109	109	107	104	101	98	95	92
		5	109	109	109	109	109	107	104	101	98	95	92
		10	109	109	108	106	105	101	97	94	91	87	84
		15	110	110	108	106	104	100	96	93	89	86	83
		20	113	111	108	106	104	100	96	92	88	84	81
		25	115	112	110	107	105	100	95	91	87	83	78
		30	117	114	111	108	105	100	95	89	84	79	75
	30	35	121	118	114	111	108	102	95	89	83	78	74
		40	126	123	119	115	111	103	96	89	84	79	75
		45	132	127	122	116	112	103	96	90	84	79	75
		0	102	102	102	102	102	100	98	95	93	90	88
		5	102	102	102	102	102	100	98	95	93	90	88
		10	102	102	101	100	98	95	92	89	87	84	81
		15	103	103	101	99	98	95	92	89	86	83	80
		20	106	104	103	101	99	95	92	88	85	82	79
		25	109	106	104	102	100	96	92	88	84	81	78
	40	30	111	109	106	104	101	96	92	88	84	79	75
		35	116	113	110	107	105	99	94	89	83	78	74
		40	122	119	115	112	109	103	96	89	84	79	75
		45	128	124	120	116	112	103	96	90	84	79	75
		0	93	93	93	93	93	92	90	88	86	84	82
		5	93	93	93	93	93	92	90	88	86	84	82
		10	93	93	93	92	90	88	86	83	81	79	77
		15	94	94	93	91	90	88	85	83	80	78	76
		20	98	96	95	93	92	89	86	83	80	78	75
	50	25	101	99	97	95	94	90	87	84	80	77	75
		30	104	102	100	98	96	92	88	84	81	77	74
		35	109	107	104	102	100	95	91	87	83	78	74
		40	116	113	110	107	105	99	94	89	84	79	75
		45	123	119	116	113	110	103	96	90	84	79	75
		0	85	85	85	85	85	84	82	80	79	77	75
		5	85	85	85	85	85	84	82	80	79	77	75
		10	85	85	85	85	84	82	80	78	76	74	73
		15	86	86	86	85	84	82	80	78	76	74	72
	60	20	91	90	88	87	86	84	81	79	76	74	72
		25	94	93	91	90	88	85	83	80	77	74	72
		30	98	96	94	93	91	87	84	81	78	75	72
		35	103	101	99	97	95	91	87	84	80	77	74
		40	110	108	105	103	100	96	92	87	84	79	75
		45	118	115	112	109	106	101	96	90	84	79	75
		0	78	78	78	78	78	78	78	77	76	74	73
		5	78	78	78	78	78	78	78	77	76	74	73
		10	78	78	78	78	78	77	76	74	73	71	69
	70	15	79	79	79	79	79	77	76	74	72	70	69
		20	84	84	83	82	81	79	77	75	73	71	69
		25	89	88	86	85	84	81	79	76	74	72	69
		30	93	91	90	88	87	84	81	78	75	72	70
		35	98	97	95	93	91	88	84	81	78	75	72
		40	105	103	101	99	97	93	89	85	81	78	75
		45	113	110	108	105	103	98	93	89	84	79	75
		0	72	72	72	72	72	72	72	72	72	71	69
		5	72	72	72	72	72	72	72	72	72	71	70
	70	10	73	73	73	73	73	73	72	71	69	68	66
		15	74	74	74	74	74	73	72	70	69	67	66
		20	78	78	78	78	77	75	74	72	70	68	66
		25	83	83	82	81	80	78	76	73	71	69	67
		30	88	87	86	84	83	80	78	75	73	70	68
		35	94	92	91	89	88	85	82	79	76	73	70
		40	101	99	97	95	94	90	86	83	80	76	73
		45	109	107	104	102	100	95	91	87	83	79	75

Notes – See Page 4

Exposure Category	Braced Maximum Post Spacing (in)			Wind Speed (mph)									
	Snow Load (psf)	Slope (deg)	90	95	100	105	110	120	130	140	150	160	170
C	0	0	144	142	137	132	127	118	110	103	97	92	87
		5	144	143	137	132	127	118	110	103	97	92	87
		10	131	125	120	115	111	103	96	89	84	79	75
		15	127	122	117	112	107	100	93	87	81	77	72
		20	121	115	110	106	102	94	87	82	77	72	68
		25	116	110	106	101	97	90	83	78	73	68	65
		30	111	106	101	97	93	86	79	74	69	65	62
		35	111	105	101	96	92	85	79	74	69	65	61
	10	40	111	106	101	97	93	86	80	74	69	65	N/A
		45	112	107	102	97	93	86	80	74	N/A	N/A	N/A
		0	127	126	123	120	118	112	107	102	97	92	87
		5	127	126	123	121	118	112	107	102	97	92	87
		10	120	117	114	111	108	102	96	89	84	79	75
		15	119	115	112	109	106	100	93	87	81	77	72
	20	20	117	113	110	106	102	94	87	82	77	72	68
		25	116	110	106	101	97	90	83	78	73	68	65
		30	111	106	101	97	93	86	79	74	69	65	62
		35	111	105	101	96	92	85	79	74	69	65	61
		40	111	106	101	97	93	86	80	74	69	65	N/A
		45	112	107	102	97	93	86	80	74	N/A	N/A	N/A
		0	109	108	106	104	102	99	95	92	88	85	82
		5	109	108	106	104	103	99	95	92	89	85	82
	30	10	105	102	100	98	96	92	88	84	81	77	74
		15	104	101	99	97	95	91	86	83	79	76	72
		20	104	101	99	96	94	89	85	81	77	72	68
		25	105	102	99	96	93	88	83	78	73	68	65
		30	105	102	99	96	93	86	79	74	69	65	62
		35	108	105	101	96	92	85	79	74	69	65	61
		40	111	106	101	97	93	86	80	74	69	65	N/A
		45	112	107	102	97	93	86	80	74	N/A	N/A	N/A
	40	0	102	101	100	98	97	93	90	87	85	82	79
		5	102	101	100	98	97	94	91	88	85	82	79
		10	98	97	95	93	91	88	84	81	78	75	72
		15	98	96	94	92	90	87	83	80	76	73	71
		20	99	97	94	92	90	86	82	78	75	72	68
		25	100	97	95	92	90	86	81	77	73	68	65
		30	101	98	95	93	90	85	79	74	69	65	62
		35	105	101	98	95	92	85	79	74	69	65	61
	50	40	109	105	101	97	93	86	80	74	69	65	N/A
		45	112	107	102	97	93	86	80	74	N/A	N/A	N/A
		0	85	85	85	84	83	81	79	77	75	73	71
		5	85	85	85	84	83	81	79	77	75	73	71
		10	84	83	82	81	79	77	75	72	70	68	66
		15	84	83	82	80	79	77	74	72	69	67	65
		20	86	85	83	82	80	77	74	72	69	66	64
		25	88	87	85	83	81	78	75	72	69	66	63
	60	30	91	89	87	85	83	79	75	72	68	65	62
		35	95	93	90	88	86	81	77	74	69	65	61
		40	101	98	95	92	90	85	80	74	69	65	N/A
		45	106	103	100	97	93	86	80	74	N/A	N/A	N/A
		0	78	78	78	78	78	76	75	73	71	69	68
		5	78	78	78	78	78	76	75	73	71	70	68
		10	78	78	77	76	75	73	71	69	67	65	63
		15	79	78	77	76	75	73	71	69	66	64	62
	70	20	81	80	79	77	76	74	71	69	66	64	62
		25	84	82	81	79	78	75	72	69	67	64	62
		30	87	85	83	81	79	76	73	70	67	64	61
		35	91	89	87	85	83	79	75	72	69	65	61
		40	97	94	92	90	87	83	78	74	69	65	N/A
		45	103	100	97	94	92	86	80	74	N/A	N/A	N/A

