From:	Beckman, Abigail S (DEC)
To:	Jonas Bukh; engineer@townofvanburen.com
Cc:	yanoshd@hunt-eas.com; Deyo, Jacob (External); Prateek Tare; Ryan Harrington; Trevor Maclachlan; dspaizman@distributedei.com; dmoulton@distributedei.com; "Jackson Elwell"; "Brian Parker"; Cook, Joshua P (DEC)
Subject:	Van Buren Landfill 734031- Modifications to Change of Use Workplan
Date:	Wednesday, December 17, 2025 10:53:00 AM
Attachments:	250905 - Van Buren Solar - 90 _CIVIL IFC (2).pdf CALC 2535010 Van Buren Landfill NY 07302025 stamped 8-19-25 (002).pdf

Good morning,

The New York State Department of Environmental Conservation (NYSDEC) approved a Change of Use Work Plan for the Van Buren Solar Farm Project on October 2, 2023. NYSDEC has received the following documents accompanied by a request to modify the approved work plan. The NYSDEC herby approves the changes set forth in the attached documentation.

If you have any questions, please contact me at 315-426-7735 or e-mail: abigail.beckman@dec.ny.gov.

Abigail Beckman *(she/her/hers)*
Assistant Engineer

Department of Environmental Conservation
Division of Environmental Remediation
5786 Widewaters Parkway, Syracuse, NY 13214-1867
P: (315) 426-7735 M: (680) 323- 0035 | abigail.beckman@dec.ny.gov
dec.ny.gov
Facebook | X (Twitter) | YouTube | Podcast

NYSDEC has a new File Transfer System. We no longer accept third-party links. You can send me files here:

https://mysend.ny.gov:443/nys/send/to/user/abigailbeckmandecnygov

From:	Jonas Bukh
To:	Beckman, Abigail S (DEC)
Cc:	Trevor Maclachlan; Deyo, Jacob (External); Ryan Harrington; Prateek Tare; smikheyeva@nexamp.com; Peter Plaks; David Moulton; Jackson Elwell
Subject:	Re: Van Buren - Module explanation
Date:	Tuesday, December 2, 2025 4:10:41 PM
Attachments:	CALC_2535010_Van Buren Landfill, NY_07302025 stamped 8-19-25.pdf

ATTENTION: This email came from an external source. Do not open attachments or click on links from unknown senders or unexpected emails.

Hey Abigail,

Hope you had a great Holiday. To answer question 1, please see the attached calculations and yes, it is confirmed that we a copy of the change of use plan approved in 2023. For questions 2 and 3 I will defer to Nexamp to provide an official answer.

Best,
Jonas

Jonas Bukh
617-921-8311
jbukh@distributedei.com
icon

From: Beckman, Abigail S (DEC) <abigail.beckman@dec.ny.gov>
Sent: Monday, November 24, 2025 3:09 PM
To: Jonas Bukh <jbukh@distributedei.com>
Cc: Trevor Maclachlan <tmaclachlan@distributeder.com>; Deyo, Jacob (External) <deyoj@hunt-eas.com>; Ryan Harrington <rharrington@distributeder.com>; Prateek Tare <ptare@distributedei.com>; smikheyeva@nexamp.com <smikheyeva@nexamp.com>; Peter Plaks <pplaks@nexamp.com>; David Moulton <dmoulton@distributedei.com>; Jackson Elwell <jelwell@distributedei.com>
Subject: RE: Van Buren - Module explanation

Jonas,

I have a few additional comments and questions:

1.Please provide a copy of the document being referenced for calculations.

2. The previous module I am referencing was in the approved change of use work plan it

was called “ZNSHINE ZXM7-SHLDD144” (See Change of use Work plan pg 62). I'm assuming this is different than the Heliene module being referenced and I wanted to clarify.

3. Can you send this information about the new module and about the ballasts, if they are different than what is referenced in the Change of use work plan approved in 2023, in a letter similar to the one you sent over for the culvert addendum. Please include in this letter the document that has the maximum applied bearing calculations.

Please confirm you have a copy of the Change of Use Workplan approved in 2023.

Thank you,
Abigail

From: Jonas Bukh <jbukh@distributedei.com>
Sent: Thursday, November 13, 2025 1:04 PM
To: Beckman, Abigail S (DEC) <abigail.beckman@dec.ny.gov>
Cc: Trevor Maclachlan <tmaclachlan@distributeder.com>; Deyo, Jacob (External) <deyoj@hunt-eas.com>; Ryan Harrington <rharrington@distributeder.com>; Prateek Tare <ptare@distributedei.com>; smikheyeva@nexamp.com; Peter Plaks <pplaks@nexamp.com>; David Moulton <dmoulton@distributedei.com>; Jackson Elwell <jelwell@distributedei.com>
Subject: Van Buren - Module explanation

Hey Abigail,

Regarding the explanation for module on the cap. Please see engineer response below.

Tier 2 Engineering Response:
It is our understanding that DEI requested the module be changed from Heliene to Silfab back in July during 50% comments.
The applied bearing to the landfill cap resulting from the racking loading is a direct function of the tributary area of the modules supported by the rack. When the module dimensions change slightly, the applied bearing values will also slightly change. A bearing capacity of 1000psf is the assumed limit used for all module types unless provided other information that says otherwise. For the current Silfab module, the maximum applied bearing is 520psf as outlined in the calculations on pages 22, 43, and 64 of 64. With the previous Heliene module (not currently used or reflected in the calculations), the maximum applied bearing capacity was 580psf.

Best,

Jonas

VAN BUREN SOLAR

DISTRIBUTED ENERGY INFRASTRUCTURE, LLC

3.78MWAC/4.88 MWDC GROUND MOUNTED PV SOLAR

1320 KINGDOM ROAD
BALDWINSVILLE, NY 13027

PROJECT INFORMATION	
PROPERTY OWNER:	TOWN OF VAN BUREN 7575 VAN BUREN ROAD BALDWINSVILLE, NY 13027
SITE NAME:	VAN BUREN SOLAR
SITE ADDRESS:	1320 KINGDOM ROAD BALDWINSVILLE, NY13027
TAX MAP #:	042.-01-03.1
ZONING JURISDICTION:	TOWN OF VAN BUREN
COUNTY:	ONONDAGA COUNTY
TOTAL AREA OF DISTURBANCE:	30.30± ACRES

VAN BUREN SOLAR CIVIL QUANTITIES

FENCED AREA (ACRES)	27.1
EQUIPMENT PAD AREA (SF)	224
LAYDOWN AREA (SF)	7,619
TOTAL DISTURBED AREA (ACRES)	+/-14.9
ROAD LENGTH (LF)	998'
LAYDOWN YARD AGGREGATE (CY)	71
SILT SOCK (LF)	4,693'
FENCE (LF)	419'
AGGREGATE DRIVEWAY (CY)	903
AGGREGATE EQUIPMENT PADS (CY)	33
GEOTEXTILE (SF)	27,340
GATE COUNT	TWO AT 20' WIDE

IFC SITE IMPROVEMENT PLANS

SHEET INDEX

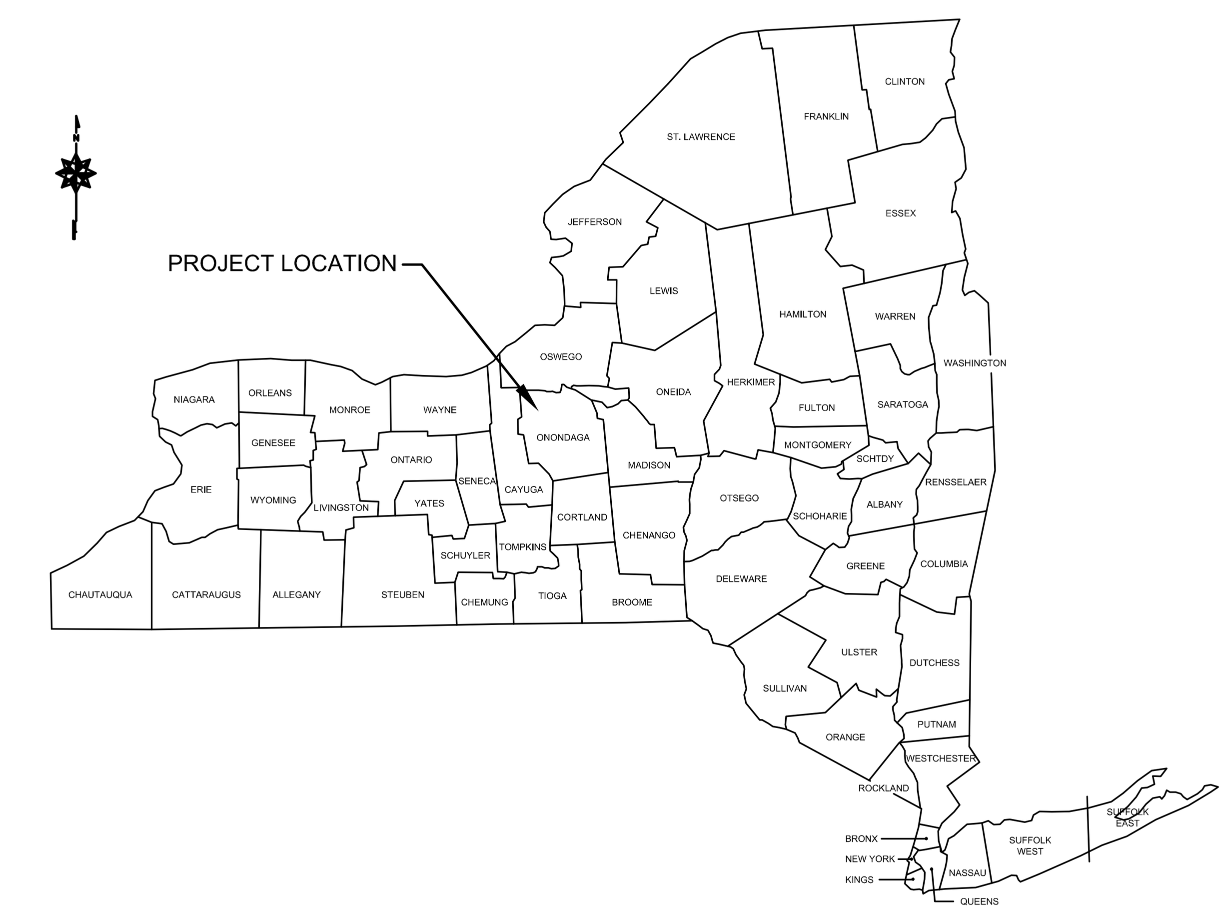
PV RACKING DESIGN & DETAILS BY TERRASMART, DATED 09/03/2025.
PV ELECTRICAL PLANS BY CANNING ENGINEERS, DATED XX/XX/XXXX.

