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STRUCTURAL CALCULATIONS, NOTES, & SPECIFICATIONS

PREPARED FOR:

PROJECT TYPE:

K2 Systems Ground Mount - South Carolina

DESIGNER:

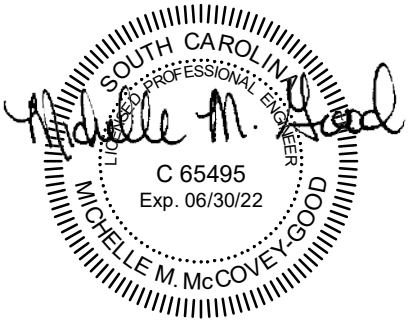
K2 Systems LLC
2835 La Mirada Dr Suite A
Vista, CA 92081

PROJECT ENGINEER:

Pedro Asuncion-Velasco

PROJECT MANAGER:

Joel. J. Neal, P.E., LEED AP



PRINCIPAL
Date Signed: 04.06.2021

T&S Job No.: 20497
February 26, 2021

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Job No.: *20497*
Job Name: *SC Ground Mount - Everest*

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Summary Letter

Date: February 26, 2021

To: Ryan Estrada
Product Development Engineer
K2 Systems LLC

From: Pedro Asuncion-Velasco
Taylor & Syfan Consulting Engineers, Inc.

Project: Everest Ground Mount System – South Carolina

T&S Job No.: 20497

Subject: Summary Letter for Everest Ground Mount System

INTRODUCTION

This Project Summary Letter is in reference to the Structural Calculation Packet for the Everest Ground Mount System, dated February 26, 2021. The calculations have been performed in accordance with the 2018 *International Building Code* (IBC). The 2018 IBC references the 2016 *Minimum Design Loads for Buildings and Other Structures*, by the American Society of Civil Engineers (ASCE), referred to as ASCE 7-16. The system has been designed to withstand code-prescribed forces due to the self-weight of the racking system, weight of the solar panels, snow loads, wind loads, and seismic loads.

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SUMMARY CHARTS & LOADS

The attached pages of this summary contain charts relating the solar array's overall size and tilt angle with varying wind speeds and snow loads. Along with the Structural Notes & Specifications, these charts may be used as a quick reference for looking up maximum allowed span conditions on the array location and site conditions; however, varying site and loading conditions must be determined by a registered professional engineer who can evaluate the exact topographic conditions for the specific site and exact loading conditions for that array prior to construction. Array span charts are only valid for the various site-specific conditions noted for which they were designed.

SITE-SPECIFIC ANALYSIS

Each racking configuration summarized and labeled within the following chart has been analyzed. Because there are many different possible configurations, a common case has been provided in this report as an example calculation. A registered, professional engineer is required to verify the site conditions and local code requirements to ensure the values listed herein are applicable to the site and unique project before construction. Taylor & Syfan may provide these services upon request.

Note that further analysis may be required if the location of the solar panel installation or configuration corresponds to any of the following criteria (but not limited to):

- The pitch of the solar panels (solar panel pitch) exceeds 35 degrees above the horizontal.
- A topographic factor applies to the location. Topographic factors apply, for general purposes, when the structure is on the upper one-half of a hill, or escarpment (mesa or bluff). For complete descriptions of topographic factors, please refer to ASCE 7-16 Section 26.8.2.

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- The site specific ground snow load is greater than 50 psf.
- The site specific design wind speed is greater than 140 mph (3 second gust speed). Note that ASCE 7-16 uses a Mean Recurrence Interval (MRI) of 300 years and this design wind speed should not be compared to those provided in previous versions of ASCE 7.
- Soil conditions other than those described in the Structural Specifications.
- Adjacent to a body of water or other flat surface (such as salt flats) that exceeds 5,000 ft. (Exposure "D" per ASCE 7-16 26.7.2)
- A combination of loads and/or site conditions applies that is not addressed in the attached span and foundation charts.
- Risk Category II, III or IV.
- Seismic Design Category "F."

If one or more of these factors applies to the project location, please contact Taylor & Syfan, and we will be able to analyze the site conditions and recommend a custom engineered configuration for each specific site. A registered professional engineer must address site-specific features and factors, for wind speeds greater than 140 mph (3 sec. gust), for sites is in a wind borne debris region (as defined by ASCE 7-16 Section 26.12.3.1) or Special Wind Region (per ASCE 7-16 Figure 26.5-1A). These charts are for estimation purposes only. Sites with topographic factors shall have a licensed engineer calculate the exact design factors prior to construction. (Taylor & Syfan may be retained for this evaluation; however, they or another registered structural engineer should evaluate the site.)

The Risk Category was assigned as Category I based on the following assumed conditions:

- The open nature of the ground mount construction and confined (fenced-in) nature of the site qualify the installation as 'uninhabitable' and therefore, the

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installation "represents a low hazard to human life in event of failure." (IBC Table 1604.5)

- Failure of the ground mount would not represent a loss of functionality to any receiving facilities or disrupt daily civilian life, in addition to the lower chance of complete structural failure due to the redundant nature of the array.
- The Client is willing to accept the risk accompanying a lower wind speed, which represents a lower Mean Recurrence Interval (MRI) than a higher Risk Category assignment (700 yr. MRI, etc.).

The seismic forces used in these calculation charts are based on values for Seismic Design Category "E" and assume Site Class D. These values incorporate the full range of short period spectral accelerations present in Virginia as outlined in the IBC Figure 1613.2.1.

The ground snow load in these calculations assumes a value of 50 psf or less. Where ground snow loads exceed this value, a registered professional engineer shall evaluate the site specific ground snow loads and design prior to construction.

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Summary Letter

REFERENCES AND LIMITATIONS

Please note that all sizes, material specifications, and weights of the racking components have been provided by Everest and are assumed to be accurate and correct. Installation must be in accordance with Everest's drawings and specifications. Everest shall notify Taylor & Syfan regarding any inaccuracies or changes in the materials, specifications, or details.

All waterproofing, ice effects, corrosion protection, module (panel) connections, modules, electrical components, flood effects, egress and access pathways, fire protection, setbacks, drainage issues, and all non-structural issues are the responsibility of Everest's customer, known as the contractor, professional solar installer, or owner. This summary letter discusses the structural adequacy of the solar racking system itself only and does not investigate or validate the adequacy of the panels or panel attachments. It is also the responsibility of Everest's customer to verify the site specific design forces (wind speed, topography, ground snow load, etc.) before using the charts contained in this document. Construction of any and all structures is under the jurisdiction of the local building official and building enforcement agency, which shall review and approve all projects prior to commencement of construction.

Please feel free to contact us with any questions or concerns. Thank you.

Sincerely,
Taylor & Syfan Consulting Engineers, Inc.

Pedro Asuncion-Velasco
Project Engineer

Project: **20497 – SC Ground Mount – Everest**

INSTALLATION DIMENSIONS

G	Wind Speed	Snow	Tie-Brace	Pipe Data		A*	A1**	*Concrete Depth (A)*		*Concrete Depth (A1)*	
TILT ANGLE	ASCE 7-16 (mph)	Ground Snow Load	Required?	Pipe Size	Pipe Specification	Post Spacing	Post Spacing w/ V-Brace	*Front*	*Back*	*Front*	*Back*
20°	105	5 psf	Yes	1.5”	Sch. 40	7'-3”	12'-6”	2'-0”	4'-0”	3'-0”	5'-0”
			Yes		Sch. 80	7'-9”	13'-0”	2'-0”	4'-0”	3'-0”	5'-0”
			Yes	2”	Sch. 40	9'-0”	14'-6”	2'-0”	4'-3”	3'-0”	5'-3”
			Yes		Sch. 80	10'-0”	15'-0”	2'-3”	4'-6”	3'-0”	5'-3”
20°	105	15 psf	Yes	1.5”	Sch. 40	6'-6”	11'-6”	2'-0”	4'-0”	3'-0”	5'-0”
			Yes		Sch. 80	7'-0”	12'-0”	2'-0”	4'-0”	3'-0”	5'-0”
			Yes	2”	Sch. 40	8'-3”	13'-6”	2'-0”	4'-0”	3'-0”	5'-0”
			Yes		Sch. 80	9'-0”	15'-0”	2'-3”	4'-6”	3'-3”	5'-3”
30° - 35°	105	15 psf	Yes	1.5”	Sch. 40	6'-0”	9'-6”	2'-0”	4'-6”	3'-0”	6'-0”
			Yes		Sch. 80	7'-6”	11'-0”	2'-6”	5'-3”	3'-0”	6'-0”
			Yes	2”	Sch. 40	8'-0”	12'-6”	2'-6”	5'-3”	3'-0”	7'-0”
			Yes		Sch. 80	9'-6”	14'-6”	2'-6”	6'-0”	3'-0”	7'-0”
20°	115	10 psf	Yes	1.5”	Sch. 40	6'-5”	11'-0”	2'-0”	4'-0”	3'-0”	5’-0”
			Yes		Sch. 80	7'-0”	12'-0”	2'-0”	4'-0”	3'-0”	5’-6”
			Yes	2”	Sch. 40	8'-0”	13'-6”	2'-3”	4'-6”	3'-0”	5’-6”
			Yes		Sch. 80	9'-6”	14'-6”	2'-6”	5'-0”	3'-3”	6’-0”
30° - 35°	115	10 psf	Yes	1.5”	Sch. 40	6'-0”	8'-0”	2'-3”	5'-0”	3'-0”	6’-0”
			Yes		Sch. 80	6'-6”	10'-6”	2'-6”	5'-0”	3'-0”	7’-0”
			Yes	2”	Sch. 40	7'-6”	11'-6”	2'-6”	5'-6”	3'-0”	7’-0”
			Yes		Sch. 80	9'-0”	13'-0”	3'-0”	6'-0”	3'-3”	7’-3”
20°	130	10 psf	Yes	1.5”	Sch. 40	6'-0”	11'-0”	2'-0”	4'-3”	3'-0”	6’-0”
			Yes		Sch. 80	6'-6”	11'-6”	2'-3”	4'-6”	3'-0”	6’-0”
			Yes	2”	Sch. 40	7'-0”	12'-6”	2'-3”	5'-0”	3'-0”	6’-0”
			Yes		Sch. 80	8'-0”	14'-0”	2'-6”	5'-0”	3'-6”	6’-6”
30° - 35°	130	10 psf	Yes	1.5”	Sch. 40	5'-0”	7'-0”	2'-3”	5'-0”	3'-0”	6’-6”
			Yes		Sch. 80	5'-6”	8'-6”	2'-6”	5'-6”	3'-0”	7’-0”
			Yes	2”	Sch. 40	7'-0”	10'-6”	3'-0”	6'-0”	3'-6”	7’-6”
			Yes		Sch. 80	8'-0”	12'-6”	3'-0”	6'-3”	3'-6”	8’-0”
20°	140	10 psf	Yes	1.5”	Sch. 40	5'-6”	9'-6”	2'-3”	4'-6”	3'-0”	6’-0”
			Yes		Sch. 80	6'-6”	11'-0”	2'-6”	5'-0”	3'-3”	6’-3”
			Yes	2”	Sch. 40	7'-0”	12'-0”	2'-6”	5'-0”	3'-3”	6’-6”
			Yes		Sch. 80	8'-0”	13'-6”	3'-0”	5'-6”	3'-6”	7’-0”
30° - 35°	140	10 psf	Yes	1.5”	Sch. 40	5'-0”	6'-6”	2'-6”	5'-6”	3'-0”	6’-6”
			Yes		Sch. 80	5'-6”	7'-6”	3'-0”	6'-0”	3'-3”	7’-0”
			Yes	2”	Sch. 40	6'-0”	9'-0”	3'-0”	6'-0”	3'-6”	7’-6”
			Yes		Sch. 80	7'-6”	11'-0”	3'-0”	7'-0”	3'-6”	8’-0”

NOTES:

* Spacing “A” Indicates East-West Spacing for Arrays without V-Braces

** Spacing “A1” Indicates East-West Spacing for Arrays with V-Braces

***Increased Span Assumes Modified Bracing Support and ¼” TekScrews with Hollaendar Fittings. Construction Drawings and Attachment Details are per Everest.

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STRUCTURAL SPECIFICATIONS

GENERAL

1. Do not scale drawings. Contractor shall use dimensions on plans to lay out array, foundations and other elements. If dimensional questions occur, Everest Solar Systems (Everest) must be consulted.

2. All construction and materials shall comply and be installed in accordance with all the requirements of all legally constituted public authorities having jurisdiction, including all county, government, and local ordinances, and the Safety Orders of the State Industrial Accident Commission, OSHA.

3. The Contractor shall be responsible for shoring and providing bracing during construction and/or erection to support all loads to which the structure may be subjected.