Notes – See Page 4

	Braced Maximum Post Spacing (in)			Wind Speed (mph)									
	Exposure Category	Snow Load (psf)	Slope (deg)	90	95	100	105	110	120	130	140	150	160
D	0	0	138	132	127	122	117	109	101	95	89	84	80
		5	138	132	127	122	117	109	101	95	89	84	80
		10	121	116	111	106	102	94	88	82	77	72	68
		15	118	112	107	103	99	91	85	79	74	70	66
		20	111	106	102	97	93	86	80	75	70	66	62
		25	106	101	97	93	89	82	76	71	66	62	59
		30	102	97	93	89	85	78	73	68	63	60	56
		35	102	97	92	88	84	78	72	67	63	59	56
		40	102	97	93	89	85	78	73	68	63	N/A	N/A
		45	103	98	93	89	85	79	73	N/A	N/A	N/A	N/A
	10	0	124	121	117	114	112	106	101	95	89	84	80
		5	124	121	118	115	112	106	101	95	89	84	80
		10	114	111	108	104	101	94	88	82	77	72	68
		15	113	109	106	102	99	91	85	79	74	70	66
		20	110	106	102	97	93	86	80	75	70	66	62
		25	106	101	97	93	89	82	76	71	66	62	59
		30	102	97	93	89	85	78	73	68	63	60	56
		35	102	97	92	88	84	78	72	67	63	59	56
		40	102	97	93	89	85	78	73	68	63	N/A	N/A
		45	103	98	93	89	85	79	73	N/A	N/A	N/A	N/A
	20	0	107	104	102	100	98	94	91	87	84	80	77
		5	107	105	103	101	99	95	91	87	84	81	77
		10	101	98	96	94	91	87	83	79	76	72	68
		15	100	97	95	92	90	86	82	78	74	70	66
		20	99	97	94	91	89	84	80	75	70	66	62
		25	99	96	93	90	88	82	76	71	66	62	59
		30	99	96	93	89	85	78	73	68	63	60	56
		35	102	97	92	88	84	78	72	67	63	59	56
		40	102	97	93	89	85	78	73	68	63	N/A	N/A
		45	103	98	93	89	85	79	73	N/A	N/A	N/A	N/A
	30	0	100	98	97	95	93	90	87	83	80	77	75
		5	100	98	97	95	93	90	87	84	80	78	75
		10	95	93	91	89	87	83	80	76	73	70	67
		15	94	92	90	88	86	82	79	75	72	69	66
		20	95	92	90	88	85	81	77	74	70	66	62
		25	95	93	90	87	85	80	76	71	66	62	59
		30	96	93	90	87	85	78	73	68	63	60	56
		35	99	95	92	88	84	78	72	67	63	59	56
		40	102	97	93	89	85	78	73	68	63	N/A	N/A
		45	103	98	93	89	85	79	73	N/A	N/A	N/A	N/A
	40	0	92	90	89	88	86	84	81	78	76	73	71
		5	92	90	89	88	86	84	81	78	76	73	71
		10	88	86	85	83	82	78	75	73	70	67	65
		15	87	86	84	82	81	78	75	72	69	66	64
		20	89	87	85	83	81	77	74	71	67	65	62
		25	90	88	85	83	81	77	73	70	66	62	59
		30	91	89	86	84	81	77	73	68	63	60	56
		35	95	92	89	86	84	78	72	67	63	59	56
		40	99	96	92	89	85	78	73	68	63	N/A	N/A
		45	103	98	93	89	85	79	73	N/A	N/A	N/A	N/A
	50	0	85	84	83	82	81	78	76	74	72	70	68
		5	85	84	83	82	81	79	76	74	72	70	68
		10	82	81	79	78	77	74	72	69	67	65	62
		15	82	80	79	78	76	74	71	68	66	64	61
		20	83	82	80	78	77	74	71	68	65	63	60
		25	85	83	81	79	78	74	71	68	65	62	59
		30	87	85	83	80	78	74	71	67	63	60	56
		35	91	88	86	83	81	77	72	67	63	59	56
		40	95	93	90	87	85	82	78	73	68	63	N/A
		45	100	97	93	89	85	79	73	N/A	N/A	N/A	N/A
	60	0	78	78	78	77	76	74	72	70	69	67	65
		5	78	78	78	77	76	74	72	71	69	67	65
		10	77	76	75	74	73	71	68	66	64	62	60
		15	77	76	75	74	73	70	68	66	63	61	59
		20	79	78	76	75	73	71	68	65	63	61	58
		25	81	79	78	76	75	71	68	66	63	60	58
		30	83	81	79	78	76	72	69	66	63	60	56
		35	87	85	83	81	79	75	71	67	63	59	56
		40	92	90	87	85	82	78	73	68	63	N/A	N/A
		45	98	94	91	89	85	79	73	N/A	N/A	N/A	N/A
	70	0	72	72	72	72	72	71	69	67	66	64	62
		5	72	72	72	72	72	71	69	67	66	64	63
		10	73	72	71	70	69	68	66	64	62	60	58
		15	73	72	71	70	69	67	65	63	61	59	57
		20	75	74	73	72	70	68	66	63	61	59	57
		25	78	76	75	73	72	69	66	64	61	59	57
		30	80	78	77	75	73	70	67	64	61	59	56
		35	84	82	80	78	76	73	69	66	63	59	56
		40	90	87	85	82	80	76	72	68	63	N/A	N/A
		45	95	92	89	87	84	79	73	N/A	N/A	N/A	N/A

Notes – See Page 4

Tamarack 3.13 Rail, Ground Mounting System – 3 Module – Structural Analysis

Exposure Category	Unbraced Minimum Foundation Depths (in)			Wind Speed (mph)										
	Pier Diameter (in)	Slope (deg)		90	95	100	105	110	120	130	140	150	160	170
				0	36	36	36	36	36	36	36	36	36	36
B	12	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	42	42	42	42	42	42	48	48	48
		20	42	42	42	48	48	48	48	48	48	48	48	48
		25	48	48	48	48	48	48	48	48	48	48	48	48
		30	48	48	48	48	48	48	48	48	48	48	48	48
		35	48	48	48	48	48	48	48	48	48	48	48	48
		40	48	48	48	48	48	48	48	48	48	48	48	*
		45	48	48	48	48	48	48	48	48	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
C	16	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	42	42	42	42
		20	36	42	42	42	42	42	42	42	42	42	42	42
		25	42	42	42	42	42	42	42	42	42	42	42	42
		30	42	42	42	42	42	42	42	42	42	42	42	*
		35	42	42	42	42	42	42	42	42	42	42	*	*
		40	42	42	42	42	42	42	42	42	*	*	*	*
		45	42	42	42	42	42	42	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
D	20	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	42
		20	36	36	36	36	36	42	42	42	42	42	42	42
		25	42	42	42	42	42	42	42	42	42	42	42	42
		30	42	42	42	42	42	42	42	42	*	*	*	*
		35	42	42	42	42	42	42	42	42	*	*	*	*
		40	42	42	42	42	42	42	*	*	*	*	*	*
		45	42	42	42	42	42	*	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
E	24	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	36	36	36	36	36	36
		25	36	36	36	36	36	36	36	36	36	36	*	*
		30	36	36	36	36	36	36	36	36	*	*	*	*
		35	36	36	36	36	36	36	*	*	*	*	*	*
		40	36	36	36	36	36	*	*	*	*	*	*	*
		45	36	36	36	*	*	*	*	*	*	*	*	*
		0	36	36	36	*	*	*	*	*	*	*	*	*