SCALE: 1" = 1,000'

STREET MAP

SCALE: 1" = 1,000'

AERIAL MAP



NOT TO SCALE

LOCATION MAPS

UTILITY INFORMATION:
NATIONAL GRID
300 ERIE BLVD W
SYRACUSE NY, 13202
1-800-642-4272

ELECTRICAL ENGINEER OF RECORD:
CANNING ENGINEERS, INC
PATRICK CANNING
PHONE: 413-644-6347
LICENSE: NO. 54889

OWNER/ OPERATOR INFORMATION:
NEXAMP, INC.
ATTN: PETER PLAKS
(303)-625-3519
261 MADISON AVE, 18TH FLOOR
NEW YORK, NY 10016

CIVIL ENGINEER OF RECORD:
HUNT-EAS
4 COMMERCIAL STREET, SUITE 300
ROCHESTER, NY 14120

APPLICANT INFORMATION:
DISTRIBUTED ENERGY INFRASTRUCTURE, LLC
1320 KINGDOM ROAD
BALDWINSVILLE, NY 13027

SEPTEMBER 2025
HUNT NO. 3615.004
90% IFC PLANS

NOT FOR CONSTRUCTION

THIS IS TO CERTIFY THAT TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF - THESE PLANS AND SPECIFICATIONS ARE IN ACCORDANCE WITH APPLICABLE REQUIREMENTS OF THE BUILDING CODE, FIRE CODE, AND ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE.

HUNT ENGINEERS | ARCHITECTS | SURVEYORS

HORSEHEADS, NY 607 - 358 - 1000 ROCHESTER, NY 585 - 327 - 7949 TOWANDA, PA 570 - 265 - 4868
BINGHAMTON,NY 607 - 798 - 8081 ALBANY,NY 607 - 798 - 8081
WWW.HUNT-EAS.COM
NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC2203131464-1

GENERAL NOTES:

1. THE CONTRACTOR(S) THOROUGHLY FAMILIARIZED THEMSELVES WITH ALL CONSTRUCTION DOCUMENTS, SPECIFICATIONS, AND SITE CONDITIONS PRIOR TO BIDDING AND PRIOR TO CONSTRUCTION.
2. EXISTING INFORMATION AND CONDITIONS ARE NOT GUARANTEED. CONTRACTOR VERIFIED EXISTING CONDITIONS FOR CORRECTNESS AND COMPLETENESS OF THE INFORMATION SHOWN BEFORE BEGINNING CONSTRUCTION, THE CONTRACTOR PERFORMED THE FOLLOWING TASKS:
   - A. NOTIFIED DIG SAFELY NEW YORK AT 1-800-962-7962, AND MADE SURE THEY COMPLETED THE MARKING OF PUBLIC UTILITIES WITHIN THE LIMITS OF CONSTRUCTION AT LEAST 48 HOURS PRIOR TO START OF CONSTRUCTION. MAINTAINED MARKINGS THROUGHOUT CONSTRUCTION;
   - B. COORDINATED WITH PROJECT OWNER AND REVIEWED ANY OWNER INFORMATION THAT COULD LEAD TO THE DISCOVERY OF UTILITIES NOT LOCATED BY SURVEY;
   - C. VERIFED THE GENERAL ACCURACY OF THE EXISTING CONDITIONS SHOWN ON THE SITE DRAWINGS BY VISUAL INSPECTION OF THE SURFACE OF THE SITE AND ALL EXISTING STRUCTURES, PAVING, AND UTILITY APPURTENANCES VISIBLE THEREON;
   - D. VERIFIED THE EXISTENCE, SIZE, LOCATION AND ELEVATION OF EXISTING UTILITIES (INCLUDING BUT NOT LIMITED TO STORM DRAINS, SANITARY LINES, WATER LINES, GAS LINES, ELECTRIC LINES, TELEPHONE LINES, AND COMMUNICATION DUCTS, AND ALL MANHOLES, INLETS, CLEAN-OUTS, VALVES, HANDHOLES, ETC. RELATED THERETO WITHIN THE LIMIT OF CONTRACT IN ORDER TO, (1) AVOIDED DAMAGING OR DISRUPTING SERVICE, AND (2) TO COORDINATED AND FACILITATED CONSTRUCTION OF PROPOSED UTILITIES AND OTHER IMPROVEMENTS, UNDERGROUND FACILITIES VERIFIED AS TO LOCATION AND DEPTH PRIOR TO EXCAVATING. EXISTING UTILITY INVERTS WERE FIELD VERIFIED PRIOR TO ORDERING STRUCTURES.
   - E. IMMEDIATELY REPORTED TO PROJECT OWNER THE RESULTS OF STEPS (A),(B),(C), AND (D) WHICH MIGHT INDICATE ANY DISCREPANCY BETWEEN ACTUAL CONDITIONS AND THOSE SHOWN ON THE PLAN, AND POTENTIAL CONFLICTS BETWEEN PROPOSED IMPROVEMENT AND EXISTING CONDITIONS
2. THE CONTRACTOR VERIFED ALL EXISTING CONDITIONS IN THE FIELD AND REPORTED ANY DISCREPANCIES BETWEEN PLANS AND ACTUAL CONDITIONS TO PROJECT OWNER PRIOR TO STARTING WORK
3. IN THE EVENT THAT THE CONTRACTOR OR CONTRACTOR'S SUBCONTRACTORS DAMAGED ANY EXISTING SITE FEATURE (I.E. CURB, PAVEMENT, UTILITY, TREE, LAWN, ETC.) NOT INDICATED TO BE DEMOLISHED INSIDE OR OUTSIDE LIMIT OF CONTRACT, OR ANY NEWLY INSTALLED IMPROVEMENT, THE CONTRACTOR REPAIRED AND REPLACED SAID DAMAGE TO PROJECT OWNER'S SATISFACTION, AT CONTRACTOR'S SOLE COST AND EXPENSE
4. PROPERTY IRONS SHOWN ON THE PLANS OR LOCATED DURING CONSTRUCTION PROTECTED FROM THE CONTRACTORS OPERATIONS. DAMAGED OR REMOVED IRONS WERE REPLACED AT THE CONTRACTOR'S EXPENSE BY LICENSED SURVEYOR.
5. UNLESS NOTED OTHERWISE, THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING MATERIALS AND LABOR FOR CONSTRUCTION, SURVEY, AND STAKE OUT OF PROPOSED IMPROVEMENTS. UNLESS OTHERWISE NOTED, ITEMS WERE REMOVED THAT ARE NOT STOCKPILED FOR LATER REUSE ON THE PROJECT OR DELIVERED TO THE OWNER AND ALL EXCESS EXCAVATED MATERIAL BECAME THE PROPERTY OF THE CONTRACTOR AND DISPOSED OF OFF SITE IN A LAWFUL MANNER.
6. PUBLIC AND PRIVATE ROADS AND PARKING LOT KEPT CLEAN OF MUD, DUST, AND DEBRIS AT ALL TIMES.
7. SITE SURVEY CONDUCTED BY IANUZI & ROMANS LAND SURVEYING, P.C., DATED SEPTEMBER 13, 2024. SITE LAYOUT OF ACCESS DRIVE, PAD LOCATIONS & KEY EQUIPMENT TO BE PERFORMED BY A LICENSED LAND SURVEYOR & VERIFIED BY THE PROJECT CONTRACTOR WITH THE EOR PRIOR TO CONSTRUCTION.
8. LOCATION FOR CONTRACTORS STAGING AREA (TRAILER, STORAGE, OR STOCKPILE AREAS) IS CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH PROJECT OWNER. ALL AREAS USED FOR STAGING & STOCKPILES WERE ENCIRCLED WITH SILT SOCK AND RESTORED TO EXISTING CONDITIONS AT THE CONCLUSION OF CONSTRUCTION.
9. UNLESS NOTED OTHERWISE ON DRAWINGS, REMOVAL OF EXISTING CONDITIONS INCLUDES COMPLETE REMOVAL AND LEGAL DISPOSAL OF ENTIRE FEATURE OR STRUCTURE INCLUDING FOOTINGS.
10. CONTRACTOR USED NY83, CF COORDINATE SYSTEM AND BASELINE TO LAYOUT PROPOSED WORK IN THE FIELD.
11. ANY DISCREPANCIES BETWEEN DRAWINGS, SPECIFICATIONS, AND SITE CONDITIONS WERE REPORTED IMMEDIATELY TO PROJECT OWNER FOR CLARIFICATIONS AND RESOLUTION PRIOR TO BIDDING OR CONSTRUCTION.
12. THE CONTRACTOR(S) IS RESPONSIBLE FOR COORDINATING THEIR EFFORTS WITH ALL TRADES.
13. NO LOADING OR UNLOADING TO BE DONE ON PUBLIC ROADWAYS.
14. ALL PLANS COMPLY WITH REQUIREMENTS OF SPECIAL USE PERMIT GRANTED BY THE TOWN OF VAN BUREN PLANNING BOARD ON OCTOBER 10, 2023.
15. VARIANCES GRANTED BY THE TOWN OF VAN BUREN ZBA ON FEBRUARY 14, 2023 ALLOWED A REDUCTION BOTH SIDE AND REAR SETBACKS.
16. NYSDEC JURISDICTIONAL DETERMINATION LETTER DATED FEBRUARY 4, 2025.

SYSTEM DESIGN:

1. ALL SYSTEMS DESIGNED AND INSTALLED IN ACCORDANCE WITH PROVISIONS SET FORTH BY THE UNIFORM BUILDING CODE, IBC, NEC, PSC STANDARD INTERCONNECTION REQUIREMENTS, AND ALL OTHER APPLICABLE REGULATIONS.
2. GEOTECHNICAL REPORT PROVIDED BY CME ASSOCIATES, INC, DATED JUNE 28, 2022.
3. CHANGE OF USE - WORK PLAN PREPARED BY C&S COMPANIES ON SEPTEMBER 26, 2023. NYSDEC ACCEPTED WITH LETTER DATED OCTOBER 2, 2023.
4. MECHANICAL RACKING DESIGN SUBMITTAL PROVIDED BY TERRASMART DATED 09/03/2025.