4. The Engineer will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the construction delineated by these plans. It should be understood that the contractor or his/her agent(s) shall supervise and direct all work and shall be solely and completely responsible for all construction means, methods, techniques, sequences, procedures, and conditions on the job site, including safety of all persons and property during the entire period of construction. Periodic observations by Taylor & Syfan Consulting Engineers Incorporated (or "Taylor & Syfan" typ.) personnel or representatives are not intended to include verification of dimensions or review the adequacy of the contractors safety measures on or near the construction site.

5. No deviations are allowed from the structural details, specifications, or notes without the written approval of the Engineer. Approval by Building Enforcement Agency, Inspector, Special Inspector, or any other party does not constitute authority to deviate from plans or specifications. All plan changes or addenda are subject to approval of the Building Enforcement Agency. Prior to construction, the Building Official shall review and approve the structural specifications, calculations, details, notes and design methodology contained herein. The processing of changes, assembly of permit documents, and acquisition of permits is the responsibility of the Contractor.

6. Special Inspectors shall obtain Building Enforcement Agency clearance prior to any work commencement. Copies of the inspection report(s) to be filed by the special inspector(s) shall be given to the Engineer. The Contractor is responsible for scheduling, coordination, and expenses involved in any and all inspections.

7. Taylor & Syfan's drawings are prepared to convey only the specific structural aspects of each detail. Additionally, impact loads or other effects from flying debris are not included. Non-structural information, including but not limited to fenestrations, fire-resistance, corrosion protection, foundations, insulation, finishes, panels, panel attachments, waterproofing, ice effects, drainage and flashing may not be included on the structural plans. Taylor & Syfan is not responsible for non-structural information. The Contractor shall obtain all non-structural information from Everest and Others.

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STRUCTURAL SPECIFICATIONS

8. The Building Inspector shall inspect and approve all construction for conformance to the construction documents and building code. Additionally, structural observation by Taylor & Syfan or another structural engineer is recommended to verify general conformance.

9. All construction projects require inspection and maintenance following completion. Operation, inspection, and maintenance are the sole responsibility of the Owner. The Engineer shall have no responsibility for any failures due to deviance from or neglect of the proper installation procedures, or for any failures by the Owner of Others to properly operate, inspect, or maintain the project. Ensure, and notify the Owner, that workers, equipment, storage, and other loading are not to be applied on the PV modules or racking throughout the life of the structure. Also, vegetation and debris shall be kept down to prevent snow build-up from affecting the system. In the event that the array or a portion thereof is displaced, due to seismic shaking, wind loads, or other reasons, the Owner shall re-position the array into its original design location.

10. Crossrail 80 PV Mounting Rail, Universal Pipe L-Brackets, Hollaender brace fittings, tie-braces, V-braces, pipe couplers, T-fittings, T-bolts, hex flange nuts, U-bolts, H-nuts, set screws, mid-clamps, end-clamps, modules, splice connectors, and module clamps are per Everest.

11.

MATERIAL REQUIREMENTS

1. Taylor & Syfan must be notified if the equipment or existing conditions are found to differ from what has been referenced or assumed in Everest's plans or the “Structural Calculations, Notes, & Specifications” in drawings dated 02/26/2021.

2. Cold-formed metal, other steel, and hardware exposed to weather, soil, or moisture shall be hot-dip galvanized, stainless steel, or have other corrosion protection appropriate for the installed environment specified by Everest. Finishing requirements for exposed steel and hardware are by others. Combining the aluminum connection hardware with the stainless steel hardware in a moist environment may promote corrosion between the two materials. Protection/isolation of differing metals is by others.

3. Pipe sections shall conform to ASTM A53 Grades B, Type E or S. “Sch. 40” indicates Standard Weight and “Sch. 80” indicates Extra Strong.

4. Embedment into soil is contingent upon the following: soil shall be firm, well graded, free of deleterious materials, non-expansive, not subject to erosion, free from foreign bodies and anything that hinders interaction between the pile and the soil surface. Where existing conditions do not match preceding qualifications, pile must be deepened such that embedment starts at competent soil.

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STRUCTURAL SPECIFICATIONS

CONCRETE & ANCHORAGE REQUIREMENTS

1. Soils values are per Table 1806.2 of the 2018 International Building Code (IBC) for Soil Type 4 (SW, SP, SM, SC, GM, & GC) minimum.

2. Concrete shall have a strength of 2500 psi at 28 days, a maximum slump of 5”, a maximum W/C ratio of 0.45, and 6% +/- 1.5% air entrainment except where required by code, or specified by the local authority having jurisdiction. In an area requiring special freeze/thaw protection, concrete shall have a strength of 4500 psi at 28 days, a maximum slump of 5”, a maximum W/C ratio of 0.45, and 6% +/- 1.5% air entrainment. A registered professional engineer shall determine the Concrete Exposure Classes for the site and adjust the concrete mix specification as required. Special Inspection is not required, except where specified herein, on the plans, or by the Building Department.

3. Reinforcing steel shall be to ASTM A615, deformed, clean, and free of rust. Bars shall be 60 grade minimum (unless specified otherwise).

4. Aggregates shall be per ASTM C33. Maximum size 1½” for footings and 1" for all other work. Reduce maximum aggregate size as required to conform to ACI 318 Section 3.3.2. Coarse aggregate shall be crushed rock.

5. Reinforcing clearances for foundations shall be 3” min. when against earth and 2” min. when against a formed surface UNO. Other reinforcing clearances shall be 1 1/2” minimum UNO.

6. Removal of forms (formwork) supporting vertical surfaces shall be after 2 days min. and supporting beams or girders shall be after 15 days minimum.

7. Prevent surface and ground water from entering excavated shafts. Dewater excavated shafts before concreting. Conduct water to site drainage facilities. “Tremie Method” may be used, per Geotechnical recommendations. Place concrete in a dry shaft, unless placement underwater or by slurry displacement is approved by Engineer.

8. Excavate shafts for drilled foundation elements to indicated elevations. Excavate bottom of drilled shaft to level plane and remove loose material from bottom of excavation. Do not excavate shafts deeper than elevations indicated, unless approved by Engineer.

9. Excavate shafts for closely spaced drilled foundations and those occurring in fragile or sand strata, only after adjacent drilled foundations are filled with concrete and allowed to set. Contact Engineer if temporary casings are required.

10. Back-filling soil around piles is not allowed without prior approval & direction of soils engineer.

11. Screed concrete at cutoff elevation level. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.

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STRUCTURAL SPECIFICATIONS

12. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by excavations.

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2019 CBC Solar Panel Wind Analysis - Version 1.1

Project: **20497 – SC Ground Mount – Everest**

Basic Wind Speed (V): ***105*** mph

Design Assumptions:
Surface Roughness Category: C (See ASCE 26.7.2)
No Topographic Effect (See ASCE 26.8.2)
Wind Forces Calculated by Main Wind Force-Resisting System for Open Structures (See ASCE 27.3.2)
Net Pressure Coefficient, C_N, from ASCE Figure 27.3-4 for Monoslope Free Roofs with a 45 Degree Max. Slope
15 ft Max. Height of Solar Panel Structure
Analysis for Ground Mount Panels Only

Velocity Pressure (q)

V (mph)	Kd	Ke	--	Kz	Kzt	q (psf)
105	**0.85**	**1.00**	**1.00**	**0.85**	**1.00**	**20.39**

Panel Data

Joist Wind Trib	
2.75	**ft**

Design Pressure (p)

Panel Angle	Load Case	Wind Direction	G	C_{NW}	C_{NL}	p_W (psf)	p_L (psf)	w_W (plf)	w_L (plf)
15°	*A*	*0°*	*0.85*	*-1.1*	*-1.5*	*-19.1*	*-26.0*	*-52.4*	*-71.5*
15°	*B*	*0°*	*0.85*	*-1.9*	*0.0*	*-32.9*	*0.0*	*-90.6*	*0.0*
15°	*A*	*180°*	*0.85*	*1.3*	*1.6*	*22.5*	*27.7*	*62.0*	*76.3*
15°	*B*	*180°*	*0.85*	*1.2*	*-0.3*	*20.8*	*-5.2*	*57.2*	*-14.3*
20°	**A**	**0°**	**0.85**	**-1.3**	**-1.6**	**-23.1**	**-27.7**	**-63.6**	**-76.3**
20°	**B**	**0°**	**0.85**	**-2.1**	**-0.2**	**-36.4**	**-2.9**	**-100.1**	**-7.9**
20°	**A**	**180°**	**0.85**	**1.6**	**1.8**	**27.2**	**30.6**	**74.7**	**84.2**
20°	**B**	**180°**	**0.85**	**1.7**	**0.1**	**28.9**	**2.3**	**79.4**	**6.4**
30°	**A**	**0°**	**0.85**	**-1.8**	**-1.8**	**-31.2**	**-31.2**	**-85.8**	**-85.8**
30°	**B**	**0°**	**0.85**	**-2.5**	**-0.5**	**-43.3**	**-8.7**	**-119.2**	**-23.8**
30°	**A**	**180°**	**0.85**	**2.1**	**2.1**	**36.4**	**36.4**	**100.1**	**100.1**
30°	**B**	**180°**	**0.85**	**2.6**	**1.0**	**45.1**	**17.3**	**123.9**	**47.7**

*Note: C_{NW} and C_{NL} are Worst Case for Either **Clear OR Obstructed** Wind Flow*

Note: Values in grey were used for interpolation of the 20-degree wind pressure values.

Symbols and Notation
V = Basic Wind Speed (mph) per ASCE (see Figure 26.5-1A)
Kd = Wind Directionality Factor (per ASCE Table 26.6-1)
Ke = Ground Elevation Factor (per ASCE Section 26.9)
Kz = Velocity pressure exposure coefficient evaluated at height z (per ASCE Section 27.3.1)
Kzt = Topographic factor as defined in ASCE Section 26.8
q = velocity pressure in (psf) (q = 0.00256*Kz*Kzt*Kd*V^2 per ASCE 27.3.2)
p_W = Windward Design Pressure (psf) (p = q*G*C_N per ACSC 27.4-3)
p_L = Leeward Design Pressure (psf) (p = q*G*C_N per ACSC 27.4-3)
G = Guest effect factor
C_{NW} = Windward Net Pressure Coefficient for open buildings (See Figure 27.4-4)
C_{NL} = Leeward Net Pressure Coefficient for open buildings (See Figure 27.4-4)

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2019 CBC Solar Panel Wind Analysis - Version 1.1

Project: **20497 – SC Ground Mount – Everest**

Basic Wind Speed (V): ***115*** mph

Design Assumptions:
Surface Roughness Category: C (See ASCE 26.7.2)
No Topographic Effect (See ASCE 26.8.2)
Wind Forces Calculated by Main Wind Force-Resisting System for Open Structures (See ASCE 27.3.2)
Net Pressure Coefficient, C_N, from ASCE Figure 27.3-4 for Monoslope Free Roofs with a 45 Degree Max. Slope
15 ft Max. Height of Solar Panel Structure
Analysis for Ground Mount Panels Only

Velocity Pressure (q)

V (mph)	Kd	Ke	--	Kz	Kzt	q (psf)
115	**0.85**	**1.00**	**1.00**	**0.85**	**1.00**	**24.46**

Panel Data

Joist Wind Trib	
2.75	**ft**

Design Pressure (p)

Panel Angle	Load Case	Wind Direction	G	C_{NW}	C_{NL}	p_W (psf)	p_L (psf)	w_W (plf)	w_L (plf)
15°	*A*	*0°*	*0.85*	*-1.1*	*-1.5*	*-22.9*	*-31.2*	*-62.9*	*-85.8*
15°	*B*	*0°*	*0.85*	*-1.9*	*0.0*	*-39.5*	*0.0*	*-108.6*	*0.0*
15°	*A*	*180°*	*0.85*	*1.3*	*1.6*	*27.0*	*33.3*	*74.3*	*91.5*
15°	*B*	*180°*	*0.85*	*1.2*	*-0.3*	*25.0*	*-6.2*	*68.6*	*-17.2*
20°	**A**	**0°**	**0.85**	**-1.3**	**-1.6**	**-27.7**	**-33.3**	**-76.2**	**-91.5**
20°	**B**	**0°**	**0.85**	**-2.1**	**-0.2**	**-43.7**	**-3.5**	**-120.1**	**-9.5**
20°	**A**	**180°**	**0.85**	**1.6**	**1.8**	**32.6**	**36.7**	**89.6**	**101.0**
20°	**B**	**180°**	**0.85**	**1.7**	**0.1**	**34.7**	**2.8**	**95.3**	**7.6**
30°	**A**	**0°**	**0.85**	**-1.8**	**-1.8**	**-37.4**	**-37.4**	**-102.9**	**-102.9**
30°	**B**	**0°**	**0.85**	**-2.5**	**-0.5**	**-52.0**	**-10.4**	**-142.9**	**-28.6**
30°	**A**	**180°**	**0.85**	**2.1**	**2.1**	**43.7**	**43.7**	**120.1**	**120.1**
30°	**B**	**180°**	**0.85**	**2.6**	**1.0**	**54.1**	**20.8**	**148.7**	**57.2**

*Note: C_{NW} and C_{NL} are Worst Case for Either **Clear OR Obstructed** Wind Flow*

Note: Values in grey were used for interpolation of the 20-degree wind pressure values.