Notes – See Page 5

Exposure Category	Unbraced Minimum Foundation Depths (in)			Wind Speed (mph)										
	Pier Diameter (in)	Slope (deg)		90	95	100	105	110	120	130	140	150	160	170
				0	36	36	36	36	36	36	36	36	36	36
C	12	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	42	42	42	42	42	48	48	48	48	48	48	48
		20	48	48	48	48	48	48	48	48	48	48	48	48
		25	48	48	48	48	48	48	48	48	48	48	48	48
		30	48	48	48	48	48	48	48	48	48	*	*	*
		35	48	48	48	48	48	48	48	48	*	*	*	*
		40	48	48	48	48	48	48	48	*	*	*	*	*
		45	48	48	48	48	48	48	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
C	16	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	42	42	42	42	42	42	42	42
		20	42	42	42	42	42	42	42	42	42	42	42	42
		25	42	42	42	42	42	42	42	42	42	42	*	*
		30	42	42	42	42	42	42	42	*	*	*	*	*
		35	42	42	42	42	42	42	*	*	*	*	*	*
		40	42	42	42	42	42	*	*	*	*	*	*	*
		45	42	42	42	42	*	*	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
C	20	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	42	42	42	42
		20	36	42	42	42	42	42	42	42	42	42	42	*
		25	42	42	42	42	42	42	42	42	42	*	*	*
		30	42	42	42	42	42	42	*	*	*	*	*	*
		35	42	42	42	42	42	*	*	*	*	*	*	*
		40	42	42	42	*	*	*	*	*	*	*	*	*
		45	42	*	*	*	*	*	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
C	24	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	36	36	36	36	*	*
		25	36	36	36	36	36	36	*	*	*	*	*	*
		30	36	36	36	36	*	*	*	*	*	*	*	*
		35	36	36	36	*	*	*	*	*	*	*	*	*
		40	36	*	*	*	*	*	*	*	*	*	*	*
		45	*	*	*	*	*	*	*	*	*	*	*	*

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Exposure Category	Pier Diameter (in)	Slope (deg)	Wind Speed (mph)										
			Unbraced Minimum Foundation Depths (in)			Wind Speed (mph)							
			90	95	100	105	110	120	130	140	150	160	170
D	12	0	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	42	42	42	42
		15	42	42	42	42	48	48	48	48	48	48	48
		20	48	48	48	48	48	48	48	48	48	48	48
		25	48	48	48	48	48	48	48	48	48	48	*
		30	48	48	48	48	48	48	48	48	*	*	*
		35	48	48	48	48	48	48	*	*	*	*	*
		40	48	48	48	48	48	*	*	*	*	*	*
	16	45	48	48	48	48	48	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	42	42	42	42	42	42	42	42	42
		20	42	42	42	42	42	42	42	42	42	42	42
		25	42	42	42	42	42	42	42	42	*	*	*
	20	30	42	42	42	42	42	42	*	*	*	*	*
		35	42	42	42	42	42	*	*	*	*	*	*
		40	42	42	42	*	*	*	*	*	*	*	*
		45	42	42	*	*	*	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36
	24	15	36	36	36	36	36	36	42	42	42	42	42
		20	42	42	42	42	42	42	42	42	*	*	*
		25	42	42	42	42	42	42	*	*	*	*	*
		30	42	42	42	42	*	*	*	*	*	*	*
		35	42	42	42	*	*	*	*	*	*	*	*
		40	42	*	*	*	*	*	*	*	*	*	*
		45	*	*	*	*	*	*	*	*	*	*	*

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Table F4 - Soil Class 3

		Braced Minimum Foundation Depths (in)			Wind Speed (mph)									
Exposure Category	Pier Diameter (in)	Slope (deg)	90	95	100	105	110	120	130	140	150	160	170	
B	12	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	42	42	42	42	42
		20	36	36	36	42	42	42	42	48	48	48	48	48
		25	42	42	42	48	48	48	48	54	54	54	54	60
		30	48	48	48	48	54	54	54	60	60	60	60	66
		35	48	54	54	54	54	60	60	60	66	66	66	66
		40	54	54	54	60	60	60	66	66	66	72	72	72
		45	60	60	60	60	66	66	66	72	72	78	78	78
	16	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	36	42	42	42	42	42
		25	36	36	36	42	42	42	42	48	48	48	48	48
		30	42	42	42	42	48	48	48	48	54	54	54	54
		35	42	42	48	48	48	48	54	54	54	60	60	60
		40	48	48	48	48	54	54	54	60	60	60	66	66
		45	48	54	54	54	54	60	60	60	66	66	66	66
	20	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	36	36	36	36	42	42
		25	36	36	36	36	36	36	42	42	42	42	42	48
		30	36	36	42	42	42	42	42	48	48	48	48	48
		35	42	42	42	42	42	48	48	48	48	48	54	54
		40	42	42	42	48	48	48	48	48	54	54	54	60
		45	48	48	48	48	48	54	54	54	60	60	60	60
	24	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	36	36	36	36	36	36
		25	36	36	36	36	36	36	36	36	42	42	42	42
		30	36	36	36	36	36	42	42	42	42	42	48	48
		35	36	36	36	42	42	42	42	48	48	48	48	48
		40	42	42	42	42	48	48	48	48	48	54	54	54
		45	42	42	42	48	48	48	48	48	54	54	54	60

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Table F5 - Soil Class 3

		Braced Minimum Foundation Depths (in)			Wind Speed (mph)									
Exposure Category	Pier Diameter (in)	Slope (deg)	90	95	100	105	110	120	130	140	150	160	170	
C	12	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	42	42	42	42
		15	36	36	36	36	36	42	42	42	42	48	48	48
		20	42	42	42	42	42	48	48	48	54	54	54	54
		25	48	48	48	48	48	54	54	60	60	60	60	60
		30	54	54	54	54	54	60	60	66	66	66	72	72
		35	54	54	60	60	60	66	66	72	72	72	72	72
		40	60	60	60	66	66	66	72	72	78	78	78	78
		45	66	66	66	66	72	72	78	78	84	84	84	84
	16	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	42	42	42	42
		20	36	36	36	36	42	42	42	42	48	48	48	48
		25	42	42	42	42	42	48	48	48	54	54	54	54
		30	48	48	48	48	48	54	54	54	60	60	60	60
		35	48	48	48	54	54	54	60	60	60	66	66	66
		40	54	54	54	54	60	60	60	66	66	66	72	72
		45	54	60	60	60	60	66	66	72	72	72	78	78
	20	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	42	42	42	42	42	42
		25	36	36	36	42	42	42	42	48	48	48	48	48
		30	42	42	42	42	48	48	48	48	54	54	54	54
		35	42	42	48	48	48	48	54	54	54	60	60	60
		40	48	48	48	48	54	54	54	60	60	60	66	66
		45	48	54	54	54	54	60	60	60	66	66	66	66
	24	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	36	36	36	36	42	42
		25	36	36	36	36	36	42	42	42	42	42	42	48
		30	36	36	42	42	42	42	48	48	48	48	48	54
		35	42	42	42	42	42	48	48	48	48	54	54	54
		40	42	42	48	48	48	48	54	54	54	54	54	60
		45	48	48	48	48	54	54	54	60	60	60	60	60

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Table F6 - Soil Class 3

		Braced Minimum Foundation Depths (in)			Wind Speed (mph)									
Exposure Category	Pier Diameter (in)	Slope (deg)	90	95	100	105	110	120	130	140	150	160	170	
D	12	0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	42
		10	36	36	36	36	36	36	36	42	42	42	42	48
		15	36	36	36	42	42	42	42	48	48	48	48	54
		20	42	42	48	48	48	48	54	54	54	54	54	60
		25	48	48	54	54	54	60	60	60	60	66	66	66
		30	54	54	54	60	60	60	66	66	66	72	72	72
		35	60	60	60	60	66	66	72	72	78	78	78	78
		40	60	66	66	66	66	72	72	78	78	84	84	84
	16	45	66	66	72	72	72	78	78	84	84	90	90	90
		0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	42	42	42	42	42
		20	36	36	42	42	42	42	42	48	48	48	48	48
		25	42	42	42	48	48	48	48	54	54	54	54	60
	20	30	48	48	48	54	54	54	54	60	60	60	60	66
		35	48	54	54	54	54	60	60	60	66	66	66	66
		40	54	54	60	60	60	60	66	66	72	72	72	72
		45	60	60	60	60	66	66	72	72	72	78	78	78
		0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
	24	10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	42
		20	36	36	36	36	36	36	42	42	42	42	42	48
		25	36	42	42	42	42	42	48	48	48	48	48	54
		30	42	42	48	48	48	48	54	54	54	54	54	60
		35	48	48	48	48	48	54	54	54	60	60	60	60
		40	48	48	54	54	54	54	60	60	60	66	66	66
		45	54	54	54	54	60	60	66	66	66	72	72	72
		0	36	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	36	36	42	42	42	42
		25	36	36	36	36	42	42	42	42	48	48	48	48
		30	42	42	42	42	42	48	48	48	48	48	54	54
		35	42	42	42	48	48	48	48	54	54	54	54	60
		40	48	48	48	48	48	48	54	54	54	60	60	60
		45	48	48	54	54	54	54	60	60	60	66	66	66