ELECTRICAL NOTES:

1. ELECTRICAL PLANS "SITE BASE 3D_CANNING LAYOUT" PROVIDED BY CANNING ENGINEERS, DATED 09/XX/2025.

SEQUENCE OF CONSTRUCTION:

1. CONDUCTED A PRE-CONSTRUCTION MEETING THAT SHALL BE ATTENDED BY THE QUALIFIED INSPECTOR, AND INVOLVED SUBCONTRACTORS TO DISCUSS RESPONSIBILITIES AS THEY RELATE TO THE IMPLEMENTATION OF THE SWPPP MEASURES TO AVOID AND MINIMIZE IMPACTS TO PROTECTED SPECIES DURING REMEDIATION, DEMOLITION, AND CONSTRUCTION.
2. INSTALL STABILIZED CONSTRUCTION ENTRANCES/EXIT(S) AS SHOWN ON THE PLANS.
3. DELINEATE THE LIMITS OF DISTURBANCE FOR THE PROJECT.
4. ESTABLISH LOCATION FOR STAGING AREA AND SOIL STOCKPILE AS SHOWN ON THE PLANS. IF THESE AREAS ARE NOT CONDUCIVE DUE TO ANY UNFORESEEN CONDITIONS, THE CONTRACTOR SHALL IDENTIFY A NEW LOCATION FOR REVIEW AND APPROVAL BY THE ENGINEER.
5. INSTALLED PERIMETER CONTROLS (SILT FENCE / SILT SOCK) ON THE SITE AS SHOWN ON THE PLANS INCLUDING THE INSTALLATION SURROUNDING THE PERIMETER OF THE SOIL STOCKPILE AREA(S) STAGING AREA, AND THE DOWN GRADIENT SIDE OF ALL SOLAR PANEL ARRAY LOCATIONS. CLEARED ONLY TO THOSE AREAS NECESSARY TO INSTALL PERIMETER CONTROLS.
6. STABILIZED ANY EXISTING DISTURBED AREAS WITHIN THE PROPERTY THAT ARE OUTSIDE THE LIMITS OF CONSTRUCTION DISTURBANCE.
7. ENGAGED A QUALIFIED PROFESSIONAL TO PERFORM AN INITIAL SITE INSPECTION AND ASSESSMENT. IMPLEMENTED ANY ADDITIONAL CONTROLS RECOMMENDED IN SAID INSPECTION.
8. ENGAGED A QUALIFIED INSPECTOR TO CONDUCT CONSTRUCTION DURATION INSPECTIONS ACCORDING TO THE SWPPP.
9. CLEARED AND GRUBBED SITE WITHIN LIMITS OF CONSTRUCTION.
10. STRIPPED AND STOCKPILED TOPSOIL AS NEEDED.
11. INSTALLED ACCESS DRIVE.
12. BEGIN ROUGH GRADING AND MASS EXCAVATION ACTIVITIES.
13. INSTALLED STORM SEWERS, STORMWATER MANAGEMENT PRACTICES, AND OTHER REQUIRED UTILITIES AS SHOWN ON PLANS.
14. BEGIN INSTALLATION OF SOLAR ARRAY BALLASTS, MOUNTING STRUCTURES, AND MODULES. CONSTRUCTOR SHALL LIMIT SOLAR ARRAY SUPPORTS AND MODULE INSTALLATION TO AREAS AND SECTIONS OF NO GREATER THAN 5 ACRES AT ONE TIME, SEEDING AND STABILIZATION MEASURES SHALL BE IMPLEMENTED BEFORE MOVING ONTO THE NEXT SECTION OF SOLAR PANEL INSTALLATION.
15. INSTALLED AND MAINTAINED ALL PRACTICES IN CONFORMANCE WITH THE PLANS, DETAILS, AND PROJECT SWPPP.
16. TEMPORARILY SEEDED, THROUGHOUT CONSTRUCTION, DENUDED AREAS THAT WERE INACTIVE FOR 14 DAYS OR MORE.
17. INSTALLED SOLAR PANELS, CIVIL, ELECTRICAL, MECHANICAL SCOPE.
18. PERMANENTLY STABILIZED AREAS AS THEY WERE BROUGHT TO FINAL GRADE.
19. COMPLETED FINAL GRADING AND INSTALLED LANDSCAPE PLANTINGS.
20. RESTORED SOIL IN ACCORDANCE WITH SECTION 5.1.6 OF THE STORMWATER MANAGEMENT DESIGN MANUAL. FULL SOIL RESTORATION WAS REQUIRED IN AREAS OF CUT OR FILL AND IN AREAS THAT HAVE BEEN IMPACTED BY CONSTRUCTION EQUIPMENT.
21. OBTAINED CONCURRENCE WITH THE CONSTRUCTION MANAGER (CM) THAT THE SITE HAS BEEN FULLY STABILIZED THEN:
    - a. REMOVED ALL REMAINING TEMPORARY EROSION AND SEDIMENT CONTROL DEVICES.
    - b. STABILIZED ANY AREAS DISTURBED BY THE REMOVAL OF BMP'S
    - c. ASKED THE CM TO CONTACT THE QUALIFIED INSPECTOR TO COMPLETE FINAL SITE INSPECTION AND REPORT ACCORDING TO THE SWPPP. VERIFIED THAT CONSTRUCTION IS COMPLETE AND THAT THE SITE HAS ACHIEVED FINAL STABILIZATION. COMPLETED THE NOTICE OF TERMINATION (NOT) AND SUBMITTED TO NYSDEC DIVISION OF WATER TO CLOSE THE PERMIT.

LANDSCAPING NOTES:

1. LANDSCAPING INSTALLED IN ACCORDANCE W/ VISUAL SCREENING REQUIREMENTS PER PLAN.
2. VEGETATIVE SCREENING INSTALLED TO MINIMIZE ANY VIEWING OF THE FACILITY FROM IMMEDIATE SURROUNDING ROADWAYS

DRIVEWAY PERMIT NOTES:

1. PROJECT DID NOT CAUSE DISRUPTION TO TRAFFIC ON COUNTY OR TOWN ROADWAYS AND ANY TEMPORARY TRAFFIC CONTROLS WERE IN ACCORDANCE WITH THE PERMIT AND NYDOT 619 SAFETY STANDARDS.

BASIS OF DESIGN

APPLICABLE BUILDING CODE:
2018 IBC

RISK CATEGORY: 1

WIND CRITERIA:
EXPOSURE CATEGORY: C
WIND SPEED (V): 102 MPH
TOPOGRAPHIC FACTOR (K_{ZT}): 1.0

SNOW CRITERIA:
GROUND SNOW (P_g): 50 PSF
EXPOSURE FACTOR (C_e): 1.0

SEISMIC CRITERIA:
SEISMIC DESIGN CATEGORY: A
S_S: 0.16
S_{DS}: 0.14
S_{D1}: 0.064
S_1: 0.045

ABBREVIATIONS

(E)	EXISTING	LF	LINEAR FEET
(P)	PROPOSED	MAX	MAXIMUM
APPROX	APPROXIMATE	MH	MANHOLE
AHJ	AUTHORITY HAVING JURISDICTION	MIN	MINIMUM
℄	CENTERLINE	NTS	NOT TO SCALE
CP	CONTROL POINT	OC	ON CENTER
DIA	DIAMETER	PE	PERMANENT EASEMENT
EAE	ENGINEER APPROVED EQUAL	ROW	RIGHT OF WAY
EOR	ENGINEER OF RECORD	SAN	SANITARY
EG	EXISTING GROUND	STA	STATION
FT	FEET/FOOT	TE	TEMPORARY EASEMENT
GW	GROUNDWATER	TELE	TELEPHONE
GV	GAS VALVE	TEMP	TEMPORARY
EL	ELEVATION	TYP	TYPICAL
IN	INCH	W/	WITH
INV	INVERT	WV	WATER VALVE

Dig Safely. New York
Call 811 before you dig

NOT FOR CONSTRUCTION

DRAWN BY:
CHECKED BY:
DATE: 07/22/2025
PHASE: 90% IFC PLANS

#	DATE:	DESCRIPTION OF REVISION:
1	08/22/2025	REVISED PER EQUIPMENT PAD RELOCATION
2	09/03/2025	REVISED MODULE & EQUIPMENT LAYOUT

HUNT ENGINEERS | ARCHITECTS | SURVEYORS
HORSEHEADS, NY 607 - 358 - 1000 ROCHESTER, NY 585 - 327 - 7950
TOWANDA, PA 570 - 265 - 4868 BINGHAMTON, NY 607 - 798 - 8081
ALBANY, NY 607 - 798 - 8081 WWW.HUNT-EAS.COM
NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC2203131464-1

GENERAL NOTES

VAN BUREN SOLAR
DISTRIBUTED ENERGY INFRASTRUCTURE
1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C001

PROJECT NO: 3615-004

MAP REFERENCE:
KINGDOM ROAD SOLAR
BY: IANUZI & ROMANS LAND SURVEYING, P.C.
FILE NO.: 13616
DATED: FEBRUARY 28, 2024

LAND OWNER
TOWN OF VAN BUREN
1320 KINGDOM ROAD
BALDWINSVILLE, NY, 13027

Control Points

CP1
IRON ROD
N=1147981.04
E=865284.61
Elev=443.68

CP2
IRON ROD
N=1146916.81
E=865376.56
Elev=503.56

CP3
IRON PIPE
N=1147095.71
E=865793.78
Elev=476.49

CP4
IRON PIPE
N=1147127.77
E=866266.86
Elev=490.82

CP5
IRON PIPE
N=1147154.17
E=866635.74
Elev=510.79

EXISTING CONDITIONS NOTES:

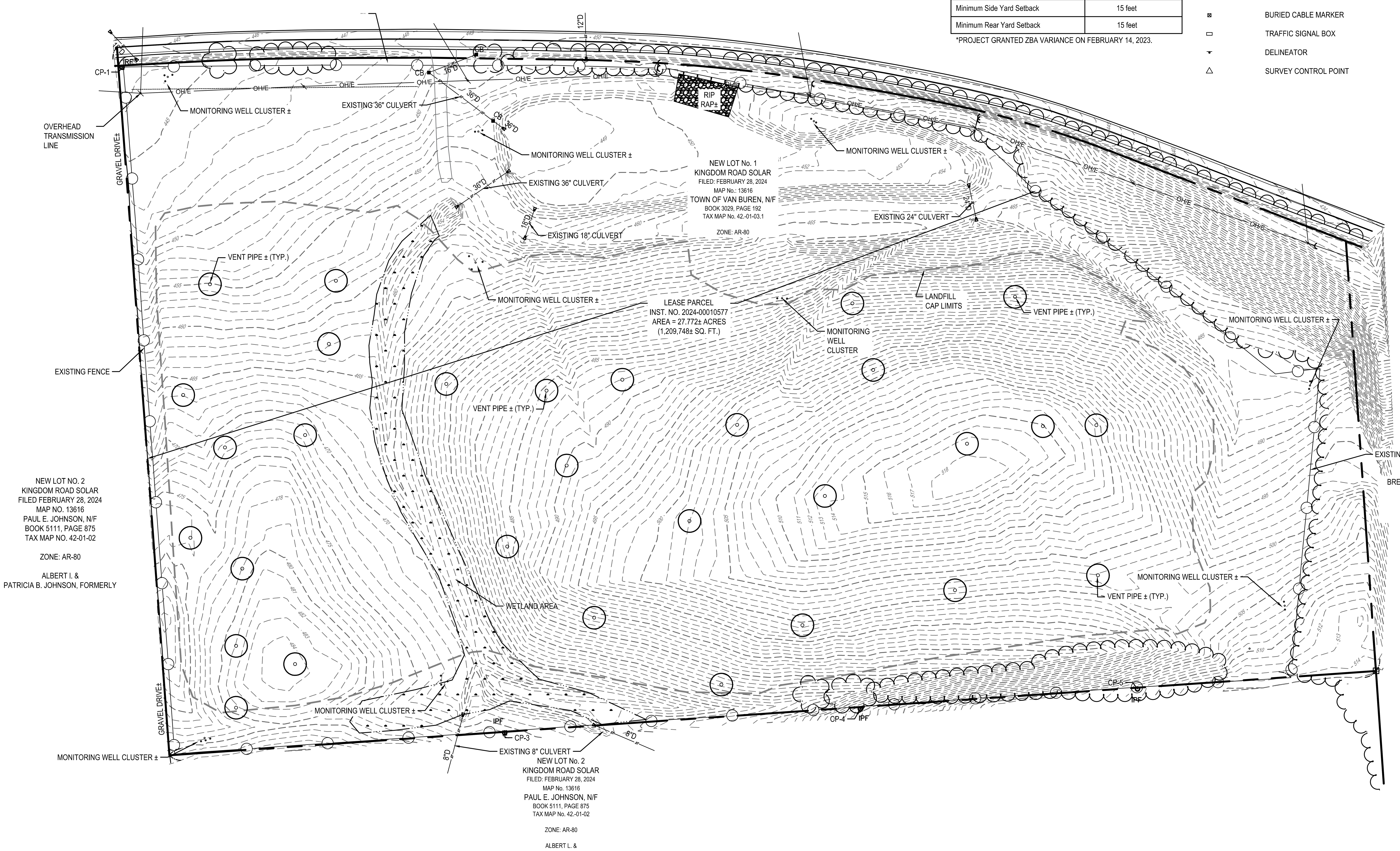
1. TOTAL AREA: 30.30± ACRES TO ROAD BOUNDARY. TAX MAP NO. 42.-01-03.1. PRESENT ZONE: AR-80 (AGRICULTURE/RESIDENCE)
2. HORIZONTAL DATUM: NORTH AMERICAN DATUM OF 1983 (NAD83), NY83CF CENTRAL ZONE, US SURVEY FEET.
3. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88) AS ESTABLISHED BY THE NEW YORK STATE DEPARTMENT OF TRANSPORTATION (NYSDOT) REAL TIME NETWORK (NYSNET RTN).
4. EXISTING CONDITIONS SURVEY INFORMATION WAS PREPARED BY IANUZI & ROMANS LAND SURVEYING, P.C. MAP DATED SEPTEMBER 13, 2024.
5. WETLAND DELINEATION CONDUCTED IN JUNE 2022 BY C&S ENGINEERS, INC. AND A JURISDICTIONAL DETERMINATION WAS MADE BY THE NYSDEC ON FEBRUARY 4, 2025.
6. THE PREMISES SHOWN HEREON IS WITHIN ZONE "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.) ACCORDING TO FEDERAL EMERGENCY MANAGEMENT AGENCY NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP COMMUNITY PANEL NO. 36067C0043F, EFFECTIVE DATE: NOVEMBER 4, 2016.
7. CONTROL POINTS SHALL BE LOCATED AND/OR ESTABLISHED ON SITE BY A LICENSED SURVEYOR PRIOR TO COMMENCING PROPOSED SITE LAYOUT.
8. SITE TOPOGRAPHY SHOWN BASED ON AERIAL DRONE SURVEY PROVIDED BY DEI ON JULY 24, 2025, FILE NAME "2535010__DEI__CAD RELEASE__20250724"
9. CONTOUR INTERVAL IS 1 FOOT.
10. LOCATION OF UNDERGROUND UTILITIES TAKEN BY FIELD MEASUREMENT WHERE PRACTICABLE, OTHERWISE TAKEN FROM VARIOUS OTHER SOURCES AND ARE APPROXIMATE ONLY.

BULK REGULATIONS	
PRESENT ZONE:	AR-80 RESIDENTIAL/RESIDENCE
PRINCIPAL & ATTACHED ACCESSORY STRUCTURE	
Minimum Lot Area	80,000 sq. ft.
Minimum Lot Width	200 feet
Minimum Lot Depth	250 feet
Minimum Front Yard Setback	60 feet
Minimum Side Yard Setback	*20 / 58 feet
Minimum Rear Yard Setback	*55 feet
Maximum Building Area	500 sq. ft.
Building Height	30 feet
Maximum Lot Coverage	20%
DETACHED ACCESSORY STRUCTURE	
Minimum Front Yard Setback	EBL
Minimum Side Yard Setback	15 feet
Minimum Rear Yard Setback	15 feet

*PROJECT GRANTED ZBA VARIANCE ON FEBRUARY 14, 2023.

LEGEND

CONCRETE MONUMENT	SANITARY SEWER
IRON PIN	STORM SEWER
IRON PIPE	GAS PIPELINE
5/8" REBAR WITH SURVEY CAP SET	WATER PIPELINE
MAILBOX	BURIED TELEPHONE CABLE
CATCH BASIN	BURIED ELECTRIC CABLE
WATER OR GAS VALVE	OVERHEAD UTILITY LINES
UTILITY POLE	DECIDUOUS TREE
UTILITY POLE W/STREET LIGHT	CONIFEROUS TREE
UTILITY POLE ANCHOR	EXISTING SPOT ELEVATION
FIRE HYDRANT	MAJOR CONTOUR
STREET SIGN	MINOR CONTOUR
BOLLARD	FENCE
BURIED CABLE MARKER	SHRUBBERY / WOODLINE
TRAFFIC SIGNAL BOX	STONE WALL
DELINEATOR	EXISTING PROPERTY LINE
SURVEY CONTROL POINT	LIMIT OF DISTURBANCE
	PROPERTY SETBACK LINE
	LANDFILL CAP LIMITS



1 EXISTING CONDITIONS PLAN
SCALE: 1" = 10'

N

SCALE IN FEET
0 37.5 75 150 225
SCALE: 1" = 75'

NOT FOR CONSTRUCTION

DRAWN BY:
CHECKED BY:
DATE: 07/22/2025
PHASE: 90% IFC PLANS

#	DATE:	DESCRIPTION OF REVISION:
1	08/22/2025	REVISED PER EQUIPMENT PAD RELOCATION
2	09/03/2025	REVISED MODULE & EQUIPMENT LAYOUT

"IT IS A VIOLATION OF THE LAW FOR ANY PERSON TO MAKE UNAUTHORIZED ALTERATIONS OR ADDITIONS TO PLANS BEARING A LICENSED ENGINEER'S, ARCHITECT'S OR SURVEYOR'S SEAL."

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NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC22031131464-1

EXISTING CONDITIONS PLAN
VAN BUREN SOLAR
DISTRIBUTED ENERGY INFRASTRUCTURE
1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C101

PROJECT NO: 3615-004

SITE IMPROVEMENT NOTES:

1. PROVIDE 20' WIDE GRAVEL ACCESS ROAD WITH 70' T-TURNAROUNDS AS SHOWN. SEE DETAIL 2/C602.
2. PROVIDE CONCRETE EQUIPMENT PAD. SEE ELECTRICAL PLANS FOR DETAILS.
3. PROVIDE 8' CHAIN LINK FENCE WITH 10' O.C. POST SPACING AS SHOWN. PROVIDE WARNING SIGNS WITH CONTACT INFO. SEE DETAILS ON SHEET C603.
4. PROVIDE 20' VEHICLE GATE WITH KNOX BOX AND 4' PERSONNEL GATE. SEE DETAIL 7/C601. GATES SHALL BE A MINIMUM OF 6' OFFSET FROM EXISTING DRAINAGE STRUCTURES.
5. SOLAR PANELS ON RACKS BY OTHERS. PER 07-30-2025 CANNING LAYOUT "SITE BASE 3D_CANNING LAYOUT".
6. TEMPORARY GRAVEL LAYDOWN YARD. SEE DETAIL 1/C602. SOIL RESTORATION SHALL BE APPLIED TO LAYDOWN AREAS AFTER REMOVAL.
7. SOIL STOCKPILE AREA. SEE DETAIL 3/C601.
8. POINT OF INTERCONNECTION. SEE ELECTRICAL PLANS FOR DETAILS.
9. EXISTING VENT PIPE LOCATIONS TO MAINTAIN 15 FT OF CLEARANCE FROM DEVELOPMENT FOR MAINTENANCE PURPOSES.
10. TEMPORARY CONSTRUCTION TRAILER & GENERATOR LOCATION.