Symbols and Notation
V = Basic Wind Speed (mph) per ASCE (see Figure 26.5-1A)
Kd = Wind Directionality Factor (per ASCE Table 26.6-1)
Ke = Ground Elevation Factor (per ASCE Section 26.9)
Kz = Velocity pressure exposure coefficient evaluated at height z (per ASCE Section 27.3.1)
Kzt = Topographic factor as defined in ASCE Section 26.8
q = velocity pressure in (psf) (q = 0.00256*Kz*Kzt*Kd*V^2 per ASCE 27.3.2)
p_W = Windward Design Pressure (psf) (p = q*G*C_N per ACSC 27.4-3)
p_L = Leeward Design Pressure (psf) (p = q*G*C_N per ACSC 27.4-3)
G = Guest effect factor
C_{NW} = Windward Net Pressure Coefficient for open buildings (See Figure 27.4-4)
C_{NL} = Leeward Net Pressure Coefficient for open buildings (See Figure 27.4-4)

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2019 CBC Solar Panel Wind Analysis - Version 1.1

Project: **20497 – SC Ground Mount – Everest**

Basic Wind Speed (V): ***130*** mph

Design Assumptions:
Surface Roughness Category: C (See ASCE 26.7.2)
No Topographic Effect (See ASCE 26.8.2)
Wind Forces Calculated by Main Wind Force-Resisting System for Open Structures (See ASCE 27.3.2)
Net Pressure Coefficient, C_N, from ASCE Figure 27.3-4 for Monoslope Free Roofs with a 45 Degree Max. Slope
15 ft Max. Height of Solar Panel Structure
Analysis for Ground Mount Panels Only

Velocity Pressure (q)

V (mph)	Kd	Ke	--	Kz	Kzt	q (psf)
130	**0.85**	**1.00**	**1.00**	**0.85**	**1.00**	**31.26**

Panel Data

Joist Wind Trib	
2.75	**ft**

Design Pressure (p)

Panel Angle	Load Case	Wind Direction	G	C_{NW}	C_{NL}	p_W (psf)	p_L (psf)	w_W (plf)	w_L (plf)
15°	*A*	*0°*	*0.85*	*-1.1*	*-1.5*	*-29.2*	*-39.9*	*-80.4*	*-109.6*
15°	*B*	*0°*	*0.85*	*-1.9*	*0.0*	*-50.5*	*0.0*	*-138.8*	*0.0*
15°	*A*	*180°*	*0.85*	*1.3*	*1.6*	*34.5*	*42.5*	*95.0*	*116.9*
15°	*B*	*180°*	*0.85*	*1.2*	*-0.3*	*31.9*	*-8.0*	*87.7*	*-21.9*
20°	**A**	**0°**	**0.85**	**-1.3**	**-1.6**	**-35.4**	**-42.5**	**-97.4**	**-116.9**
20°	**B**	**0°**	**0.85**	**-2.1**	**-0.2**	**-55.8**	**-4.4**	**-153.4**	**-12.2**
20°	**A**	**180°**	**0.85**	**1.6**	**1.8**	**41.6**	**46.9**	**114.5**	**129.1**
20°	**B**	**180°**	**0.85**	**1.7**	**0.1**	**44.3**	**3.5**	**121.8**	**9.7**
30°	**A**	**0°**	**0.85**	**-1.8**	**-1.8**	**-47.8**	**-47.8**	**-131.5**	**-131.5**
30°	**B**	**0°**	**0.85**	**-2.5**	**-0.5**	**-66.4**	**-13.3**	**-182.7**	**-36.5**
30°	**A**	**180°**	**0.85**	**2.1**	**2.1**	**55.8**	**55.8**	**153.4**	**153.4**
30°	**B**	**180°**	**0.85**	**2.6**	**1.0**	**69.1**	**26.6**	**190.0**	**73.1**

*Note: C_{NW} and C_{NL} are Worst Case for Either **Clear OR Obstructed** Wind Flow*

Note: Values in grey were used for interpolation of the 20-degree wind pressure values.

Symbols and Notation
V = Basic Wind Speed (mph) per ASCE (see Figure 26.5-1A)
Kd = Wind Directionality Factor (per ASCE Table 26.6-1)
Ke = Ground Elevation Factor (per ASCE Section 26.9)
Kz = Velocity pressure exposure coefficient evaluated at height z (per ASCE Section 27.3.1)
Kzt = Topographic factor as defined in ASCE Section 26.8
q = velocity pressure in (psf) (q = 0.00256*Kz*Kzt*Kd*V^2 per ASCE 27.3.2)
p_W = Windward Design Pressure (psf) (p = q*G*C_N per ACSC 27.4-3)
p_L = Leeward Design Pressure (psf) (p = q*G*C_N per ACSC 27.4-3)
G = Guest effect factor
C_{NW} = Windward Net Pressure Coefficient for open buildings (See Figure 27.4-4)
C_{NL} = Leeward Net Pressure Coefficient for open buildings (See Figure 27.4-4)

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2019 CBC Solar Panel Wind Analysis - Version 1.1

Project: **20497 – SC Ground Mount – Everest**

Basic Wind Speed (V): ***140*** mph

Design Assumptions:
Surface Roughness Category: C (See ASCE 26.7.2)
No Topographic Effect (See ASCE 26.8.2)
Wind Forces Calculated by Main Wind Force-Resisting System for Open Structures (See ASCE 27.3.2)
Net Pressure Coefficient, C_N, from ASCE Figure 27.3-4 for Monoslope Free Roofs with a 45 Degree Max. Slope
15 ft Max. Height of Solar Panel Structure
Analysis for Ground Mount Panels Only

Velocity Pressure (q)

V (mph)	Kd	Ke	--	Kz	Kzt	q (psf)
140	**0.85**	**1.00**	**1.00**	**0.85**	**1.00**	**36.25**

Panel Data

Joist Wind Trib	
2.75	**ft**

Design Pressure (p)

Panel Angle	Load Case	Wind Direction	G	C_{NW}	C_{NL}	p_W (psf)	p_L (psf)	w_W (plf)	w_L (plf)
15°	*A*	*0°*	*0.85*	*-1.1*	*-1.5*	*-33.9*	*-46.2*	*-93.2*	*-127.1*
15°	*B*	*0°*	*0.85*	*-1.9*	*0.0*	*-58.5*	*0.0*	*-161.0*	*0.0*
15°	*A*	*180°*	*0.85*	*1.3*	*1.6*	*40.1*	*49.3*	*110.2*	*135.6*
15°	*B*	*180°*	*0.85*	*1.2*	*-0.3*	*37.0*	*-9.2*	*101.7*	*-25.4*
20°	**A**	**0°**	**0.85**	**-1.3**	**-1.6**	**-41.1**	**-49.3**	**-113.0**	**-135.6**
20°	**B**	**0°**	**0.85**	**-2.1**	**-0.2**	**-64.7**	**-5.1**	**-178.0**	**-14.1**
20°	**A**	**180°**	**0.85**	**1.6**	**1.8**	**48.3**	**54.4**	**132.8**	**149.7**
20°	**B**	**180°**	**0.85**	**1.7**	**0.1**	**51.4**	**4.1**	**141.2**	**11.3**
30°	**A**	**0°**	**0.85**	**-1.8**	**-1.8**	**-55.5**	**-55.5**	**-152.5**	**-152.5**
30°	**B**	**0°**	**0.85**	**-2.5**	**-0.5**	**-77.0**	**-15.4**	**-211.8**	**-42.4**
30°	**A**	**180°**	**0.85**	**2.1**	**2.1**	**64.7**	**64.7**	**178.0**	**178.0**
30°	**B**	**180°**	**0.85**	**2.6**	**1.0**	**80.1**	**30.8**	**220.3**	**84.7**

*Note: C_{NW} and C_{NL} are Worst Case for Either **Clear OR Obstructed** Wind Flow*

Note: Values in grey were used for interpolation of the 20-degree wind pressure values.

Symbols and Notation
V = Basic Wind Speed (mph) per ASCE (see Figure 26.5-1A)
Kd = Wind Directionality Factor (per ASCE Table 26.6-1)
Ke = Ground Elevation Factor (per ASCE Section 26.9)
Kz = Velocity pressure exposure coefficient evaluated at height z (per ASCE Section 27.3.1)
Kzt = Topographic factor as defined in ASCE Section 26.8
q = velocity pressure in (psf) (q = 0.00256*Kz*Kzt*Kd*V^2 per ASCE 27.3.2)
p_W = Windward Design Pressure (psf) (p = q*G*C_N per ACSC 27.4-3)
p_L = Leeward Design Pressure (psf) (p = q*G*C_N per ACSC 27.4-3)
G = Guest effect factor
C_{NW} = Windward Net Pressure Coefficient for open buildings (See Figure 27.4-4)
C_{NL} = Leeward Net Pressure Coefficient for open buildings (See Figure 27.4-4)

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2019 CBC Solar Panel Wind Analysis - Version 1.1

Project: **20497 – SC Ground Mount – Everest**

SNOW LOAD CALCULATIONS PER ASCE 7-16 CH. 7

Ground Snow Load, Pg

LC1 = 0 psf
LC2 = 5 psf
LC3 = 10 psf
LC4 = 15 psf

Flat Roof Snow Load, Pf

$P_f = 0.7\ C_e\ C_t\ I_s\ P_g$ Eq. 7.3-1

	15 deg.	20 deg.	30 deg.	35 deg.	
C_e	0.90	0.90	0.90	0.90	Table 7.3-1
C_t	1.20	1.20	1.20	1.20	Table 7.3-2
I_s	0.80	0.80	0.80	0.80	Table 1.5-2