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Exposure Category	Unbraced Minimum Foundation Depths (in)			Wind Speed (mph)										
	Pier Diameter (in)	Slope (deg)		90	95	100	105	110	120	130	140	150	160	170
				0	36	36	36	36	36	36	36	36	36	36
B	12	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	42	42	42	42	42
		15	42	42	42	42	42	48	48	48	54	54	54	54
		20	48	48	48	54	54	54	54	54	54	54	54	54
		25	54	54	54	54	54	54	54	54	54	54	54	54
		30	54	54	54	54	54	54	54	54	54	54	54	54
		35	54	54	54	54	54	54	54	54	54	54	54	54
		40	54	54	54	54	54	54	54	54	54	54	54	*
		45	54	54	54	54	54	54	54	54	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
C	16	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	42	42	42	42	42	48	48	48	48
		20	42	42	42	48	48	48	48	48	48	48	48	48
		25	48	48	48	48	48	48	48	48	48	48	48	48
		30	48	48	48	48	48	48	48	48	48	48	48	*
		35	48	48	48	48	48	48	48	48	48	*	*	*
		40	48	48	48	48	48	48	48	*	*	*	*	*
		45	48	48	48	48	48	*	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
D	20	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	42	42	42	42	42	42
		20	36	42	42	42	42	42	48	48	48	48	48	48
		25	42	48	48	48	48	48	48	48	48	48	48	48
		30	48	48	48	48	48	48	48	48	*	*	*	*
		35	48	48	48	48	48	48	48	48	*	*	*	*
		40	48	48	48	48	48	48	*	*	*	*	*	*
		45	48	48	48	48	48	*	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
E	24	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	42	42	42	42
		20	36	36	36	42	42	42	42	42	42	42	42	42
		25	42	42	42	42	42	42	42	42	42	*	*	*
		30	42	42	42	42	42	42	42	*	*	*	*	*
		35	42	42	42	42	42	42	*	*	*	*	*	*
		40	42	42	42	42	42	*	*	*	*	*	*	*
		45	42	42	42	*	*	*	*	*	*	*	*	*
		0	36	36	36	*	*	*	*	*	*	*	*	*

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Table F8 - Soil Class 4

Exposure Category	Unbraced Minimum Foundation Depths (in)			Wind Speed (mph)										
	Pier Diameter (in)	Slope (deg)		90	95	100	105	110	120	130	140	150	160	170
				0	36	36	36	36	36	36	36	36	36	36
C	12	5	36	36	36	36	36	36	36	36	42	42	42	42
		10	36	36	36	36	42	42	42	42	48	48	48	48
		15	42	48	48	48	48	48	54	54	54	54	54	54
		20	54	54	54	54	54	54	54	54	54	54	54	54
		25	54	54	54	54	54	54	54	54	54	54	54	54
		30	54	54	54	54	54	54	54	54	54	*	*	*
		35	54	54	54	54	54	54	54	54	*	*	*	*
		40	54	54	54	54	54	54	54	*	*	*	*	*
		45	54	54	54	54	54	54	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
C	16	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	42	42	42	42
		15	42	42	42	42	42	48	48	48	48	48	48	48
		20	48	48	48	48	48	48	48	48	48	48	48	48
		25	48	48	48	48	48	48	48	48	48	48	*	*
		30	48	48	48	48	48	48	48	*	*	*	*	*
		35	48	48	48	48	48	48	*	*	*	*	*	*
		40	48	48	48	48	*	*	*	*	*	*	*	*
		45	48	48	48	*	*	*	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
C	20	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	42	42	42	42	42	42	48	48	48
		20	42	42	42	48	48	48	48	48	48	48	48	*
		25	48	48	48	48	48	48	48	48	48	*	*	*
		30	48	48	48	48	48	48	*	*	*	*	*	*
		35	48	48	48	48	48	*	*	*	*	*	*	*
		40	48	48	48	*	*	*	*	*	*	*	*	*
		45	48	*	*	*	*	*	*	*	*	*	*	*
		0	36	36	36	36	36	36	36	36	36	36	36	36
C	24	5	36	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	42	42	42	42	42	42
		20	42	42	42	42	42	42	42	42	42	*	*	*
		25	42	42	42	42	42	42	*	*	*	*	*	*
		30	42	42	42	42	*	*	*	*	*	*	*	*
		35	42	42	42	*	*	*	*	*	*	*	*	*
		40	42	*	*	*	*	*	*	*	*	*	*	*
		45	*	*	*	*	*	*	*	*	*	*	*	*

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		Unbraced Minimum Foundation Depths (in)		Wind Speed (mph)										
	Exposure Category	Pier Diameter (in)	Slope (deg)	90	95	100	105	110	120	130	140	150	160	170
D	12	0	0	36	36	36	36	36	36	36	42	42	48	48
			5	36	36	36	36	36	36	36	42	42	48	48
			10	36	36	42	42	42	42	42	48	48	54	54
			15	48	48	48	48	54	54	54	54	54	54	54
			20	54	54	54	54	54	54	54	54	54	54	54
			25	54	54	54	54	54	54	54	54	54	54	*
			30	54	54	54	54	54	54	54	54	*	*	*
			35	54	54	54	54	54	*	*	*	*	*	*
			40	54	54	54	54	54	*	*	*	*	*	*
	16	0	45	54	54	54	54	54	*	*	*	*	*	*
			5	36	36	36	36	36	36	36	36	36	36	36
			10	36	36	36	36	36	36	36	42	42	42	42
			15	42	42	42	42	48	48	48	48	48	48	48
			20	48	48	48	48	48	48	48	48	48	48	48
			25	48	48	48	48	48	48	48	48	*	*	*
			30	48	48	48	48	48	48	*	*	*	*	*
	20	0	35	48	48	48	48	48	*	*	*	*	*	*
			40	48	48	48	*	*	*	*	*	*	*	*
			45	48	48	*	*	*	*	*	*	*	*	*
			5	36	36	36	36	36	36	36	36	36	36	36
			10	36	36	36	36	36	36	36	36	36	36	42
			15	36	42	42	42	42	42	42	48	48	48	48
	24	0	20	42	48	48	48	48	48	48	48	48	*	*
			25	48	48	48	48	48	48	*	*	*	*	*
			30	48	48	48	48	*	*	*	*	*	*	*
			35	48	48	48	*	*	*	*	*	*	*	*
			40	48	*	*	*	*	*	*	*	*	*	*
			45	*	*	*	*	*	*	*	*	*	*	*
			5	36	36	36	36	36	36	36	36	36	36	36
			10	36	36	36	36	36	36	36	36	36	36	36
			15	36	36	36	36	42	42	42	42	42	42	42
			20	42	42	42	42	42	42	42	*	*	*	*