POROUS GRAVEL ROAD
TEMPORARY GRAVEL LAYDOWN

PROJECT INFORMATION	
PROJECT LATITUDE	43.149342°
PROJECT LONGITUDE	-76.411736°
UTILITY NAME	NATIONAL GRID
MIN. AMBIENT TEMPERATURE	-22.7°C
MAX. AMBIENT TEMPERATURE	33.6°C
METER NUMBER	OPEN
MODULE NAME	SILFAB SIL-580 XM+
INVERTER	(21) SOLECTRIA XGI 1500-166/166 (166 kW) (2) SOLECTRIA XGI 1500-150/166 (150 kW)
TILT ANGLE	±30°
NO. OF MODULES	8,424
DC STRING LENGTH	24
NO. OF STRINGS	351

Control Points

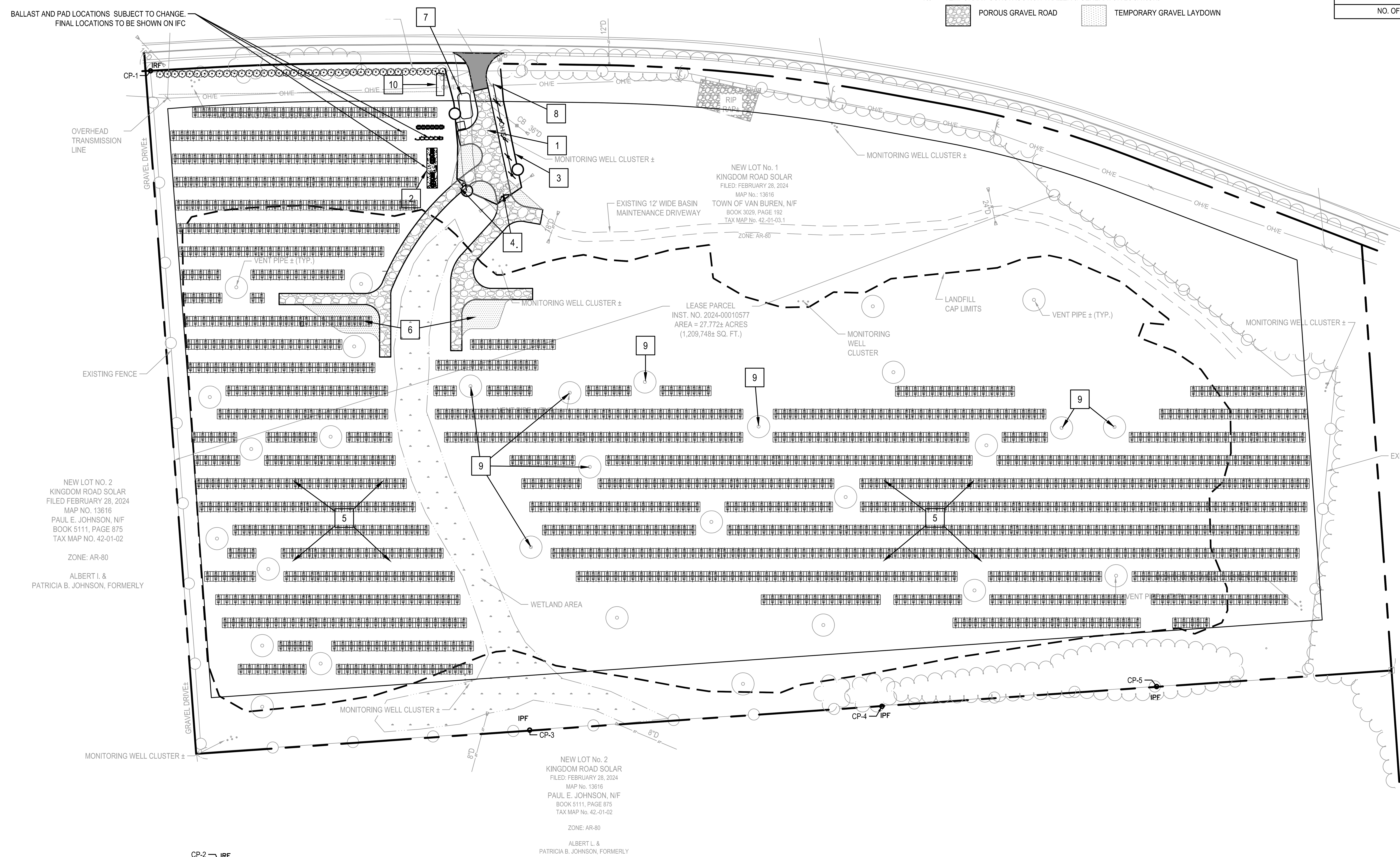
CP1
IRON ROD
N=1147981.04
E=865284.61
Elev=443.68

CP2
IRON ROD
N=1146916.81
E=865376.56
Elev=503.56

CP3
IRON PIPE
N=1147095.71
E=865793.78
Elev=476.49

CP4
IRON PIPE
N=1147127.77
E=866266.86
Elev=490.82

CP5
IRON PIPE
N=1147154.17
E=866635.74
Elev=510.79



1 SITE IMPROVEMENT PLAN
SCALE: 1"=75'

LEGEND:

- EXISTING UTILITY POLE
- UTILITY POLE ANCHOR
- OVERHEAD UTILITY LINES
- EXISTING GAS LINE
- EXISTING TRANSMISSION LINES
- APPROXIMATE PROPERTY LINE
- ADJACENT PROPERTY LINE
- SETBACKS
- UTILITY R.O.W.
- TREE LINE
- WETLANDS BOUNDARY
- PROPOSED UNDERGROUND UTILITY
- PROPOSED OVERHEAD UTILITY
- PROPOSED PROPERTY LINE
- PROPOSED SETBACK
- PROPOSED FENCE
- PROPOSED LEASE/DISTURBANCE LIMIT BOUNDARY
- LIMITS OF LANDFILL CAP
- PROPOSED GUY WIRE
- PROPOSED UTILITY POLE
- POROUS GRAVEL ROAD
- TEMPORARY GRAVEL
- WETLAND

SCALE IN FEET
0 37.5 75 150 225
SCALE: 1" = 75'

NOT FOR CONSTRUCTION

DRAWN BY:
CHECKED BY:
DATE: 07/22/2025
PHASE: 90% IFC PLANS

#	DATE:	DESCRIPTION OF REVISION:
1	08/22/2025	REVISED PER EQUIPMENT PAD RELOCATION
2	09/03/2025	REVISED MODULE & EQUIPMENT LAYOUT

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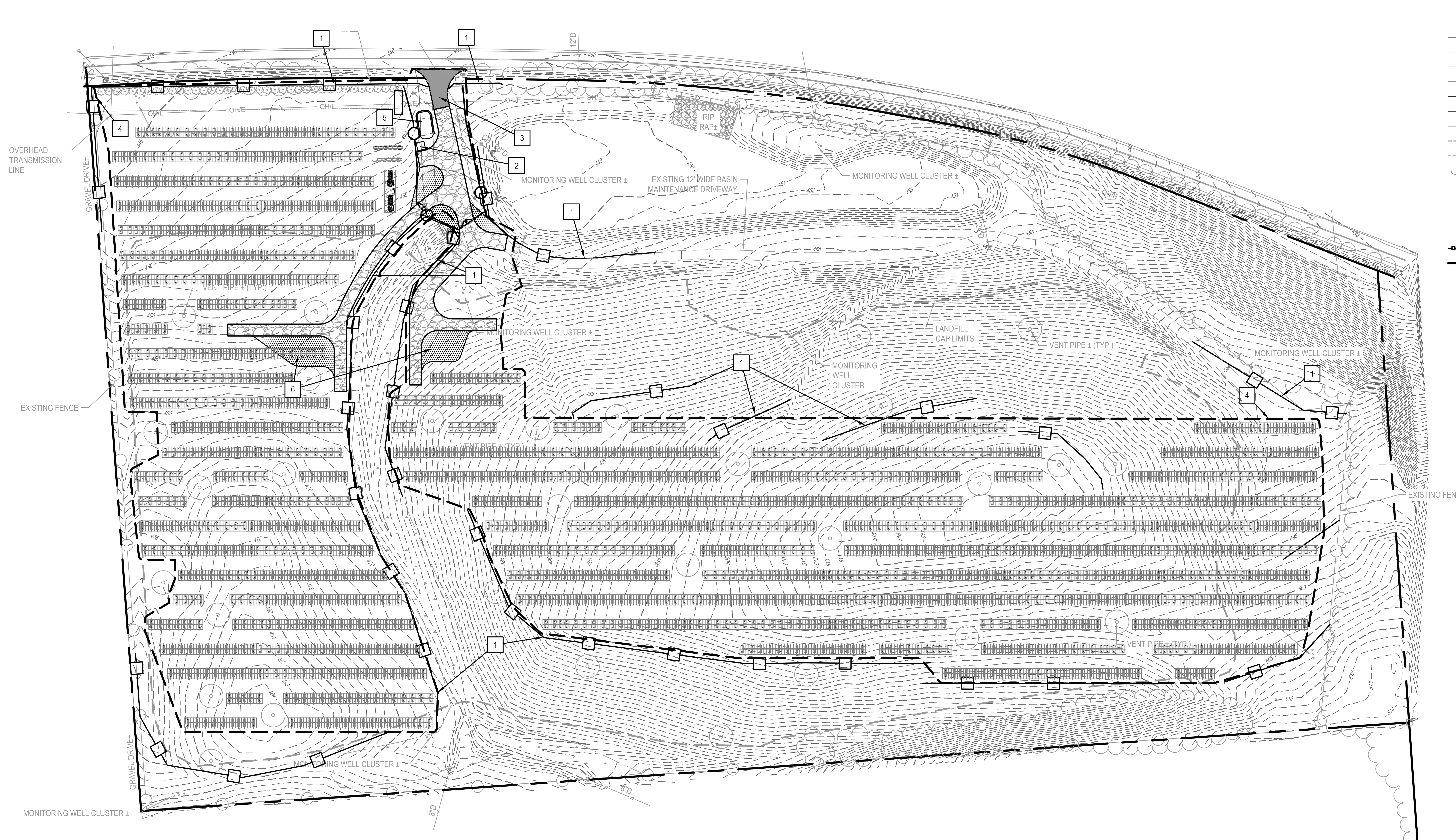
SITE IMPROVEMENT PLAN

VAN BUREN SOLAR
DISTRIBUTED ENERGY INFRASTRUCTURE
1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C201

PROJECT NO: 3615-004



1 GRADING AND EROSION CONTROL PLAN
SCALE: 1"=75'

SCALE IN FEET
0 37.5 75 150 225
SCALE: 1" = 75'

LEGEND:

- EXISTING UTILITY POLE
- UTILITY POLE ANCHOR
- OVERHEAD UTILITY LINES
- EXISTING GAS LINE
- EXISTING TRANSMISSION LINES
- APPROXIMATE PROPERTY LINE
- ADJACENT PROPERTY LINE
- SETBACKS
- UTILITY R.O.W.
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- TREE LINE
- POROUS GRAVEL ROAD
- TEMPORARY GRAVEL
- WETLAND
- STABILIZED CONSTRUCTION ENTRANCE
- SILT SOCK
- LIMITS OF DISTURBANCE

New York State Stormwater Management Design Manual
Chapter 5: Green Infrastructure Practices
Section 5.1 Planning for Green Infrastructure: Preservation of Natural Features and Conservation Design

Table 5.3 Soil Restoration Requirements

Type of Soil Disturbance	Soil Restoration Requirement		Comments/Examples
No soil disturbance	Restoration not permitted		Preservation of Natural Features
Minimal soil disturbance	Restoration not required		Clearing and grubbing
Areas where topsoil is stripped only - no change in grade	HSG A &B	~~HSG C&D~~	Protect area from any ongoing construction activities.
	apply 6 inches of topsoil	~~Aerate* and apply 6 inches of topsoil~~	
Areas of cut or fill	HSG A &B	~~HSG C & D~~	
	Aerate and apply 6 inches of topsoil	~~Apply full Soil Restoration **~~	
Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (de-compaction and compost enhancement)		THIS INCLUDES ANY AREAS ROUTINELY UTILIZED FOR CONSTRUCTION TRAFFIC AND THEREFORE HAVE BEEN COMPACTED BEYOND PRE-CONSTRUCTION DENSITIES AS A RESULT.