Sloped Roof Snow Load, Ps

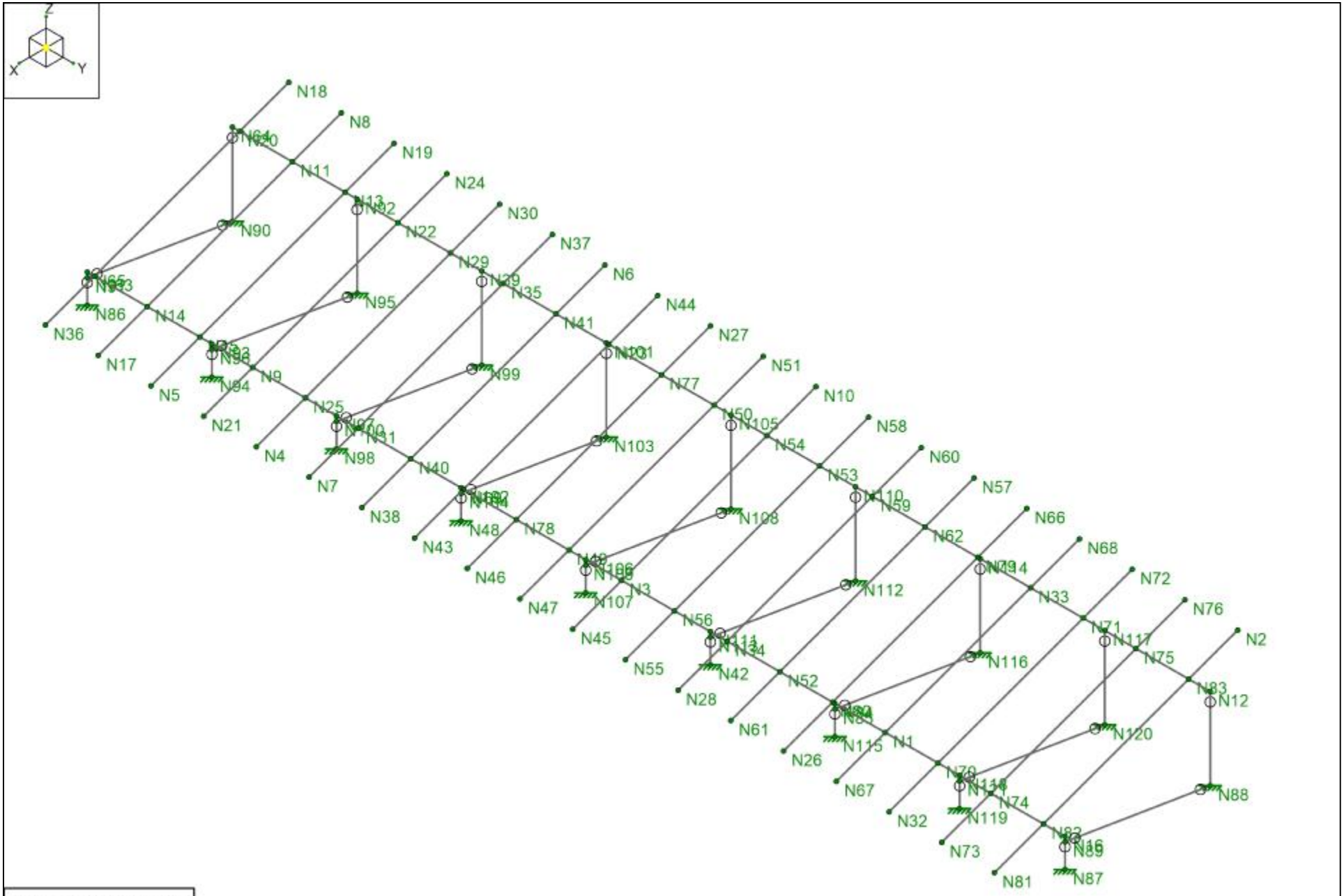
$P_s = C_s\ P_f$ Eq. 7.4-1

	15 deg.	20 deg.	30 deg.	35 deg.	
Cs	1.00	0.92	0.73	0.64	Figure 7.4-1

Panel Data	
Rail Trib. Width	
2.75	ft

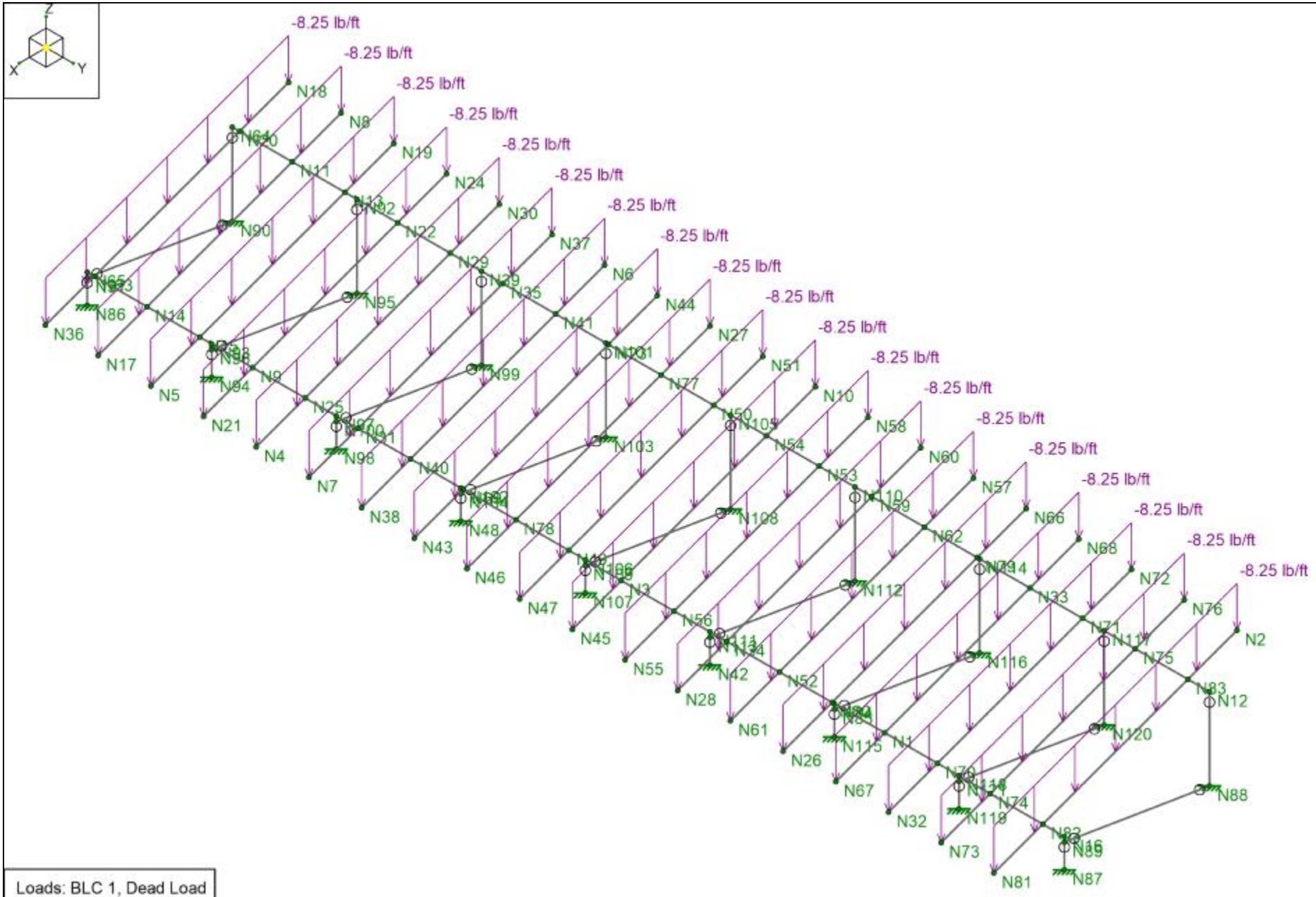
PV Snow Load (psf)				
pg (psf)	Tilt			
	15 deg.	20 deg.	30 deg.	35 deg.
0	0.00	0.00	0.00	0.00
5	4.32	3.97	3.15	2.76
10	8.64	7.95	6.31	5.53
15	12.96	11.92	9.46	8.29

PV Snow Load (plf)				
pg (psf)	Tilt			
	15 deg.	20 deg.	30 deg.	35 deg.
0	0.00	0.00	0.00	0.00
5	11.88	10.93	8.67	7.60
10	23.76	21.86	17.34	15.21
15	35.64	32.79	26.02	22.81



Envelope Only Solution

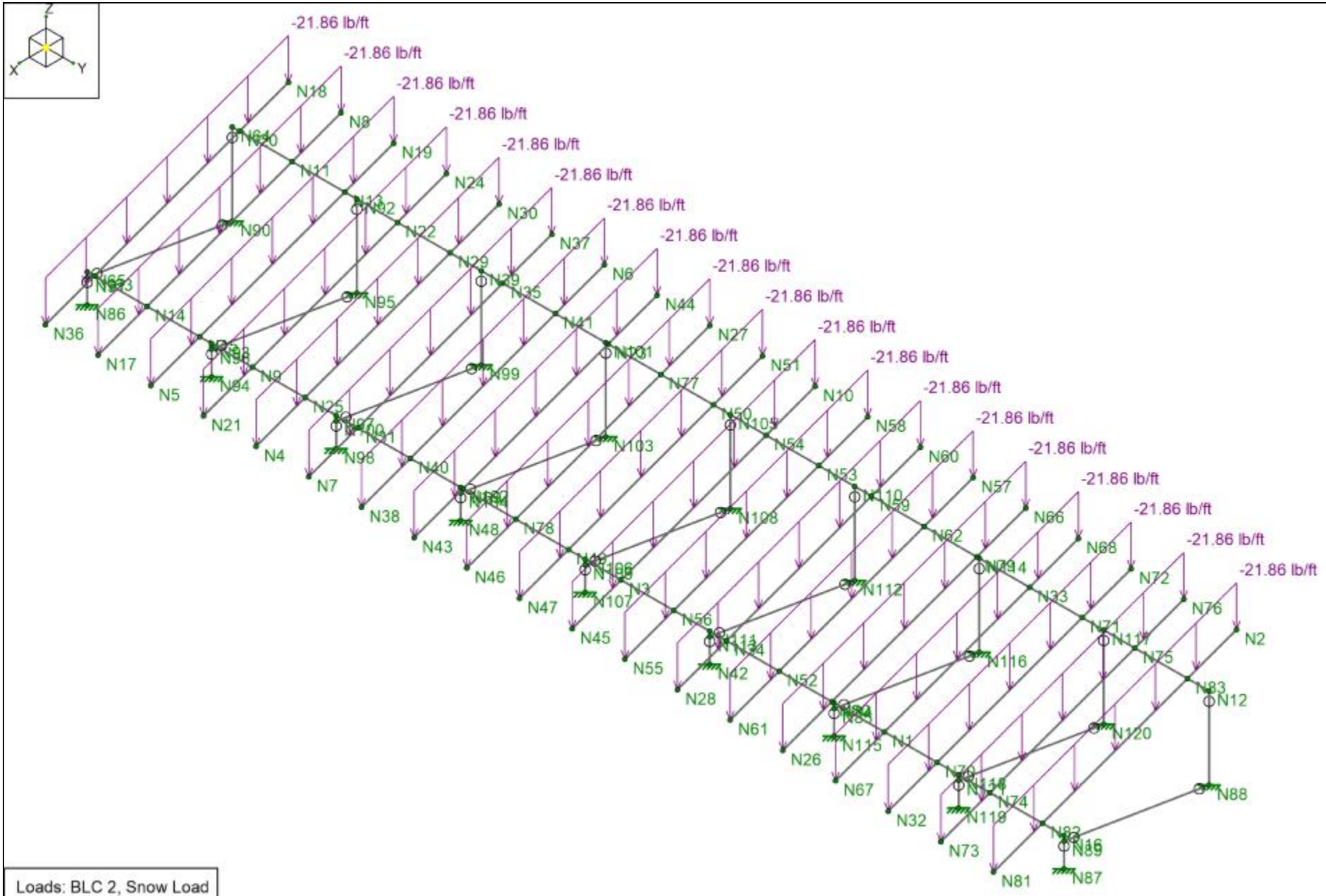
Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d



Loads: BLC 1, Dead Load
Envelope Only Solution

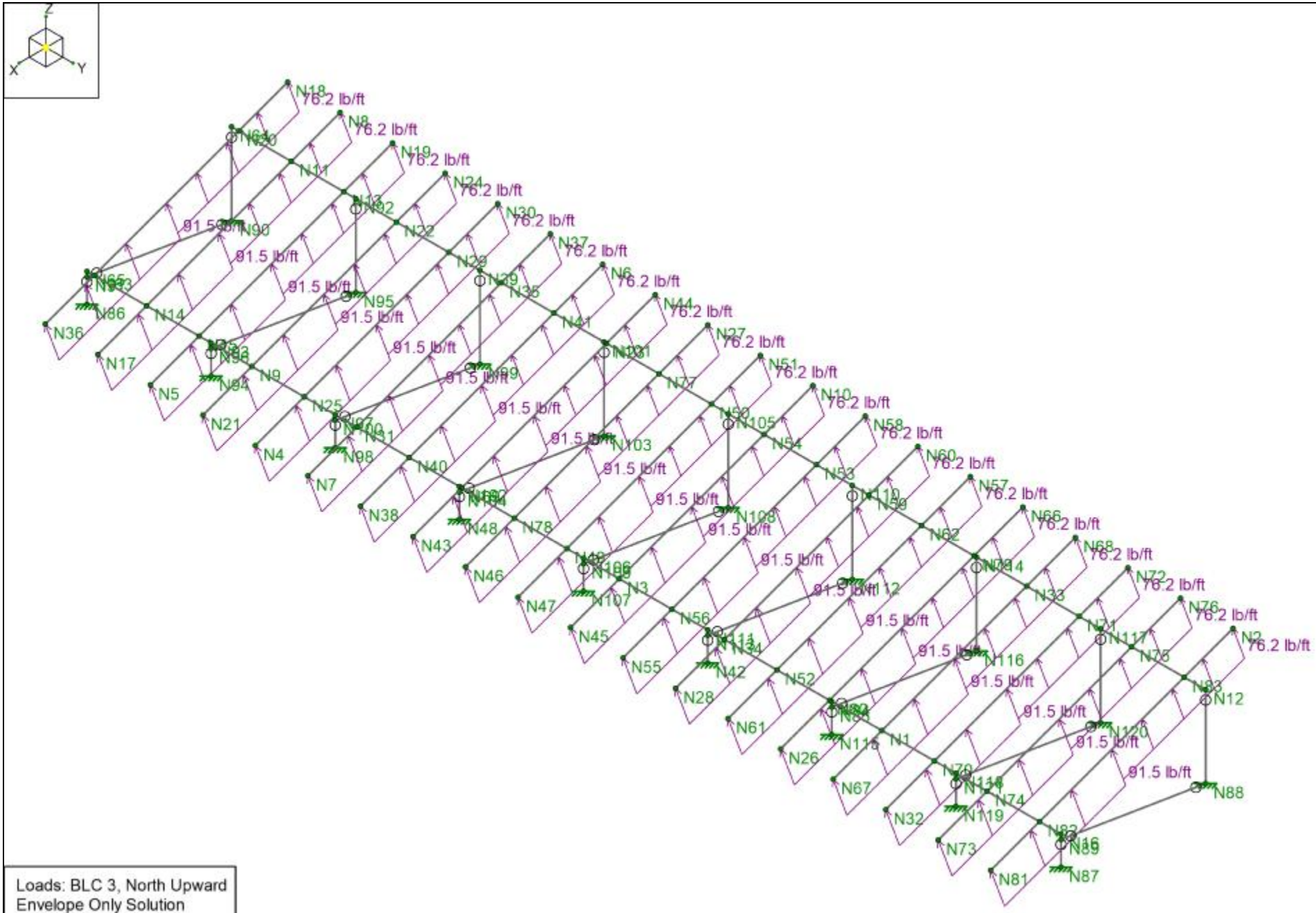
Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d