Notes – See Page 5

Table F9 - Soil Class 4

Exposure Category	Pier Diameter (in)	Slope (deg)	Wind Speed (mph)										
			Braced Minimum Foundation Depths (in)			Unbraced Minimum Foundation Depths (in)							
			90	95	100	105	110	120	130	140	150	160	170
B	12	0	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	42	42	48
		15	36	36	36	36	42	42	42	42	48	48	54
		20	42	42	42	48	48	48	48	54	54	54	60
		25	48	48	48	54	54	54	60	60	60	66	66
		30	54	54	54	60	60	60	66	66	66	72	72
		35	54	60	60	60	60	66	66	72	72	78	78
		40	60	60	66	66	66	72	72	78	78	78	84
		45	66	66	72	72	72	78	78	84	84	90	90
C	16	0	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	42	42	42	42
		20	36	36	36	42	42	42	42	48	48	48	48
		25	42	42	42	48	48	48	48	54	54	54	60
		30	48	48	48	48	54	54	54	60	60	60	66
		35	48	54	54	54	54	60	60	60	66	66	66
		40	54	54	54	60	60	60	66	66	66	72	72
		45	60	60	60	60	66	66	72	72	72	78	78
D	20	0	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	42
		20	36	36	36	36	36	36	42	42	42	42	48
		25	36	36	42	42	42	42	48	48	48	48	54
		30	42	42	42	48	48	48	48	54	54	54	60
		35	42	48	48	48	48	54	54	54	60	60	60
		40	48	48	48	54	54	54	60	60	60	66	66
		45	54	54	54	54	60	60	60	66	66	66	72
E	24	0	36	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	36	36
		20	36	36	36	36	36	36	36	36	42	42	42
		25	36	36	36	36	36	42	42	42	42	48	48
		30	36	42	42	42	42	42	48	48	48	54	54
		35	42	42	42	42	48	48	48	54	54	54	54
		40	42	48	48	48	48	54	54	54	60	60	60
		45	48	48	48	54	54	54	60	60	60	66	66

Notes – See Page 5

Table F11 - Soil Class 4

Exposure Category	Pier Diameter (in)	Slope (deg)	Wind Speed (mph)									
			Braced Minimum Foundation Depths (in)			Unbraced Minimum Foundation Depths (in)						
			90	95	100	105	110	120	130	140	150	160
C	12	0	36	36	36	36	36	36	36	42	42	42
		5	36	36	36	36	36	36	36	42	42	48
		10	36	36	36	36	36	42	42	48	48	54
		15	42	42	42	42	42	48	48	54	54	60
		20	48	48	48	48	48	54	54	60	60	66
		25	54	54	54	54	60	60	60	66	66	72
		30	60	60	60	66	66	66	72	72	78	78
		35	60	66	66	66	72	72	78	78	78	84
		40	66	72	72	72	72	78	78	84	84	90
		45	72	72	78	78	78	84	84	90	96	96
	16	0	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	42	42
		15	36	36	36	36	36	42	42	42	48	48
		20	42	42	42	42	42	48	48	54	54	54
		25	48	48	48	48	48	54	54	60	60	60
		30	54	54	54	54	54	60	60	66	66	72
		35	54	54	60	60	60	66	66	66	72	72
		40	60	60	60	66	66	66	72	72	78	78
		45	66	66	66	66	72	72	78	78	84	84
	20	0	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	42	42	42
		20	36	36	36	42	42	42	42	48	48	48
		25	42	42	42	42	48	48	48	54	54	54
		30	48	48	48	48	54	54	54	60	60	66
		35	48	54	54	54	54	60	60	60	66	66
		40	54	54	54	60	60	60	66	66	66	72
		45	60	60	60	60	66	66	66	72	72	78
	24	0	36	36	36	36	36	36	36	36	36	36
		5	36	36	36	36	36	36	36	36	36	36
		10	36	36	36	36	36	36	36	36	36	36
		15	36	36	36	36	36	36	36	36	36	42
		20	36	36	36	36	36	42	42	42	42	48
		25	36	42	42	42	42	48	48	48	48	54
		30	42	42	48	48	48	54	54	54	54	60
		35	48	48	48	48	48	54	54	54	60	60
		40	48	48	54	54	54	60	60	60	66	66
		45	54	54	54	60	60	60	66	66	72	72

Notes – See Page 5

Table F12 - Soil Class 4

		Braced Minimum Foundation Depths (in)		Wind Speed (mph)										
Exposure Category	Pier Diameter (in)	Slope (deg)		90	95	100	105	110	120	130	140	150	160	170
D	12	0	36	36	36	36	36	36	36	42	42	48	48	
			36	36	36	36	36	36	36	42	42	48	48	
			36	36	36	42	42	42	48	48	54	54	60	
			42	42	42	42	48	48	54	60	60	66	66	
			48	48	54	54	54	54	60	60	66	72	72	
			54	54	60	60	60	66	66	66	72	72	78	
			60	66	66	66	66	72	72	78	78	84	84	
			66	66	72	72	72	78	78	84	84	90	90	
			72	72	72	78	78	84	84	90	90	96	96	
	16	5	78	78	78	84	84	90	90	96	96	*	*	
			36	36	36	36	36	36	36	36	36	36	36	
			36	36	36	36	36	36	36	36	36	36	36	
			36	36	36	36	36	36	36	36	42	42	48	
			36	36	36	42	42	42	42	48	48	48	54	
			42	42	48	48	48	48	48	54	54	54	60	
			48	48	54	54	54	54	60	60	60	66	66	
	20	10	54	54	54	60	60	60	66	66	72	72	72	
			36	36	36	36	36	36	36	36	36	36	36	
			36	36	36	36	36	36	36	36	36	36	36	
			36	36	36	36	36	36	42	42	42	42	42	
			36	42	42	42	42	42	48	48	48	48	54	
			42	42	48	48	48	48	54	54	54	60	60	
			48	48	54	54	54	54	60	60	60	66	66	
	24	15	54	54	54	54	60	60	60	66	66	66	66	
			36	36	36	36	36	36	36	42	42	42	42	
			36	42	42	42	42	42	48	48	48	48	54	
			42	42	48	48	48	48	54	54	54	60	60	
			48	48	54	54	54	54	60	60	60	66	66	
			54	54	54	54	60	60	60	66	66	66	72	
			60	60	66	66	66	72	72	72	72	72	78	