E & S PROTECTION PLAN NOTES:

1. PROVIDE SILT SOCK (TYP.) AS PER DETAIL 2/C601.
2. PROVIDE CONCRETE WASH OUT AREA AS PER DETAIL 5/C601. EXACT LOCATION TO BE DETERMINED BY CONTRACTOR.
3. PROVIDE CONSTRUCTION ENTRANCE AS PER DETAIL 4/C601. NO SOIL OR DIRT SHOULD BE TRACKED ONTO PAVEMENT AREA DURING ALL CONSTRUCTION PHASES.
4. LIMIT OF DISTURBANCE. ±14.81 ACRES.
5. SOIL STOCKPILE LOCATION AS PER DETAIL 3/C601. EXACT LOCATION TO BE DETERMINED BY CONTRACTOR.
6. EQUIPMENT STAGING AREA AS PER DETAIL 1/C602. EXACT LOCATION TO BE DETERMINED BY CONTRACTOR.
7. ALL DISTURBED AREAS SHALL BE RESTORED IN ACCORDANCE WITH TABLE 5.3 - SOIL RESTORATION REQUIREMENTS, PROVIDED ON THIS SHEET.
8. NO GROUND DISTURBANCE TO TAKE PLACE WITHIN LANDFILL CAP AREA.

NOT FOR CONSTRUCTION

DRAWN BY:	
CHECKED BY:	
DATE:	07/22/2025
PHASE:	90% IFC PLANS

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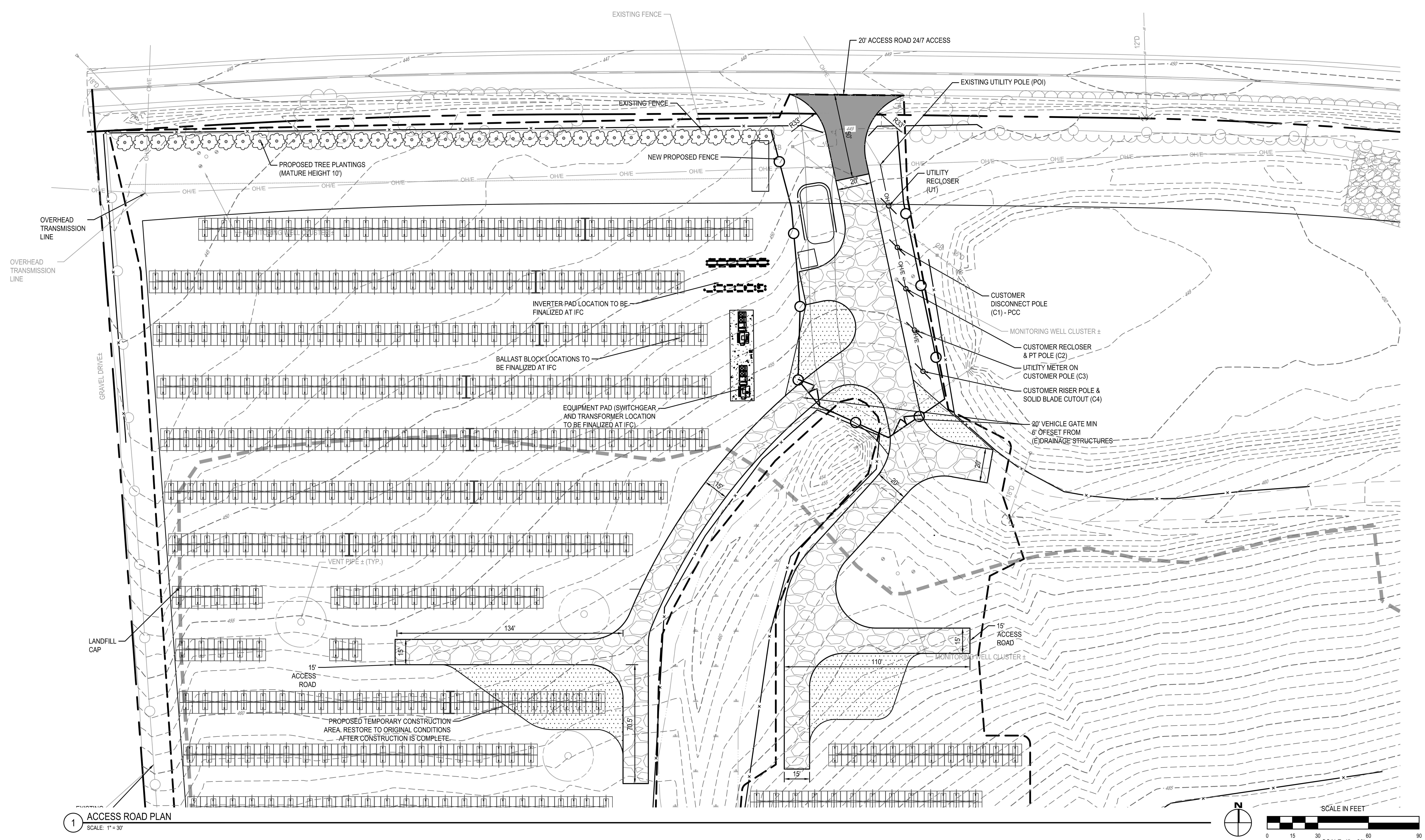
GRADING & E&SC PLAN
VAN BUREN SOLAR
DISTRIBUTED ENERGY INFRASTRUCTURE
1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C301

PROJECT NO: 3615-004



1 ACCESS ROAD PLAN
SCALE: 1" = 30'

NOT FOR CONSTRUCTION

DRAWN BY:	
CHECKED BY:	
DATE:	07/22/2025
PHASE:	90% IFC PLANS

#	DATE:	DESCRIPTION OF REVISION:
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NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC2203131464-1

ACCESS ROAD PLAN

VAN BUREN SOLAR

DISTRIBUTED ENERGY INFRASTRUCTURE

1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C401

PROJECT NO: 3615-004

WORK ZONE TRAFFIC CONTROL NOTES:

1. WORK ZONE TRAFFIC CONTROL REVISIONS

PROPOSED REVISIONS TO THE WORK ZONE TRAFFIC CONTROL (WZTC) PLAN OR MODIFICATIONS TO THE 619 STANDARD SHEETS SHALL BE SUBMITTED TO THE ENGINEER FOR THE REVIEW AND APPROVAL BY THE REGIONAL TRAFFIC ENGINEER PRIOR TO THE PLANNED IMPLEMENTATION OF SUCH REVISIONS OR MODIFICATIONS. THE CONTRACTOR SHALL NOT IMPLEMENT THE PROPOSED REVISIONS WITHOUT APPROVAL FROM THE REGIONAL TRAFFIC ENGINEER. WHEN APPLICABLE, NYSDOT WORK ZONE TRAFFIC CONTROL (WZTC) TYPICAL APPLICATIONS SHALL BE USED. TYPICALS CAN BE FOUND AT HTTPS://WEBAPPS.DOT.NY.GOV/WORK-ZONE-TRAFFIC-CONTROL

2. TRAVEL LANE WIDTHS IN WORK ZONES

WHERE NOT SHOWN IN THE WZTC PLANS OR OTHERWISE AUTHORIZED BY NYS DOT (OR THE ENGINEER), TRAVEL LANE WIDTHS IN WORK ZONES SHALL BE A MINIMUM OF 11 FT ON FREEWAYS, RAMPS, EXPRESSWAYS AND MULTI-LANE* CONVENTIONAL ROADWAYS AND 10 FT ON ALL OTHER CONVENTIONAL ROADWAYS.
*(MULTI-LANE ROADWAYS ARE THOSE WITH TWO OR MORE THRU LANES IN ONE OR BOTH DIRECTIONS.)

3. DAILY LANE, RAMP AND SHOULDER CLOSURE RESTRICTIONS

WORK ZONES SHALL BE RESTRICTED TO ONE SIDE OF THE ROADWAY AT A TIME IN EACH DIRECTION ON DIVIDED ROADWAYS, UNLESS APPROVED BY THE ENGINEER.

THE CONTRACTOR SHALL SCHEDULE WORK SO THAT ALL TRAVEL LANES AND RAMPS IN EACH DIRECTION ARE OPEN WHEN THE CONTRACTOR'S OPERATIONS ARE CLOSED DOWN OR SUBSTANTIALLY CLOSED DOWN.

DAILY CLOSURES MAY OCCUR OFF OF LONG-TERM CLOSURES AND SHALL BE SUBJECT TO DAILY CLOSURE RESTRICTIONS.WORK ZONES SHALL BE RESTRICTED TO ONE SIDE OF THE ROADWAY AT A TIME ON UNDIVIDED HIGHWAYS.

4. FLAGGING OPERATIONS

WHEN A PEDESTRIAN APPROACHES A FLAGGER STATION, THE FLAGGER SHALL STOP TRAFFIC AND DIRECT THE PEDESTRIAN TO A SAFE ROUTE THROUGH THE WORK AREA. FLAGGERS SHALL COORDINATE THE FLAGGING OF THE WORK ZONE TO ENSURE PEDESTRIANS CAN SAFELY PROCEED THROUGH THE AREA. IF THERE IS MORE THAN THE OCCASIONAL PEDESTRIAN WITHIN THE PROJECT LIMITS, REFER TO THE SITE SPECIFIC PEDESTRIAN WZTC PLAN.