3.2

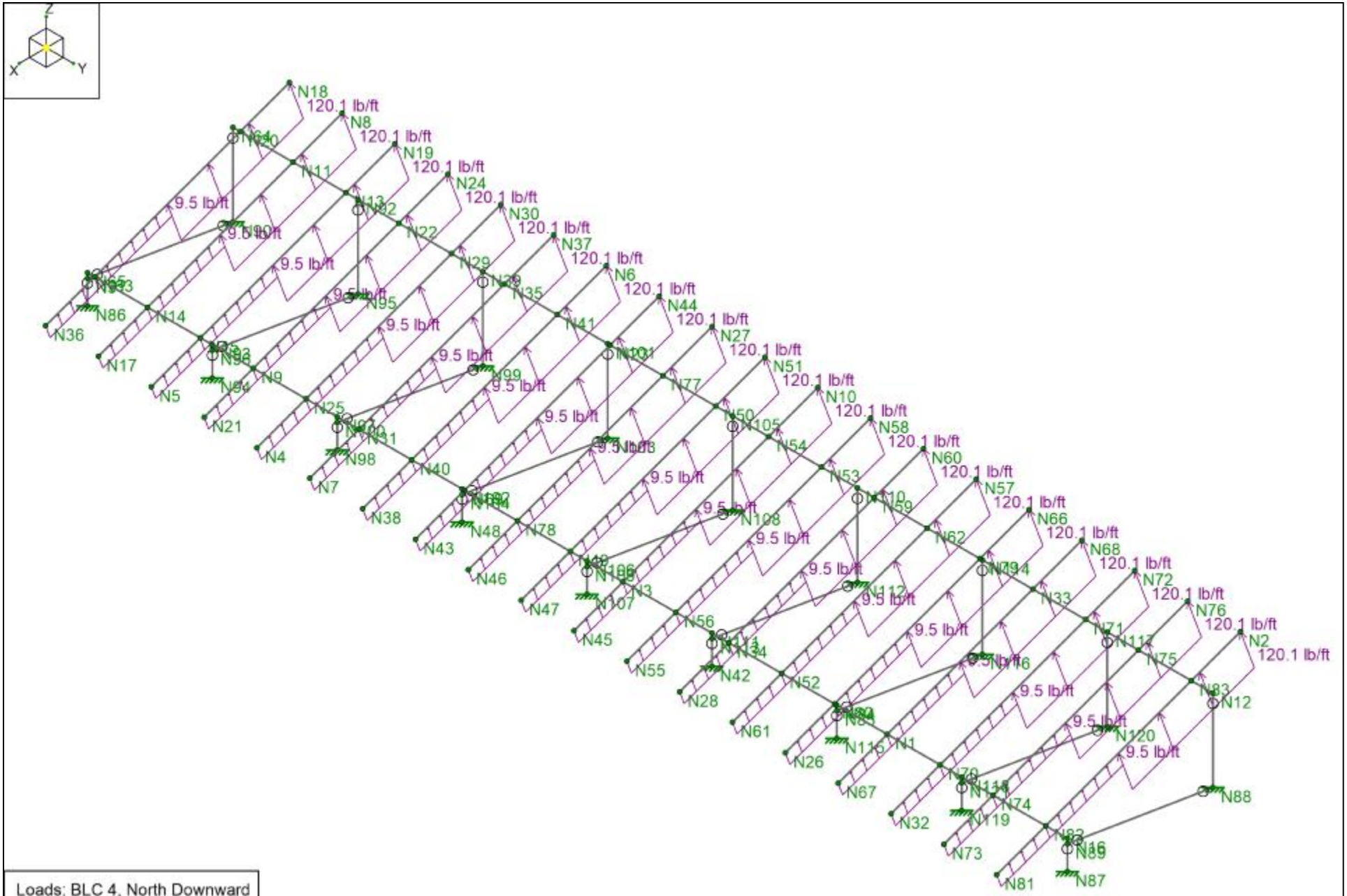


Loads: BLC 2, Snow Load
Envelope Only Solution

Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d

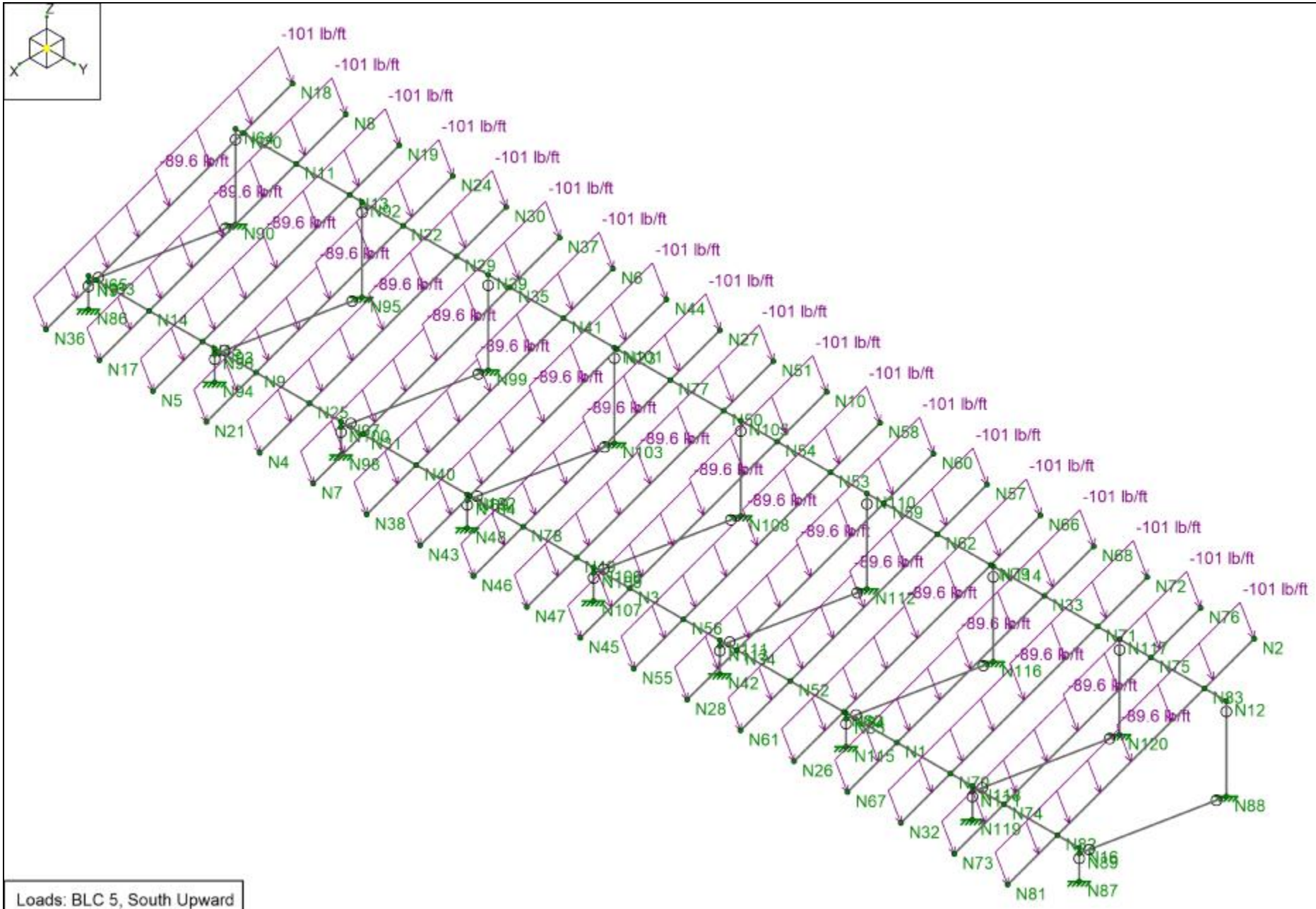


Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d



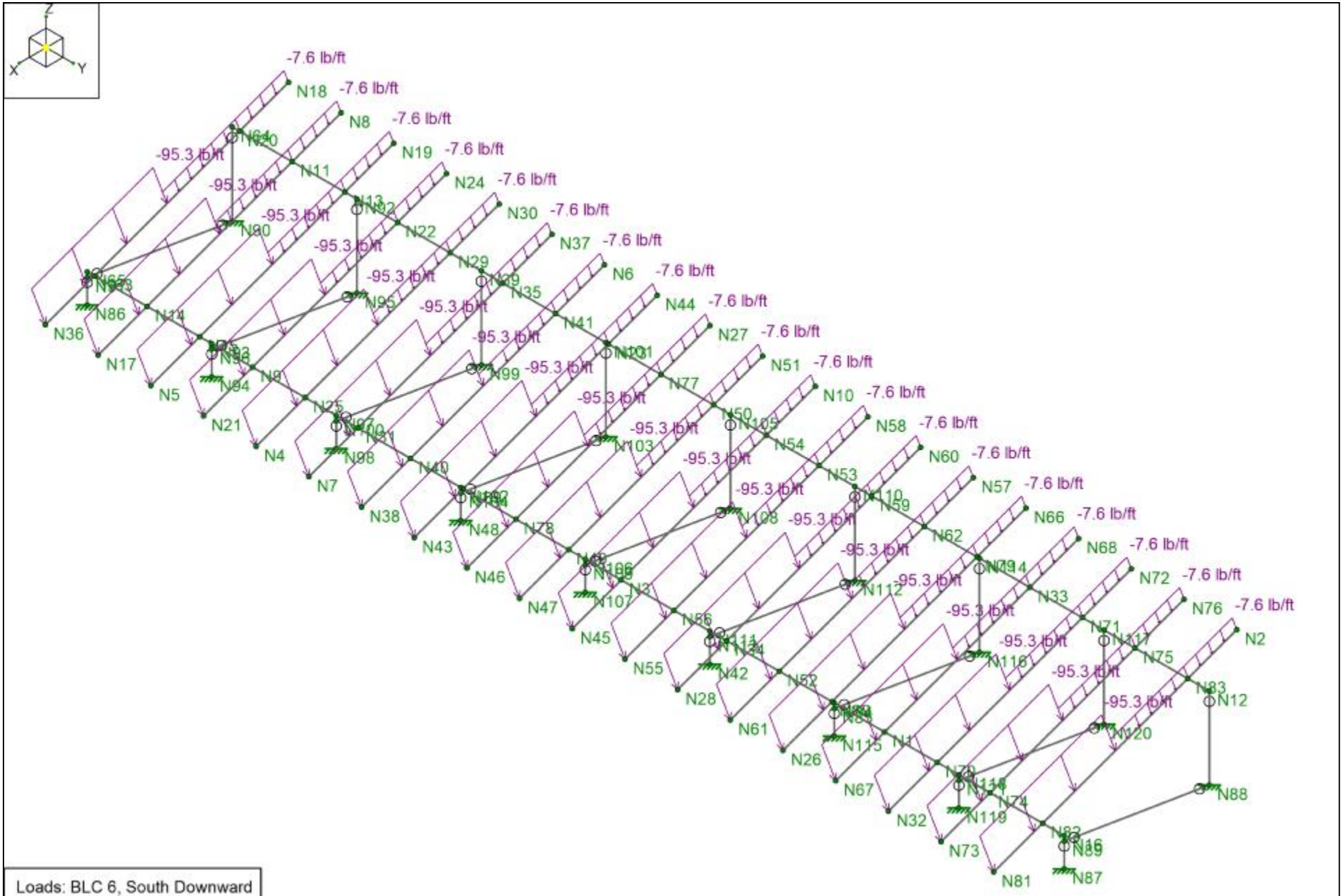
Loads: BLC 4, North Downward
Envelope Only Solution

Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d

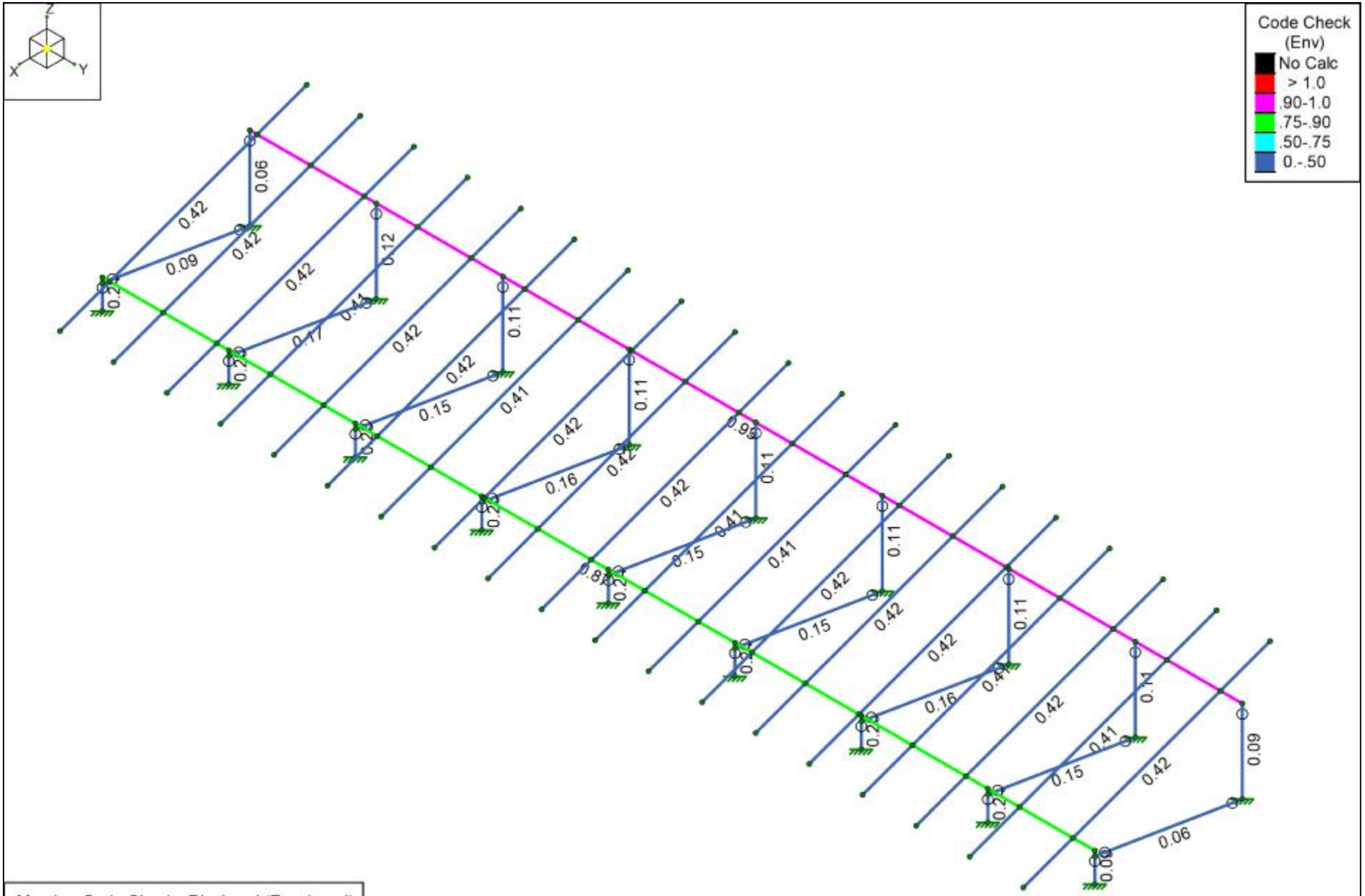


Loads: BLC 5, South Upward
Envelope Only Solution

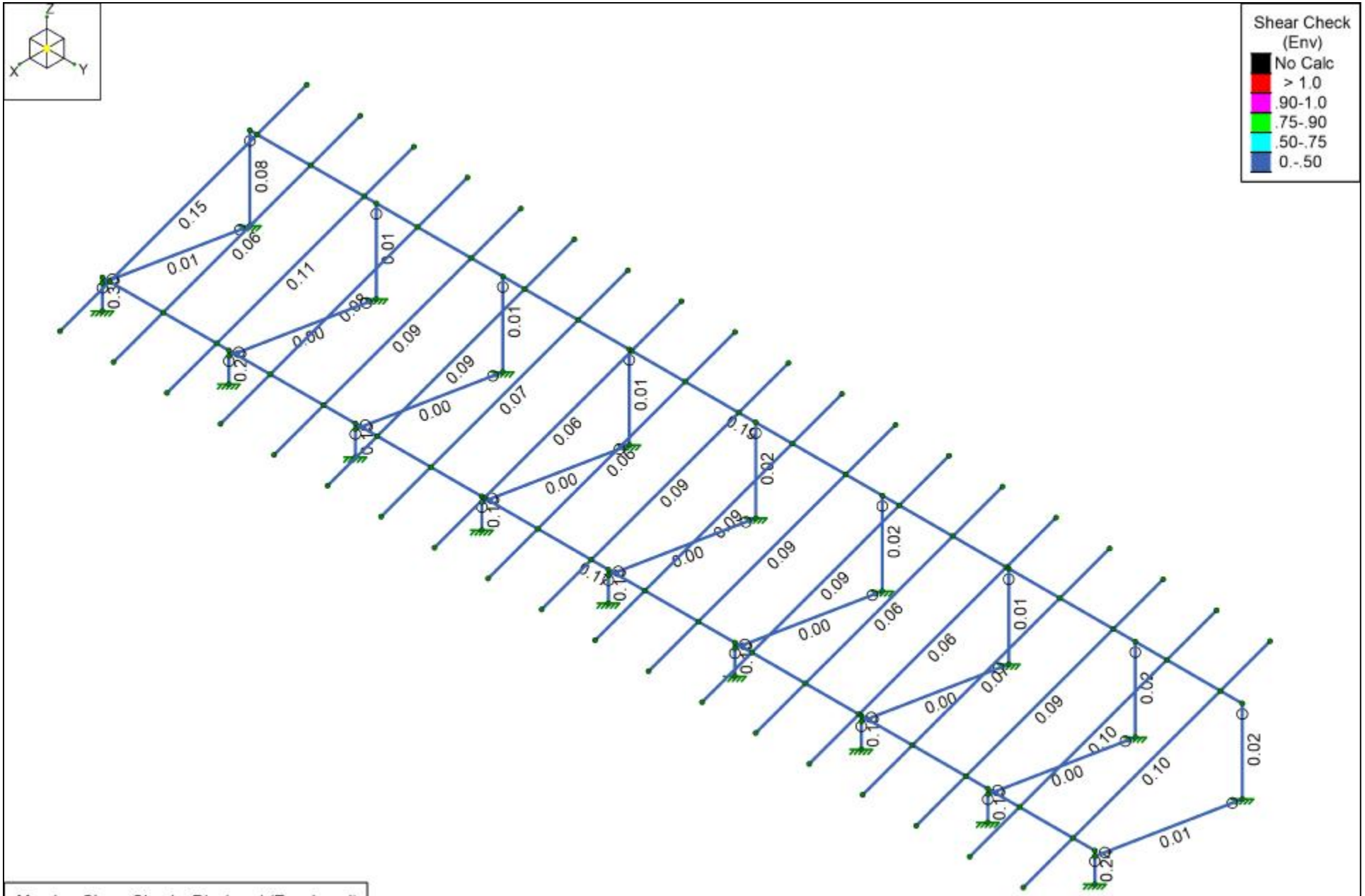
Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d



Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d



Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d



Everest Solar	Everest Ground Mount	
PAV		
20497		20deg_115MPH_10SL_1.5 Sch. 40 Pipe.r3d

Company : Everest Solar
Designer : PAV
Job Number : 20497
Model Name : Everest Ground Mount

Checked By : JJN

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e^{5}°F^{-1}]	Density [lb/ft^{3}]	Yield [psi]	Ry	Fu [psi]	Rt
1	A36 Gr.36	29000	11154	0.3	0.65	490	36000	1.5	58000	1.2
2	A992	29000	11154	0.3	0.65	490	50000	1.1	58000	1.2
3	Pipe - 35ksi	29000	11154	0.3	0.65	490	35000	1.5	58000	1.2
4	T6061 Alum.	10600	4077	0.3	1.29	173	36000	1.5	58000	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in^{2}]	Iyy [in^{4}]	Izz [in^{4}]	J [in^{4}]
1	Pipe 1.5	PIPE_1.5	VBrace	Pipe	Pipe - 35ksi	Typical	0.749	0.293	0.293	0.586
2	Pipe 2.0	PIPE_2.0	VBrace	Pipe	Pipe - 35ksi	Typical	1.02	0.627	0.627	1.25
3	Pipe 1.5X	PIPE_1.5X	VBrace	Pipe	Pipe - 35ksi	Typical	1	0.372	0.372	0.744
4	Pipe 2.0X	PIPE_2.0X	VBrace	Pipe	Pipe - 35ksi	Typical	1.4	0.827	0.827	1.65

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Distributed
1	Dead Load	DL			-1	38
2	Snow Load	SL				38
3	North Upward	WL				76
4	North Downward	WL				76
5	South Upward	WL				76
6	South Downward	WL				76
7	Earthquake X-direction	ELX	0.8			
8	Earthquake Y-direction	ELY		0.8		

Load Combinations

	Description	Solve	PDelta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	IBC 16-8	Yes	Y	DL	1	NL	1										
2	IBC 16-9	Yes	Y	DL	1	LL	1	LLS	1	NL	1						
3	IBC 16-10 (a)	Yes	Y	DL	1	NL	1										
4	IBC 16-10 (b)	Yes	Y	DL	1	SL	1	SLN	1	NL	1						
5	IBC 16-11 (b)	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	NL	1		
6	IBC 16-12 (a)	Yes	Y	DL	1	3	0.6	NL	1								
7	IBC 16-13 (a)	Yes	Y	DL	1	3	0.45	LL	0.75	LLS	0.75	NL	1				
8	IBC 16-13 (b)	Yes	Y	DL	1	3	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	NL	1
9	IBC 16-15	Yes	Y	DL	0.6	3	0.6	NL	1								
10	IBC 16-12 (a)	Yes	Y	DL	1	4	0.6	NL	1								
11	IBC 16-13 (a)	Yes	Y	DL	1	4	0.45	LL	0.75	LLS	0.75	NL	1				
12	IBC 16-13 (b)	Yes	Y	DL	1	4	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	NL	1
13	IBC 16-15	Yes	Y	DL	0.6	4	0.6	NL	1								
14	IBC 16-12 (a)	Yes	Y	DL	1	5	0.6	NL	1								
15	IBC 16-13 (a)	Yes	Y	DL	1	5	0.45	LL	0.75	LLS	0.75	NL	1				
16	IBC 16-13 (b)	Yes	Y	DL	1	5	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	NL	1
17	IBC 16-15	Yes	Y	DL	0.6	5	0.6	NL	1								
18	IBC 16-12 (a)	Yes	Y	DL	1	6	0.6	NL	1								
19	IBC 16-13 (a)	Yes	Y	DL	1	6	0.45	LL	0.75	LLS	0.75	NL	1				
20	IBC 16-13 (b)	Yes	Y	DL	1	6	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75	NL	1
21	IBC 16-15	Yes	Y	DL	0.6	6	0.6	NL	1								
22	IBC 16-12 (b) (a)	Yes	Y	DL	1	EL	0.7										
23	IBC 16-12 (b) (b)	Yes	Y	DL	1	EL	-0.7										
24	IBC 16-14 (a) (a)	Yes	Y	DL	1	EL	0.525	LL	0.75	LLS	0.75						
25	IBC 16-14 (a) (b)	Yes	Y	DL	1	EL	-0.525	LL	0.75	LLS	0.75						
26	IBC 16-14 (b) (a)	Yes	Y	DL	1	EL	0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75		
27	IBC 16-14 (b) (b)	Yes	Y	DL	1	EL	-0.525	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75		
28	IBC 16-16 (a)	Yes	Y	DL	0.6	EL	0.7										
29	IBC 16-16 (b)	Yes	Y	DL	0.6	EL	-0.7										

Load Combination Design

	Description	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
1	IBC 16-8	0.9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	IBC 16-9		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	IBC 16-10 (a)	1.25	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	IBC 16-10 (b)	1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	IBC 16-11 (b)	1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	IBC 16-12 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	IBC 16-13 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	IBC 16-13 (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	IBC 16-15	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	IBC 16-12 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	IBC 16-13 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	IBC 16-13 (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	IBC 16-15	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14	IBC 16-12 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
15	IBC 16-13 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16	IBC 16-13 (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17	IBC 16-15	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18	IBC 16-12 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
19	IBC 16-13 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
20	IBC 16-13 (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
21	IBC 16-15	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
22	IBC 16-12 (b) (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
23	IBC 16-12 (b) (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
24	IBC 16-14 (a) (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
25	IBC 16-14 (a) (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
26	IBC 16-14 (b) (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
27	IBC 16-14 (b) (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
28	IBC 16-16 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
29	IBC 16-16 (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Envelope Node Reactions

	Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N87	max	53.573	6	2.386	9	356.318	20	1.379	14	14.263	6	122.722	14
2		min	-60.224	17	-3.008	14	-163.555	9	-1.058	13	-16.115	14	-104.251	9
3	N88	max	305.752	17	-0.007	9	489.446	14	3.325	14	43.489	17	11.318	16
4		min	-272.576	6	-0.321	12	-373.942	13	-2.616	9	-55.96	10	-6.681	9
5	N86	max	82.977	6	3.887	14	561.515	20	1.287	9	22.099	6	116.056	9
6		min	-93.718	17	-2.832	9	-261.409	9	-2.295	16	-25.062	17	-144.704	14
7	N90	max	462.386	17	0	9	767.641	14	2.964	9	7.947	17	41.921	13
8		min	-411.722	6	-0.348	12	-616.074	13	-3.422	17	-11.807	10	-53.88	14
9	M93	max	95.612	6	3.696	14	652.744	20	1.033	9	25.466	6	119.887	9
10		min	-108.057	17	-2.71	9	-303.553	9	-2.197	16	-28.9	17	-144.206	14
11	M94	max	532.622	17	0.223	9	889.629	14	2.367	8	8.167	17	45.446	13
12		min	-474.41	6	-0.627	16	-712.829	13	-1.673	21	-9.989	10	-52.341	14
13	M43	max	16.091	6	0.138	16	63.082	20	0.406	13	4.244	6	6.59	17
14		min	-17.573	17	-0.163	13	1.363	9	-0.309	14	-4.658	17	-8.31	10
15	M96	max	86.196	17	0.219	9	96.084	14	3.137	16	3.733	13	5.848	14
16		min	-79.292	6	-0.714	16	-61.619	13	-1.054	9	-2.714	14	-6.259	13
17	N94	max	147.919	9	0.99	6	1103.675	20	0.374	17	39.541	9	53.711	14
18		min	-173.082	14	-1.117	17	-554.936	9	-0.703	12	-46.413	14	-39.095	9
19	N95	max	851.223	14	-0.003	9	1514.343	14	2.188	20	22.334	14	6.888	16
20		min	-737.224	9	-0.356	12	-1208.774	13	-0.987	9	-22.045	13	-0.77	9
21	N98	max	133.622	6	0.692	16	971.162	20	0.159	9	35.631	6	11.793	9
22		min	-152.208	17	-0.308	9	-476.062	9	-0.635	16	-40.774	14	-16.341	14
23	N99	max	752.367	17	-0.003	9	1307.666	14	1.472	12	32.105	17	1.731	17
24		min	-667.968	6	-0.349	12	-1056.992	13	-0.276	17	-33.132	10	-3.541	12
25	N48	max	141.475	9	0.353	16	995.954	20	0.1	9	37.778	9	6.809	13
26		min	-164.554	14	-0.146	9	-483.467	9	-0.408	20	-44.079	14	-6.219	14

Envelope Node Reactions (Continued)

	Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
27	N103	max	808.127	14	-0.004	9	1376.236	14	1.457	12	9.525	14	3.647	17
28		min	-702.464	9	-0.347	12	-1105.317	13	-0.042	17	-7.834	9	-4.178	10
29	N107	max	136.367	6	0.548	10	993.839	20	0.075	17	36.397	9	16.907	14
30		min	-156.622	14	-0.328	17	-489.666	9	-0.399	10	-41.99	14	-16.21	13
31	N108	max	772.614	17	-0.005	9	1348.36	14	1.428	20	27.655	14	9.887	10
32		min	-680.685	6	-0.344	12	-1085.039	13	-0.287	9	-27.971	10	-8.245	17
33	N42	max	136.522	6	0.513	14	997.643	20	0.266	9	36.447	9	16.371	13
34		min	-156.96	14	-0.4	9	-492.436	9	-0.314	14	-42.082	14	-17.519	14
35	N112	max	774.115	17	-0.005	9	1354.483	14	1.601	12	27.715	14	7.988	17
36		min	-681.469	6	-0.342	12	-1088.826	13	-0.343	17	-28.018	13	-9.728	10
37	N115	max	141.141	9	0.339	13	983.166	20	0.128	8	37.682	9	8.965	14
38		min	-163.757	14	-0.219	16	-474.52	9	-0.303	13	-43.858	14	-7.381	13
39	N116	max	804.322	14	-0.006	9	1357	14	1.39	20	9.474	14	3.254	10
40		min	-700.784	9	-0.34	12	-1092.332	13	-0.121	9	-7.81	9	-2.331	17
41	N119	max	133.831	6	0.466	13	1035.008	20	0.203	16	35.785	9	10.771	17
42		min	-154.896	14	-0.261	16	-518.604	9	-0.382	13	-41.565	14	-11.837	10
43	N120	max	764.577	14	-0.007	9	1396.419	14	1.305	20	34.128	14	9.352	13
44		min	-669.506	9	-0.34	12	-1122.408	13	-0.189	9	-35.889	13	-6.981	14
45	M100	max	184.11	9	0.682	8	1371.102	20	0.181	21	49.21	9	22.929	18
46		min	-215.662	14	-0.488	21	-681.563	9	-0.872	8	-57.821	14	-11.876	9
47	M101	max	1057.331	14	0.244	9	1874.726	14	3.494	16	19.471	14	17.27	14
48		min	-916.937	9	-0.482	16	-1495.386	13	-1.195	9	-17.583	13	-16.704	13
49	M103	max	166.707	6	0.756	16	1191.755	20	0.093	13	44.453	9	15.439	9
50		min	-191.617	14	-0.308	13	-573.305	9	-0.739	4	-51.345	14	-20.979	14
51	M48	max	942.129	17	0.24	9	1619.417	14	2.622	16	20.993	14	-0.109	17
52		min	-830.162	6	-0.515	16	-1305.328	13	-0.497	9	-20.113	13	-1.972	12
53	M106	max	170.227	6	0.365	4	1238.123	20	0.121	13	45.476	9	7.053	13
54		min	-197.385	14	-0.203	13	-604.9	9	-0.51	4	-52.905	14	-6.359	14
55	M107	max	969.849	14	0.243	9	1688.577	14	2.953	16	24.708	14	2.337	17
56		min	-848.777	9	-0.502	16	-1351.509	13	-0.769	9	-23.925	13	-2.603	10
57	M109	max	168.249	6	0.235	4	1216.158	20	0.175	13	44.91	9	1.572	14
58		min	-194.344	14	-0.119	13	-590.311	9	-0.341	4	-52.085	14	-1.253	9
59	M110	max	955.288	14	0.246	9	1655.018	14	3.105	16	25.375	14	0.659	14
60		min	-838.753	6	-0.505	16	-1328.96	13	-0.923	9	-24.768	13	-0.606	13
61	M113	max	174.449	6	0.254	20	1263.613	20	0.271	13	46.599	9	1.635	9
62		min	-202.427	14	-0.186	9	-616.221	9	-0.307	16	-54.25	14	-5.549	18
63	M52	max	994.483	14	0.25	9	1724.948	14	3.019	16	25.408	14	5.881	13
64		min	-869.905	9	-0.494	16	-1382.472	13	-0.886	13	-24.604	13	-5.673	14
65	M116	max	134.336	9	0.927	9	1035.116	20	0.333	21	35.921	9	56.118	14
66		min	-155.412	14	-1.123	14	-518.61	9	-0.212	6	-41.71	14	-48.049	9
67	M88	max	764.03	14	0.247	9	1399.67	14	4.218	16	17.049	14	16.429	14
68		min	-668.562	9	-0.536	16	-1108.868	13	-2.121	9	-16.465	13	-15.822	13
69	Totals:	max	10032.471	14	0	9	35820.486	16						
70		min	-8827.101	9	0	16	-20211.616	9						

Envelope AISC 14TH (360-10): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn
1	M35	PIPE_1.5	0.416	6.75	16	0.06	2.813	16	4778.659	15697.605	735.279	735.279	1	H1-1b
2	M36	PIPE_1.5	0.421	6.75	16	0.111	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
3	M37	PIPE_1.5	0.413	6.75	16	0.084	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
4	M38	PIPE_1.5	0.415	6.75	16	0.086	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
5	M39	PIPE_1.5	0.418	6.75	16	0.094	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
6	M40	PIPE_1.5	0.414	6.75	16	0.072	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
7	M41	PIPE_1.5	0.421	6.75	16	0.06	2.813	16	4778.659	15697.605	735.279	735.279	1	H1-1b
8	M42	PIPE_1.5	0.416	6.75	16	0.062	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
9	M43	PIPE_1.5	0.419	6.75	16	0.088	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
10	M45	PIPE_1.5	0.414	6.75	16	0.09	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
11	M46	PIPE_1.5	0.414	6.75	16	0.09	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b

Envelope AISC 14TH (360-10): ASD Member Steel Code Checks (Continued)

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn
12	M47	PIPE_1.5	0.419	6.75	16	0.089	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
13	M48	PIPE_1.5	0.416	6.75	16	0.062	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
14	M39A	PIPE_1.5	0.929	6.375	16	0.19	6.375	14	7966.511	15697.605	735.279	735.279	1	H1-1b
15	M40A	PIPE_1.5	0.871	6.375	16	0.168	6.375	14	7966.511	15697.605	735.279	735.279	1	H1-1b
16	M45B	PIPE_1.5	0.417	6.75	16	0.154	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
17	M46B	PIPE_1.5	0.421	6.75	16	0.06	2.813	14	4778.659	15697.605	735.279	735.279	1	H1-1b
18	M138	PIPE_1.5	0.414	6.75	16	0.069	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
19	M139A	PIPE_1.5	0.418	6.75	16	0.09	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
20	M140B	PIPE_1.5	0.415	6.75	16	0.101	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
21	M141A	PIPE_1.5	0.415	6.75	16	0.102	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
22	M51	PIPE_1.5	0.415	6.75	16	0.064	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
23	M52A	PIPE_1.5	0.415	6.75	16	0.12	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
24	M53A	PIPE_1.5	0.422	6.75	16	0.062	10.688	18	4778.659	15697.605	735.279	735.279	1	H1-1b
25	M54A	PIPE_1.5	0.418	6.75	16	0.066	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
26	M55A	PIPE_1.5	0.415	6.75	16	0.084	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
27	M56	PIPE_1.5	0.42	6.75	16	0.086	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
28	M57	PIPE_1.5	0.419	6.75	16	0.059	2.813	16	4778.659	15697.605	735.279	735.279	1	H1-1b
29	M58	PIPE_1.5	0.417	6.75	16	0.092	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
30	M59	PIPE_1.5	0.419	6.75	16	0.087	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
31	M60	PIPE_1.5	0.419	6.75	16	0.059	2.813	16	4778.659	15697.605	735.279	735.279	1	H1-1b
32	M61	PIPE_1.5	0.418	6.75	16	0.09	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
33	M62	PIPE_1.5	0.418	6.75	16	0.088	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
34	M63	PIPE_1.5	0.42	6.75	16	0.059	2.813	16	4778.659	15697.605	735.279	735.279	1	H1-1b
35	M64	PIPE_2.0	0.954	7.969	16	0.154	8.5	13	13883.389	21377.246	1245.259	1245.259	1	H1-1b
36	M65	PIPE_2.0	0.879	7.969	16	0.141	8.5	18	13883.389	21377.246	1245.259	1245.259	1	H1-1b
37	M66	PIPE_1.5	0.418	6.75	16	0.153	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
38	M67	PIPE_1.5	0.42	6.75	16	0.085	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
39	M81	PIPE_1.5	0.417	6.75	16	0.1	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
40	M82	PIPE_1.5	0.418	6.75	16	0.059	2.813	16	4778.659	15697.605	735.279	735.279	1	H1-1b
41	M83	PIPE_1.5	0.419	6.75	16	0.101	2.813	13	4778.659	15697.605	735.279	735.279	1	H1-1b
42	M84	PIPE_1.5	0.415	6.75	16	0.06	2.813	16	4778.659	15697.605	735.279	735.279	1	H1-1b
43	M91	PIPE_1.5	0.091	1.25	14	0.241	1.5	14	15046.072	15697.605	735.279	735.279	1.834	H1-1b
44	M92	PIPE_1.5	0.087	0	13	0.018	4.257	16	11156.947	15697.605	735.279	735.279	1.667	H1-1b
45	M93	PIPE_1.5	0.058	7.677	14	0.007	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
46	M76A	PIPE_1.5	0.24	1.25	14	0.303	1.5	14	15046.072	15697.605	735.279	735.279	1.824	H3-6
47	M77A	PIPE_1.5	0.061	0	16	0.083	4.257	14	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
48	M78A	PIPE_1.5	0.09	7.677	17	0.008	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
49	M76	PIPE_1.5	0.271	1.25	14	0.314	1.5	14	15046.072	15697.605	735.279	735.279	1.829	H3-6
50	M77	PIPE_1.5	0.071	0	16	0.08	4.257	14	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
51	M78	PIPE_1.5	0.104	7.677	17	0.008	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
52	M97A	PIPE_1.5	0.024	1.25	17	0.026	1.5	10	15046.072	15697.605	735.279	735.279	1.288	H1-1b
53	M98A	PIPE_1.5	0.009	0	16	0.01	4.257	13	11156.947	15697.605	735.279	735.279	1.667	H1-1b
54	M99A	PIPE_1.5	0.034	3.839	14	0.002	7.677	12	5188.632	15697.605	735.279	735.279	1.136	H1-1b
55	M76B	PIPE_1.5	0.264	1.25	14	0.227	1.5	14	15046.072	15697.605	735.279	735.279	1.709	H1-1b
56	M77B	PIPE_1.5	0.123	0	16	0.011	4.257	16	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
57	M78B	PIPE_1.5	0.166	7.677	14	0.004	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
58	M79A	PIPE_1.5	0.231	1.25	14	0.152	1.5	14	15046.072	15697.605	735.279	735.279	2.263	H1-1b
59	M80A	PIPE_1.5	0.106	0	16	0.007	4.257	10	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
60	M81A	PIPE_1.5	0.146	7.677	17	0.003	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
61	M82A	PIPE_1.5	0.249	1.25	14	0.147	1.5	14	15046.072	15697.605	735.279	735.279	2.2	H1-1b
62	M83A	PIPE_1.5	0.111	0	16	0.007	4.257	10	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
63	M84A	PIPE_1.5	0.158	7.677	14	0.002	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
64	M85A	PIPE_1.5	0.238	1.25	14	0.157	1.5	14	15046.072	15697.605	735.279	735.279	1.602	H1-1b
65	M86A	PIPE_1.5	0.109	0	16	0.017	4.257	10	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
66	M87A	PIPE_1.5	0.15	7.677	14	0.003	7.677	10	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
67	M88A	PIPE_1.5	0.239	1.25	14	0.158	1.5	14	15046.072	15697.605	735.279	735.279	1.814	H1-1b
68	M89A	PIPE_1.5	0.11	0	16	0.017	4.257	10	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
69	M90A	PIPE_1.5	0.151	7.677	14	0.003	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*