Notes – See Page 5

4

3

2

1

TAMARACK SOLAR PRODUCTS

GROUND MOUNT SOLAR MOUNTING SYSTEM

SHOWING TYPICAL PIPE BASED GROUND MOUNT STRUCTURE CONFIGURATION

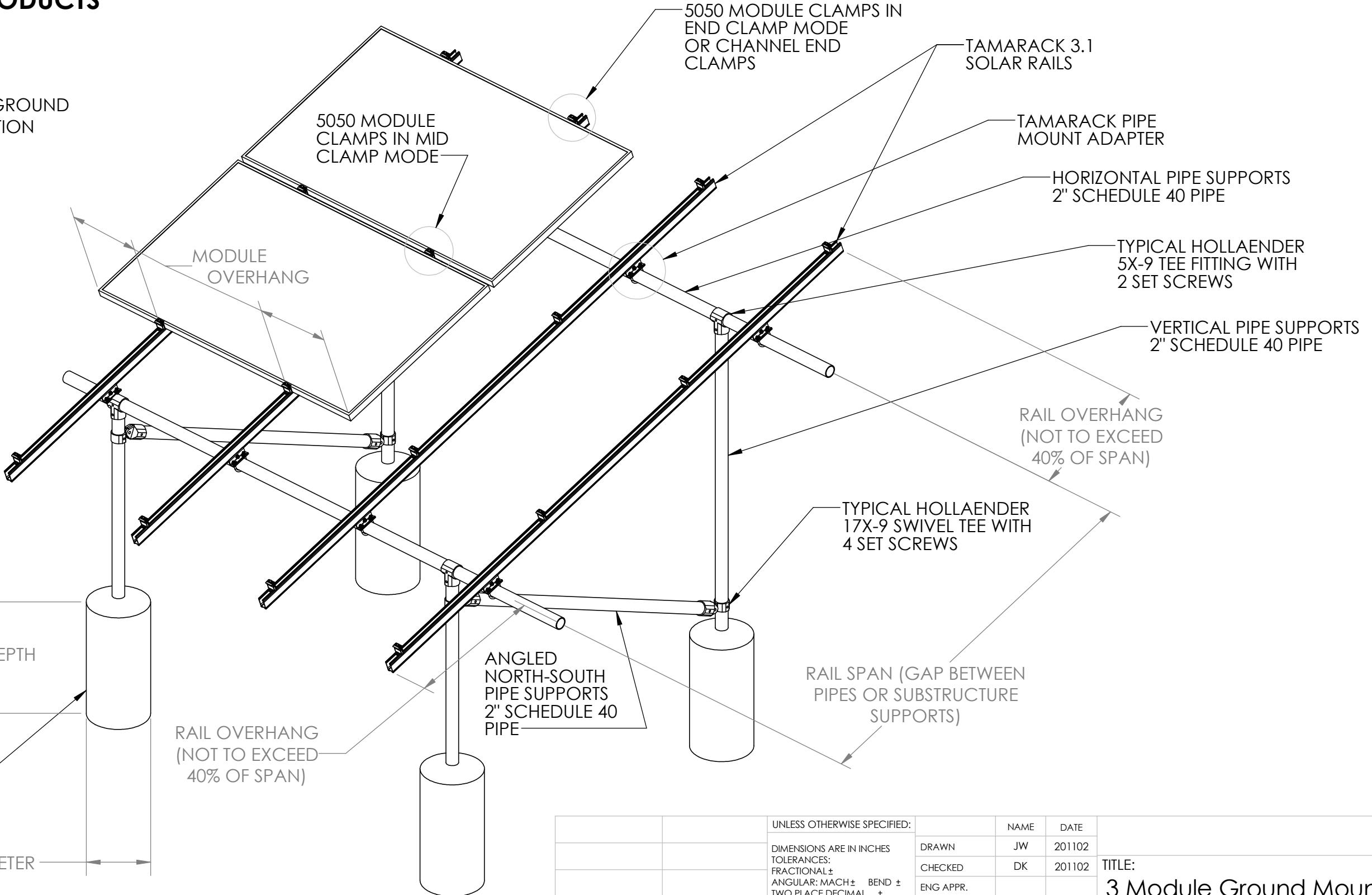
TORQUE ALL FASTENERS TO 12 FT-LBS

TORQUE ALL HOLLANDER SET SCREWS TO HOLLANDER SPECIFICATIONS

PIER DEPTH

TYPICAL CONCRETE PIER FOUNDATION

PIER DIAMETER



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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE	TITLE: 3 Module Ground Mount System 3.1 Rail
		DIMENSIONS ARE IN INCHES			
		TOLERANCES:			
		FRACTIONAL ±			
		ANGULAR: MACH ±	BEND ±		
		TWO PLACE DECIMAL ±			
		THREE PLACE DECIMAL ±			
		INTERPRET GEOMETRIC TOLERANCING PER:			
		MATERIAL			
NEXT ASSY	USED ON	FINISH			
		APPLICATION	DO NOT SCALE DRAWING		
SIZE	DWG. NO.				REV
B	GM-3M3R				B
SCALE: DNS	WEIGHT:				SHEET 1 OF 4

4

3

2

1

TAMARACK SOLAR PRODUCTS

GROUND MOUNT SOLAR MOUNTING SYSTEM

SHOWING 3.1" SYSTEM RAILS, SPLICES
MOUNTS, AND 5050 MODULE CLAMPS
(WORK IN MID OR END CONDITION).

CHANNEL END CLAMPS ARE NOT COMPATIBLE
WITH THE 3.1 RAIL

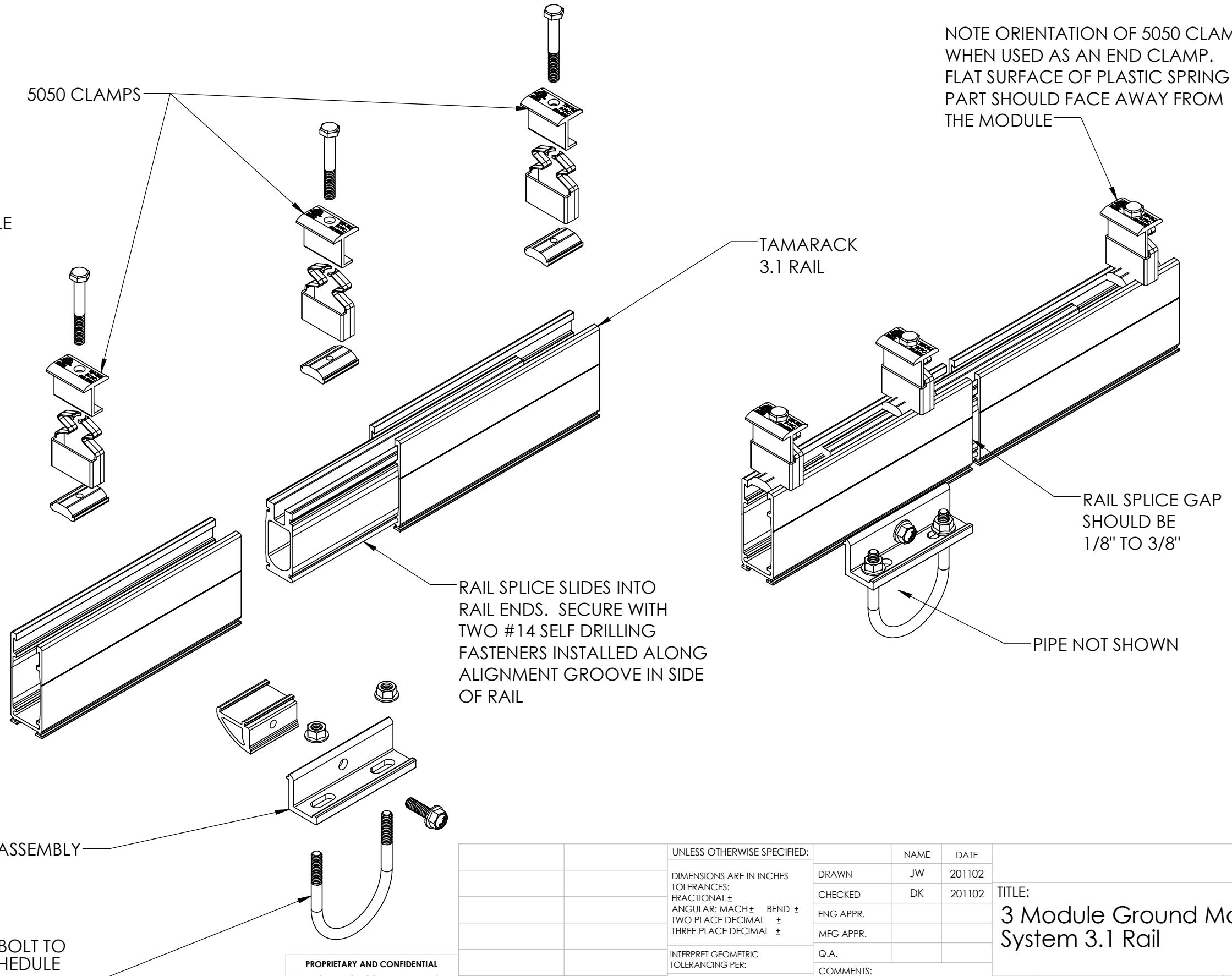
SHOWN WITH PIPE MOUNT, WHICH CLAMPS
THE RAILS TO STANDARD 2" SCHEDULE 40 PIPE
(PIPE NOT SHOWN IN RENDERINGS)