5. NOTIFICATION REQUIREMENTS

REGION 3 HAS A WORK ZONE TRAFFIC CONTROL (WZTC) NOTIFICATION POLICY WHICH REQUIRES ENGINEERS/CONTRACTOR TO NOTIFY THE REGIONAL TRANSPORTATION MANAGEMENT CENTER (RTMC) PRIOR TO ALLOWING A CONTRACTOR TO IMPLEMENT WORK ZONE TRAFFIC CONTROL ACTIVITIES WITHIN THE HIGHWAY RIGHT OF WAY. WORK ZONE NOTIFICATION IS REQUIRED FOR THE FOLLOWING:

ALL OTHER STATE HIGHWAYS: ALL LANE CLOSURES WHOSE DURATION WILL BE GREATER THAN 2 HOURS AND ALL ROAD/BRIDGE CLOSURES.

THE CONTRACTOR SHALL REPORT PROPOSED WZTC ACTIVITIES NOTED ABOVE TO THE TMC BY NOON OF THE BUSINESS DAY (I.E. MONDAY THROUGH FRIDAY EXCLUDING HOLIDAYS) PRECEDING THE PROPOSED WZTC ACTIVITY. FAILURE TO DO SO WILL RESULT IN DISAPPROVAL TO PERFORM THE UNREPORTED WZTC ACTIVITY UNTIL THE ABOVE NOTIFICATIONS REQUIREMENTS ARE SATISFIED.

NO PLANNED WZTC ACTIVITY SHALL BE IMPLEMENTED WITHOUT FIRST RECEIVING CLEARANCE FROM THE RTMC.

6. VEHICLE RESTRICTIONS

THE CONTRACTOR SHALL REPORT ANY RESTRICTION (AS DEFINED BELOW) ON HIGHWAYS, RAMPS, OR BRIDGES AT LEAST SIX (6) BUSINESS WEEKDAYS IN ADVANCE OF THE RESTRICTION. SIX (6) DAYS LEAD TIME IS NECESSARY TO PROVIDE THE RTMC ADEQUATE TIME TO PREVENT ISSUANCE OF SPECIAL HAULING PERMITS THAT WOULD ROUTE OVERSIZE VEHICLES OVER THE RESTRICTED SECTION OF THIS CONTRACT.

RESTRICTIONS SHALL BE DEFINED AS ONE OR MORE OF THE FOLLOWING:
1: COMPLETE CLOSURE OF A HIGHWAY, RAMP OR BRIDGE.
2: INSTALLATION OF BARRIER OR CHANNELIZING DEVICES THAT RESULT IN AN UNOBSTRUCTED WIDTH LESS THAN 18 FEET ALONG A HIGHWAY, RAMP OR BRIDGE.
3:SUITABLE DRIVING SURFACES OF LESS THAN 18 FEET IN WIDTH.
4: AVAILABLE VERTICAL CLEARANCE ABOVE THE HIGHWAY IS LESS THAN 14 FEET IN HEIGHT.
5: WORK WOULD LIMIT VEHICLE LENGTH (I.E. TURNING ABILITY)
6: CHANGING THE LOAD CAPACITY OF A HIGHWAY, RAMP OR BRIDGE.

THE CONTRACTOR SHALL ALSO GIVE VERBAL NOTIFICATION AT LEAST SEVEN (7) BUSINESS DAYS (I.E. MONDAY THROUGH FRIDAY EXCLUDING HOLIDAYS) PRIOR TO AND AT THE END OF A RESTRICTION ON ANY ROADWAY TO THE:

ONONDAGA COUNTY: EMERGENCY CONTROL CENTER (315) 425-2111
HIGHWAY PERMIT AGENT (315) 435-3176

7. WORK AREA COORDINATION

THE CONTRACTOR SHALL COORDINATE WORK ACTIVITIES WITH OTHER CONTRACTS WITHIN AND/OR ADJACENT TO THE CONTRACT WORK LIMITS.

8. ACCESS

THE CONTRACTOR SHALL ENSURE THAT ACTIVE LANES OF TRAFFIC ON FREEWAYS ARE NOT CROSSED BY PEDESTRIAN WORKERS. FOR ALL OTHER HIGHWAYS, THE CONTRACTOR SHALL ENSURE THAT PEDESTRIAN WORKERS CROSS ACTIVE LANES OF TRAFFIC ONLY AT PROPERLY MARKED OR UNMARKED CROSSWALKS AND/OR DEDICATED PEDESTRIAN WALKWAYS. IT IS REQUIRED THAT THE PROJECT SAFETY AND HEALTH PLAN ADDRESS ACCESS TO EACH WORK AND STAGING AREA.

WHERE IT IS FEASIBLE, VEHICLES AND EQUIPMENT USED FOR THE WORK AND TRANSPORTING OF WORKERS TO/FROM THE WORK SITE SHALL ENTER AND LEAVE THE AREA CLOSED BY CHANNELIZING DEVICES WITHIN THE TERMINATION AREA OF THE TEMPORARY TRAFFIC CONTROL ZONE. WHERE SUCH ACCESS WITHIN THE TERMINATION AREA IS NOT FEASIBLE, OTHER AREAS FOR ENTRY AND EXIT SHALL BE DETERMINED AND INCLUDED IN THE PROJECT SAFETY & HEALTH PLAN, INCLUDING ILLUSTRATED EXAMPLES (TYPICALS) TO CLEARLY SHOW THE TEMPORARY TRAFFIC CONTROL ELEMENTS THAT WILL BE PROVIDED.

9. CHANNELIZING DEVICES

ALL CHANNELIZING DEVICES SHALL BE PLACED SO AS TO PROVIDE A 2 FOOT LATERAL CLEARANCE TO THE TRAVELED WAY UNLESS OTHERWISE SHOWN ON THE PLANS. WHERE POSSIBLE A LATERAL BUFFER SPACE OF 2 FOOT MINIMUM SHALL BE PROVIDED BETWEEN THE WORK SPACE AND THE CHANNELIZING DEVICES.

CHANNELIZING DEVICE SPACING (CENTER TO CENTER) SHALL BE 40' MAXIMUM FOR POSTED SPEED LIMITS 40 MPH OR GREATER AND 20' MAXIMUM FOR POSTED SPEED LIMITS 35 MPH OR LESS.

STANDARD CONES AND TUBULAR MARKERS SHALL NOT BE USED FOR CHANNELIZATION AND DELINEATION DURING THE HOURS OF DARKNESS, WHICH IS DEFINED AS THE PERIOD BETWEEN SUNSET AND SUNRISE.

10. SIGNS

ALL CONSTRUCTION SIGNS SHALL BE MOUNTED AT A HEIGHT OF 7 FEET ABOVE THE EDGE OF TRAVEL LANE.

SIGNS SHALL NOT ENCROACH MORE THAN 4" INTO SHOULDERS USED BY PEDESTRIANS OR BICYCLES.

WHERE SHOULDER WIDTHS ARE LIMITED AND SIGNS CANNOT BE ERECTED BEYOND THE SHOULDER, CONSTRUCTION SIGNS MAY NEED TO BE MOUNTED ON CONCRETE MEDIAN BARRIERS, BRIDGE PARAPETS, ETC.

11. NON-PAYMENT

THE CONTRACTOR'S FAILURE TO COMPLY WITH THE REQUIREMENTS AS STATED ABOVE WILL BE CONSIDERED UNSATISFACTORY TEMPORARY WORK ZONE TRAFFIC CONTROL. PAYMENT WILL BE WITHHELD FOR THE VARIOUS CONTRACT ITEMS WHICH CONTAIN WORK ZONE TRAFFIC CONTROL PROVISIONS IN ACCORDANCE WITH TABLE 619-7 FOR EACH DAY THAT A FAILURE TO COMPLY OCCURS. FAILURE TO COMPLY WILL ALSO RESULT IN THE ASSESSMENT OF LIQUIDATED DAMAGES FOR EACH VIOLATION.

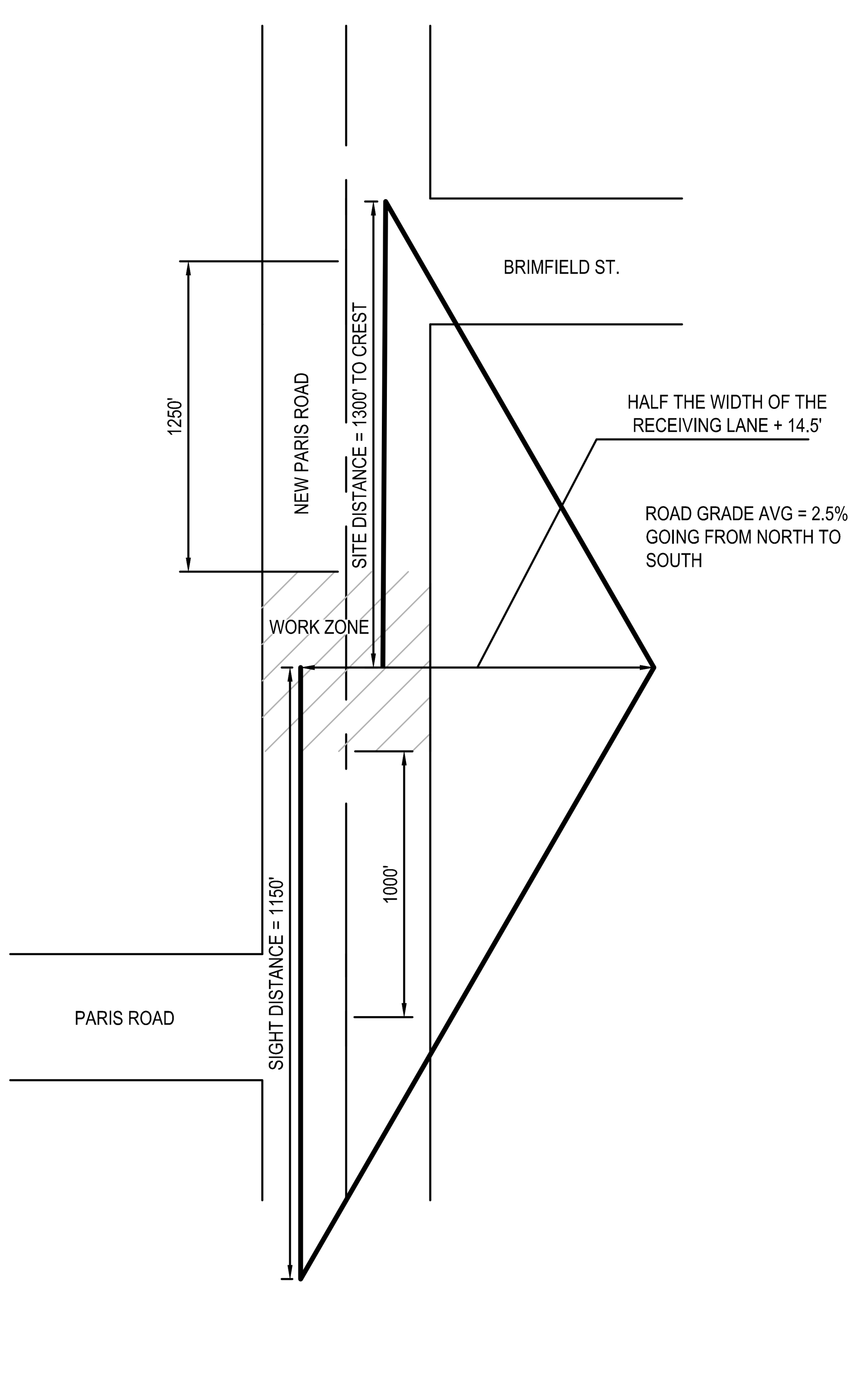
12. MISCELLANEOUS (LOCAL OR PERMIT PROJECTS)