Envelope AISC 14TH (360-10): ASD Member Steel Code Checks (Continued)

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn
70	M91A	PIPE_1.5	0.247	1.25	14	0.15	1.5	14	15046.072	15697.605	735.279	735.279	1.722	H1-1b
71	M92A	PIPE_1.5	0.109	0	16	0.005	4.257	10	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
72	M93A	PIPE_1.5	0.157	7.677	14	0.002	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
73	M94	PIPE_1.5	0.237	1.25	14	0.145	1.5	17	15046.072	15697.605	735.279	735.279	1.837	H1-1b
74	M95	PIPE_1.5	0.114	0	16	0.016	4.257	13	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
75	M96	PIPE_1.5	0.148	7.677	14	0.003	7.677	10	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
76	M76C	PIPE_1.5	0.328	1.25	14	0.201	1.5	14	15046.072	15697.605	735.279	735.279	1.663	H1-1b
77	M77C	PIPE_1.5	0.152	0	16	0.028	4.257	14	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
78	M78C	PIPE_1.5	0.228	3.839	14	0.003	7.677	18	5188.632	15697.605	735.279	735.279	1.136	H1-1a
79	M79	PIPE_1.5	0.29	1.25	14	0.192	1.5	14	15046.072	15697.605	735.279	735.279	1.819	H1-1b
80	M80	PIPE_1.5	0.131	0	16	0.004	4.257	12	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
81	M81B	PIPE_1.5	0.184	7.677	14	0.003	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
82	M82B	PIPE_1.5	0.3	1.25	14	0.174	1.5	14	15046.072	15697.605	735.279	735.279	2.25	H1-1b
83	M83B	PIPE_1.5	0.137	0	16	0.005	4.257	10	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
84	M84B	PIPE_1.5	0.189	7.677	14	0.002	7.677	10	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
85	M85	PIPE_1.5	0.295	1.25	14	0.164	1.5	14	15046.072	15697.605	735.279	735.279	1.51	H1-1b
86	M86	PIPE_1.5	0.134	0	16	0.002	4.257	14	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
87	M87	PIPE_1.5	0.186	7.677	14	0.002	7.677	8	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
88	M88	PIPE_1.5	0.307	1.25	14	0.17	1.5	14	15046.072	15697.605	735.279	735.279	1.905	H1-1b
89	M89	PIPE_1.5	0.14	0	16	0.01	4.257	13	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
90	M90	PIPE_1.5	0.194	7.677	14	0.002	7.677	18	5188.632	15697.605	735.279	735.279	1.136	H1-1b*
91	M91B	PIPE_1.5	0.238	1.25	14	0.216	1.5	14	15046.072	15697.605	735.279	735.279	1.66	H1-1b
92	M92B	PIPE_1.5	0.114	0	16	0.026	4.257	14	11156.947	15697.605	735.279	735.279	1.667	H1-1b*
93	M93B	PIPE_1.5	0.149	7.677	14	0.004	7.677	14	5188.632	15697.605	735.279	735.279	1.136	H1-1b*

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	Axial	Uplift	Moment (y)	Shear (x)
Front	1,104 lb	-555 lb	-46 ft-lb	-173 lb
Back	1,514 lb	-1,209 lb	-56 ft-lb	851 lb

	Joint		X		Y		Z		Mx		My		Mz
	N87	max	53.57	6	2.39	9	356.32	20	1.38	14	14.26	6	122.72
		min	-60.22	17	-3.01	14	-163.56	9	-1.06	13	-16.12	14	-104.25
B	N88	max	305.75	17	-0.01	9	489.45	14	3.33	14	43.49	17	11.32
		min	-272.58	6	-0.32	12	-373.94	13	-2.62	9	-55.96	10	-6.68
	N86	max	82.98	6	3.89	14	561.52	20	1.29	9	22.1	6	116.06
		min	-93.72	17	-2.83	9	-261.41	9	-2.3	16	-25.06	17	-144.7
B	N90	max	462.39	17	0	9	767.64	14	2.96	9	7.95	17	41.92
		min	-411.72	6	-0.35	12	-616.07	13	-3.42	17	-11.81	10	-53.88
	N94	max	147.92	9	0.99	6	1103.68	20	0.37	17	39.54	9	53.71
		min	-173.08	14	-1.12	17	-554.94	9	-0.7	12	-46.41	14	-39.1
B	N95	max	851.22	14	0	9	1514.34	14	2.19	20	22.33	14	6.89
		min	-737.22	9	-0.36	12	-1208.77	13	-0.99	9	-22.05	13	-0.77
	N98	max	133.62	6	0.69	16	971.16	20	0.16	9	35.63	6	11.79
		min	-152.21	17	-0.31	9	-476.06	9	-0.64	16	-40.77	14	-16.34
B	N99	max	752.37	17	0	9	1307.67	14	1.47	12	32.11	17	1.73
		min	-667.97	6	-0.35	12	-1056.99	13	-0.28	17	-33.13	10	-3.54
	N48	max	141.48	9	0.35	16	995.95	20	0.1	9	37.78	9	6.81
		min	-164.55	14	-0.15	9	-483.47	9	-0.41	20	-44.08	14	-6.22
B	N103	max	808.13	14	0	9	1376.24	14	1.46	12	9.53	14	3.65
		min	-702.46	9	-0.35	12	-1105.32	13	-0.04	17	-7.83	9	-4.18
	N107	max	136.37	6	0.55	10	993.84	20	0.08	17	36.4	9	16.91
		min	-156.62	14	-0.33	17	-489.67	9	-0.4	10	-41.99	14	-16.21
B	N108	max	772.61	17	-0.01	9	1348.36	14	1.43	20	27.66	14	9.89
		min	-680.69	6	-0.34	12	-1085.04	13	-0.29	9	-27.97	10	-8.25
	N42	max	136.52	6	0.51	14	997.64	20	0.27	9	36.45	9	16.37
		min	-156.96	14	-0.4	9	-492.44	9	-0.31	14	-42.08	14	-17.52
B	N112	max	774.12	17	-0.01	9	1354.48	14	1.6	12	27.72	14	7.99
		min	-681.47	6	-0.34	12	-1088.83	13	-0.34	17	-28.02	13	-9.73
	N115	max	141.14	9	0.34	13	983.17	20	0.13	8	37.68	9	8.97
		min	-163.76	14	-0.22	16	-474.52	9	-0.3	13	-43.86	14	-7.38
B	N116	max	804.32	14	-0.01	9	1357	14	1.39	20	9.47	14	3.25
		min	-700.78	9	-0.34	12	-1092.33	13	-0.12	9	-7.81	9	-2.33
	N119	max	133.83	6	0.47	13	1035.01	20	0.2	16	35.79	9	10.77
		min	-154.9	14	-0.26	16	-518.6	9	-0.38	13	-41.57	14	-11.84
B	N120	max	764.58	14	-0.01	9	1396.42	14	1.31	20	34.13	14	9.35
		min	-669.51	9	-0.34	12	-1122.41	13	-0.19	9	-35.89	13	-6.98
B													
B													

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INNOVATIVE STRUCTURAL DESIGNS

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Page:

Job No:20497

Engr:

Friction Pile Design

Version 12.35 - 2018 IBC

INPUT DATA:

Name: Pipe1.5_F_Full

V = 0.17 kips @ H = 0.00 ft above grade

M = 0.05 ft-kips @ H = 0.00 ft above grade

Axial = 1.10 kips

Creep = 0.00 plf/ft for D = 0.00 ft of soil

Pile is unconstrained

1.33x Short-term Stress Increase

2x Isolated Pile Increase

Pile Width = 12.00 inches

Passive = 150.00 psf/ft to a Maximum = 1500.00 psf

Friction = 250.00 psf/ft End Bearing = 2000.00 psf

SOLUTION:

Required Embedment Depths into Firm Soils:

Axial = 1.00 ft Lateral = 2.00

Required = 2.00 ft total embedment

Soil Pressures:

S1 = 266.67 psf at D/3

S3 = 4000.00 psf at full depth

Moments:

M = 0.16 ft-kips unfactored

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Project: **20497 – SC Solar Ground Mount – Everest**

PILE UPLIFT CALCULATION *(FRONT PILE)*

SYSTEM INFORMATION

Pile Diameter	**12**	**inches**
Depth of Pile	**2**	**feet**
Distance Discounted	**1**	**feet**
Skin Friction	**250**	**psf/ft**
Concrete Density	**150**	**pcf**

LOADING INFORMATION

Uplift Demand *(ASD Level)*	**555**	**pounds**

UPLIFT CAPACITY

From Skin Friction

*Skin friction = Allowed Skin Friction * Circumference * Allowed Pile Depth*

785 **pounds**

From Concrete Weight

141 **pounds**

*Concrete weight = 0.6 * Concrete Density * Pile Area * Full Pile Height*

TOTAL UPLIFT RESISTANCE

927 **pounds**

Pile Design is Acceptable for Uplift Demand

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Job No:20497

Engr:

Friction Pile Design

Version 12.35 - 2018 IBC

INPUT DATA:

Name: Pipe1.5_B_Full

V = 0.85 kips @ H = 0.00 ft above grade

M = 0.06 ft-kips @ H = 0.00 ft above grade

Axial = 1.51 kips

Creep = 0.00 plf/ft for D = 0.00 ft of soil

Pile is unconstrained

1.33x Short-term Stress Increase

2x Isolated Pile Increase

Pile Width = 12.00 inches

Passive = 150.00 psf/ft to a Maximum = 1500.00 psf

Friction = 250.00 psf/ft End Bearing = 2000.00 psf

SOLUTION:

Required Embedment Depths into Firm Soils:

Axial = 1.00 ft Lateral = 4.00

Required = 4.00 ft total embedment

Soil Pressures:

S1 = 533.33 psf at D/3

S3 = 4000.00 psf at full depth

Moments:

M = 1.19 ft-kips unfactored

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Project: **20497 – SC Solar Ground Mount – Everest**

PILE UPLIFT CALCULATION *(BACK PILE)*

SYSTEM INFORMATION

Pile Diameter	**12**	**inches**
Depth of Pile	**4**	**feet**
Distance Discounted	**1**	**feet**
Skin Friction	**250**	**psf/ft**
Concrete Density	**150**	**pcf**

LOADING INFORMATION

Uplift Demand *(ASD Level)*	**1209**	**pounds**

UPLIFT CAPACITY

From Skin Friction

*Skin friction = Allowed Skin Friction * Circumference * Allowed Pile Depth*

2356 **pounds**

From Concrete Weight

283 **pounds** *Concrete weight = 0.6 * Concrete Density * Pile Area * Full Pile Height*

TOTAL UPLIFT RESISTANCE

2639 **pounds**

Pile Design is Acceptable for Uplift Demand