TORQUE ALL FASTENERS TO 12 FT-LBS

PIPE MOUNT ASSEMBLY

5/16" U BOLT TO
FIT 2" SCHEDULE
40 PIPE

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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE	TITLE: 3 Module Ground Mount System 3.1 Rail
DRAWN	JW	201102			
CHECKED	DK	201102			
ENG APPR.					
MFG APPR.					
Q.A.					
COMMENTS:					
SIZE	DWG. NO.			REV	
B	GM-3M3R			B	
SCALE: DNS	WEIGHT:			SHEET 2 OF 4	

TAMARACK SOLAR PRODUCTS

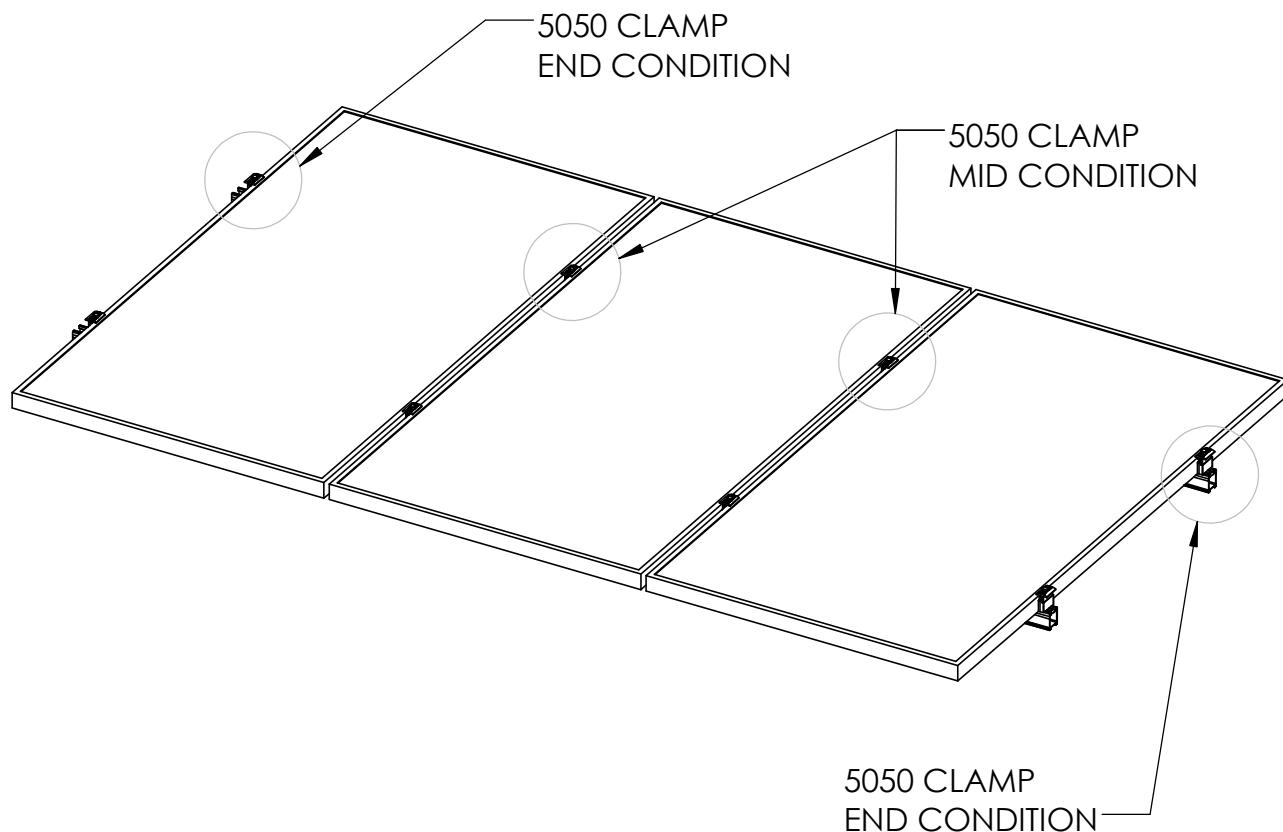
GROUND MOUNT
SOLAR MOUNTING SYSTEM

MODULE CLAMP DETAILS

5050 CLAMPS CAN BE INSTALLED IN EITHER MID OR END CLAMP CONDITIONS AS SHOWN. HALF INCH MODULE GAP. IN END CONDITION OPEN SIDE OF PLASTIC SPRING SHOULD FACE IN TO THE MODULE AS SHOWN

CHANNEL END CLAMPS ARE NOT COMPATIBLE WITH 3.1 RAIL

TORQUE ALL FASTENERS TO 12 FT-LBS

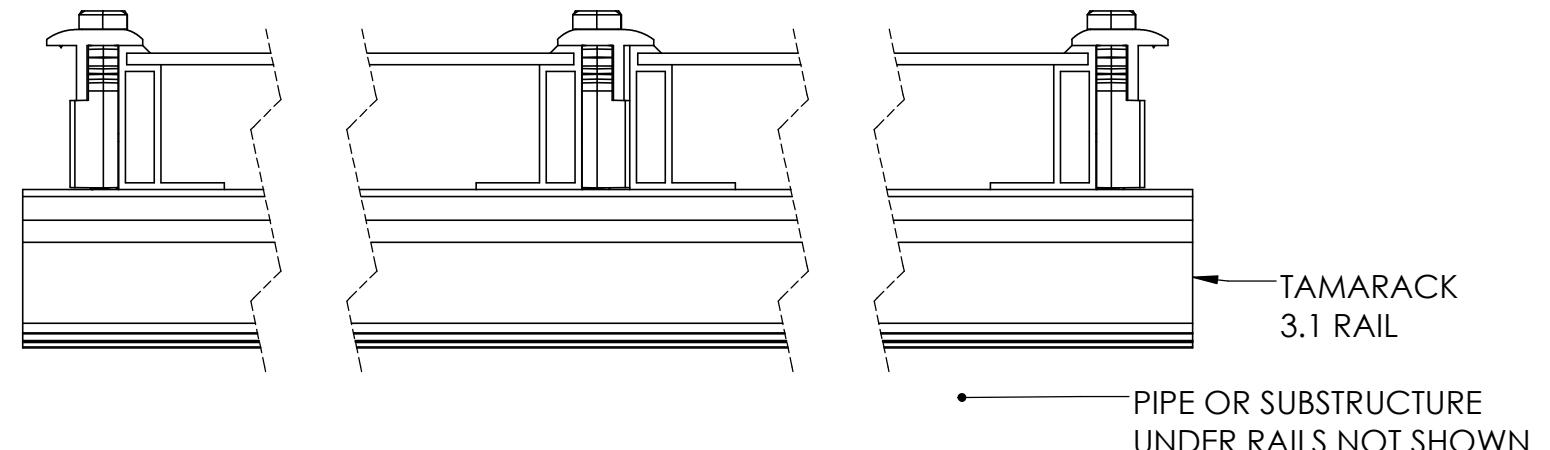
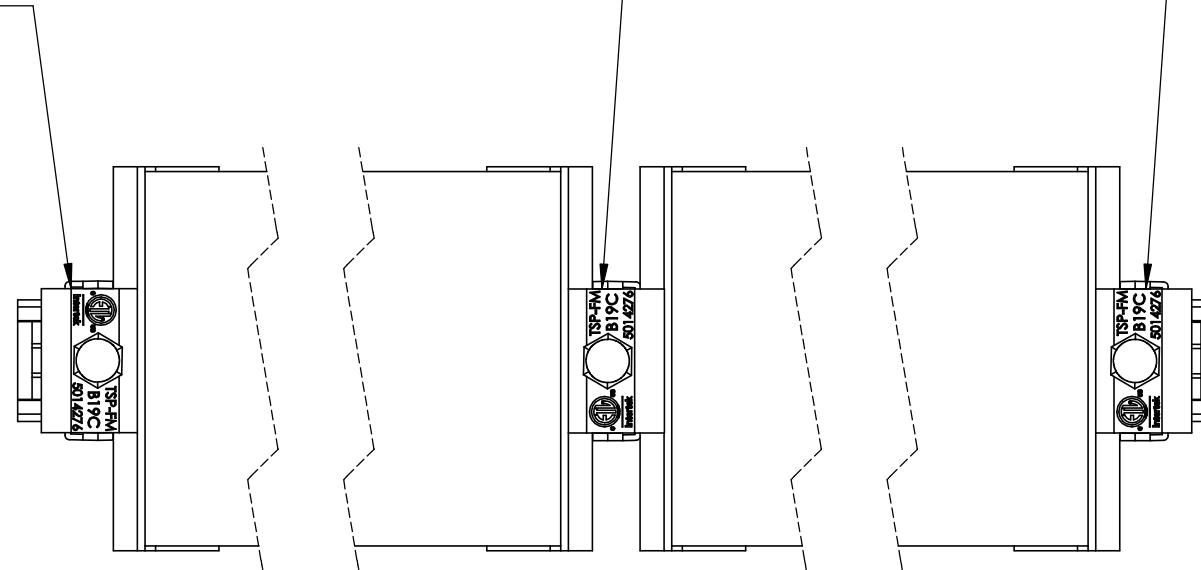


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5050 CLAMP END CONDITION. PRESS CLAMP TIGHT TO MODULE WHEN TIGHTENING.
ORIENT AS SHOWN

5050 CLAMP MID CONDITION. PRESS CLAMP TIGHT BETWEEN MODULES WHEN TIGHTENING. CAN BE ORIENTED EITHER WAY

5050 CLAMP END CONDITION. PRESS CLAMP TIGHT TO MODULE WHEN TIGHTENING.
ORIENT AS SHOWN



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TITLE: 3 Module Ground Mount System 3.1 Rail	
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±					
		INTERPRET GEOMETRIC TOLERANCING PER:		ENG APPR.	MFG APPR.		
		MATERIAL					
NEXT ASSY		FINISH		Q.A.	COMMENTS:		
USED ON		APPLICATION					
		DO NOT SCALE DRAWING		DWG. NO.	REV		
4	3	2	1	B	B		
SCALE: DNS		WEIGHT:		SHEET 3 OF 4			

TAMARACK SOLAR PRODUCTS

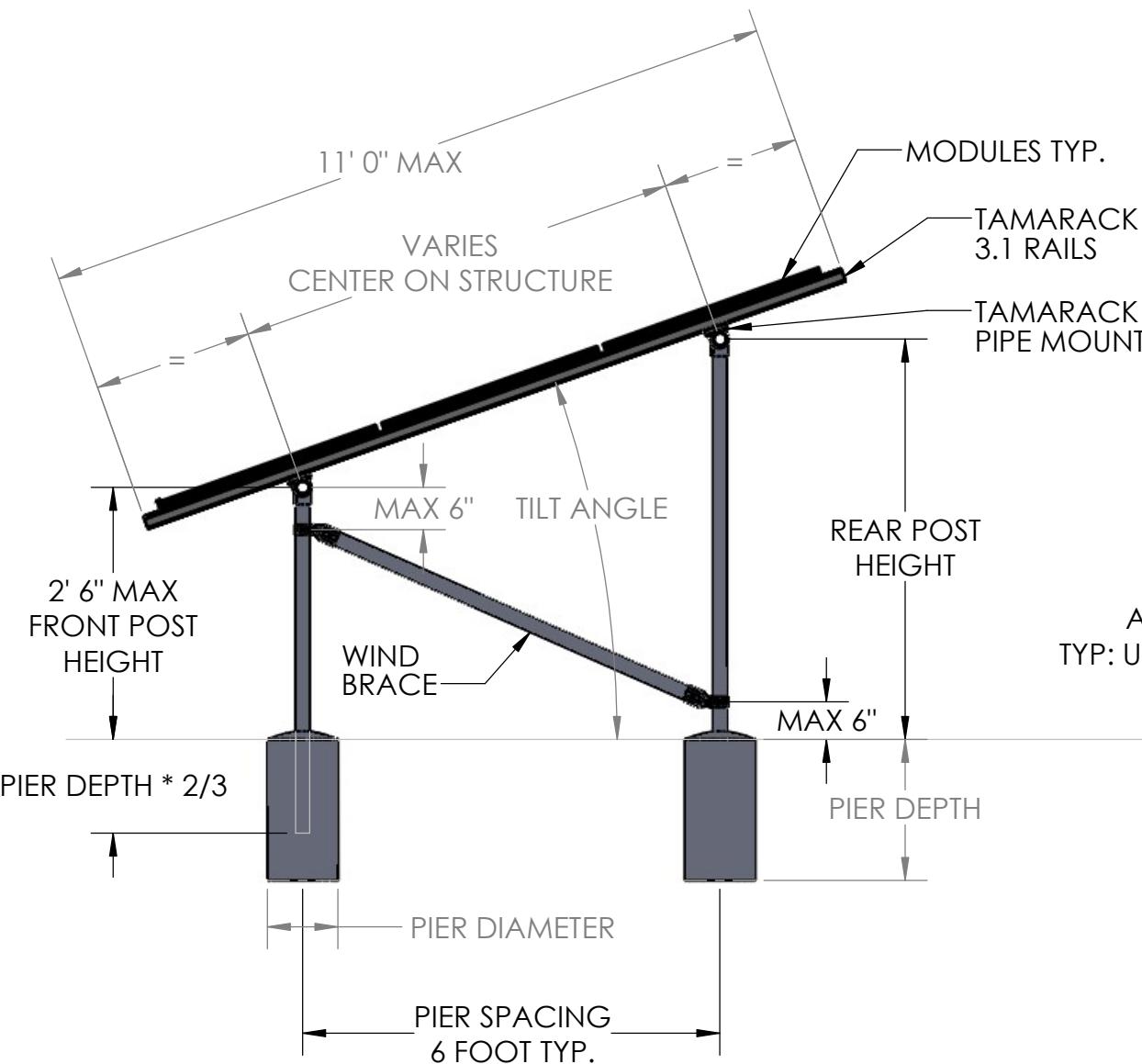
GROUND MOUNT

2 OR 3 RAILS PER COLUMN

SOLAR MOUNTING SYSTEM

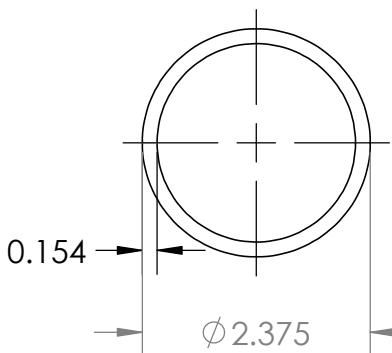
TYPICAL CONFIGURATION OF ARRAY WITH
3 MODULE COLUMNS, 2 RAILS PER COLUMN

REFER TO STRUCTURAL ENGINEERING TABLES
FOR PIER AND SPAN VALUES BASED ON LOCAL
DESIGN VALUES.



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		UNLESS OTHERWISE SPECIFIED:	NAME	DATE	TITLE: 3 Module Ground Mount System 3.1 Rail
DRAWN	JW	DIMENSIONS ARE IN INCHES		201102	
CHECKED	DK	TOLERANCES: FRACTIONAL \pm			
ENG APPR.		ANGULAR: MACH \pm			
MFG APPR.		BEND \pm			
		TWO PLACE DECIMAL \pm			
		THREE PLACE DECIMAL \pm			
INTERP. GEOMETRIC TOLERANCING PER:					
Q.A.					
COMMENTS:					
SIZE	DWG. NO.		REV		
B	GM-3M3R		B		
SCALE: DNS	WEIGHT:				SHEET 4 OF 4



APPROVED 2" PIPE
SPECIFICATIONS:

ASTM A53 GR B
35 KSI MINIMUM YIELD STRENGTH
HOT DIPPED GALVANIZED

OUTSIDE DIAMETER: 2.375"
WALL THICKNESS: 0.154"