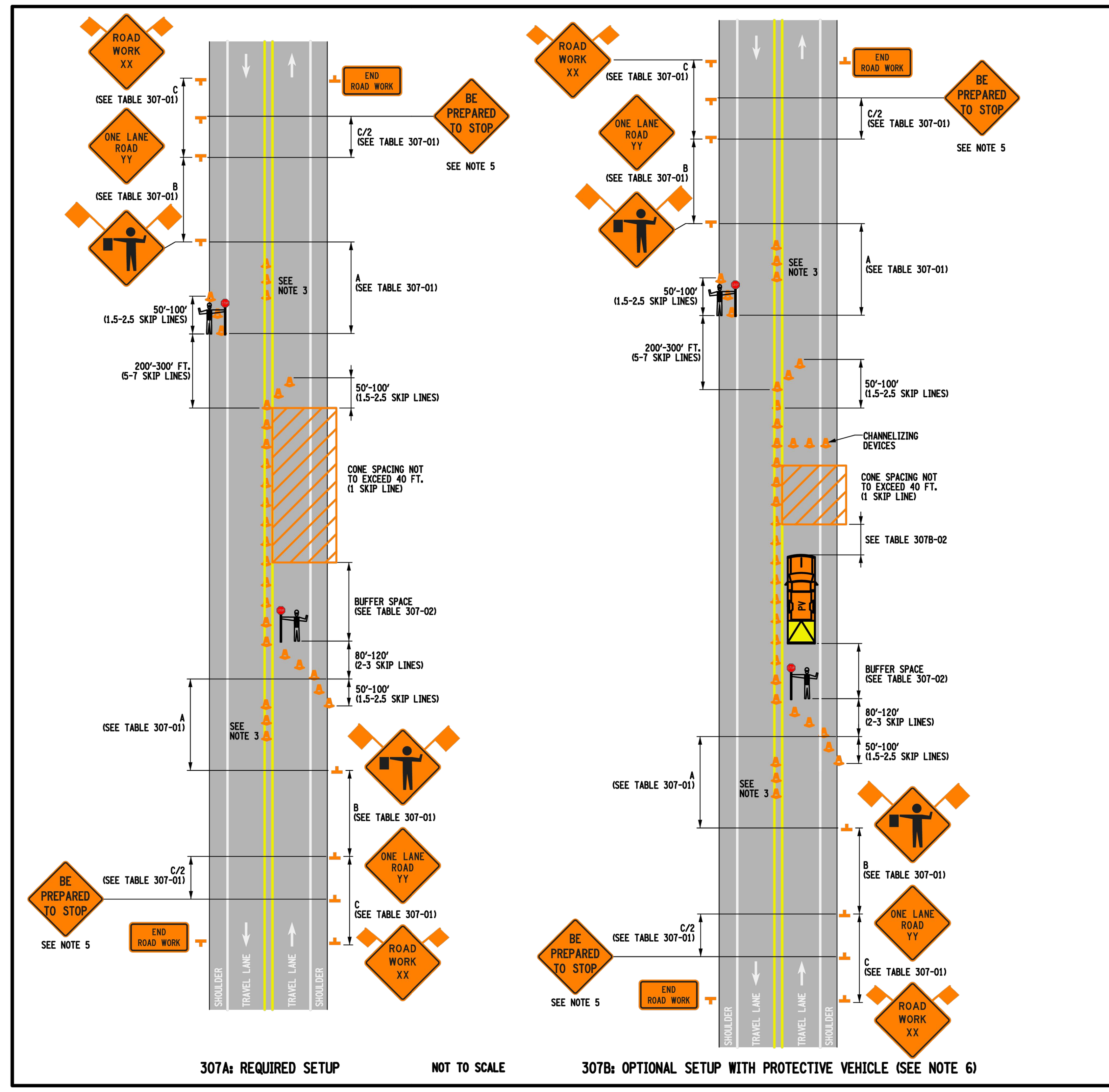
1. THE CONTRACTOR SHALL BE AWARE THAT THE WORK ZONE TRAFFIC CONTROL IS A VERY CRITICAL ITEM OF THE PERMIT AND SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 619 "WORK ZONE TRAFFIC CONTROL" OF THE STANDARD SPECIFICATIONS, THE 2009 EDITION OF THE NATIONAL MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS AND THE NEW YORK STATE SUPPLEMENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR WORK ZONE TRAFFIC CONTROL AT ALL TIMES FOR THE DURATION OF THE PERMITTED WORK.
2. ACTUAL FIELD CONDITIONS MAY REQUIRE OTHER SIGNS AND OTHER ARRANGEMENTS OF SIGNS. DISTANCES SHALL BE ADAPTED TO PREVAILING CONDITIONS. SIGNS SHALL BE LOCATED TO PROVIDE OPTIMUM VISIBILITY. SIGNS THAT ARE NOT APPLICABLE SHALL BE COVERED OR OBSCURED FROM SIGHT. ALL SIGN NUMBERS REFER TO THE 2009 EDITION OF THE NATIONAL MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS AND THE NEW YORK STATE SUPPLEMENT.
3. PEDESTRIAN ACCOMMODATIONS SHALL BE MAINTAINED FOR THE DURATION OF THE PROPOSED WORK. ANY DISTURBED AREAS WITHIN THE STATE RIGHT-OF-WAY SHALL BE ADEQUATELY FENCED TO PREVENT PEDESTRIAN ACCESS WHEN THE CONTRACTORS OPERATIONS ARE CLOSED DOWN.
4. MATERIALS, EQUIPMENT AND VEHICLES SHALL NOT BE STORED OR PARKED WITHIN THE STATE RIGHT-OF-WAY BEFORE WORK BEGINS OR AFTER CONTRACTOR'S OPERATIONS ARE SHUT DOWN. STAGING AREAS OUTSIDE THE RIGHT-OF-WAY SHALL BE USED TO STOCKPILE ALL CONSTRUCTION MATERIALS.

   DURING WORKING HOURS, NO CONSTRUCTION MATERIAL MAY BE STORED OR PLACED ON THE ROADWAY OR ROADBED EXCEPT WITHIN A PROTECTED WORK AREA.
5. VEHICLES BELONGING TO THE CONTRACTOR OR WORKERS SHALL NOT BE PARKED WITHIN 30 FEET OF THE EDGE OF PAVEMENT ALONG A ROADWAY BEING USED BY THE GENERAL PUBLIC, UNLESS THEY ARE PARKED WITHIN A PROTECTED WORK AREA.

   DURING NON-WORKING HOURS, CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT BE STORED WITHIN 30 FEET OF THE EDGE OF PAVEMENT.
6. W20-7A "FLAGGER" SIGNS SHALL BE USED WHENEVER FLAGGING OCCURS FOR MORE THAT A BRIEF PERIOD OF TIME. THE SIGNS SHALL BE PROMPTLY REMOVED, COVERED, OR FACED AWAY FROM TRAFFIC WHEN THE FLAGGING OPERATION CEASES.

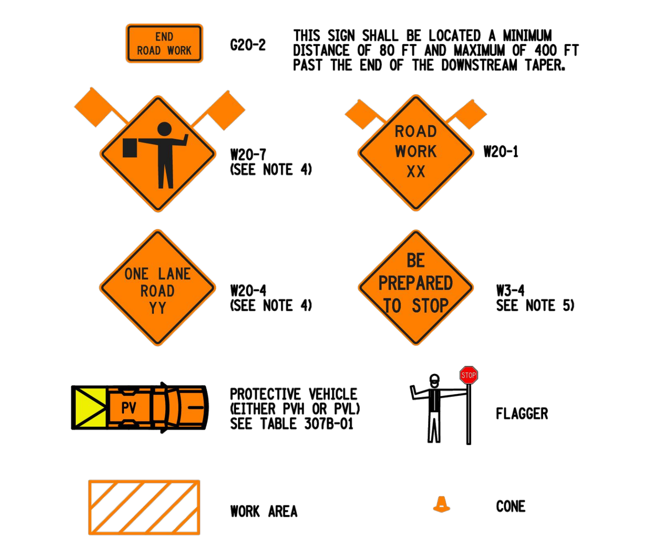
   ALL FLAGGING STATIONS AND LANE CLOSURES SHOULD BE LOCATED TO ENSURE MAXIMUM VISIBILITY.
7. NO DROP-OFF GREATER THAN SIX INCHES SHALL BE LEFT OVERNIGHT WITHIN 30 FEET OF THE EDGE OF PAVEMENT. DROP-OFFS LESS THAN SIX INCHES WILL BE PERMITTED IF PROPER DELINEATION AND SIGNING IS PROVIDED, AND PRIOR PERMISSION IS GRANTED IN WRITING BY A REPRESENTATIVE OF THE DEPARTMENT. A DROP-OFF IS CONSIDERED ELIMINATED IF TAPERED AWAY BY A 1 ON 6 SLOPE OR FLATTER.
8. CARE SHALL BE TAKEN TO INSURE THAT NO DAMAGE OCCURS TO THE EXISTING PAVEMENT/SHOULDER/CURB AREAS AS A RESULT OF CONSTRUCTION EQUIPMENT MOVEMENT.
9. THE CONTRACTOR MAY SUBMIT REVISIONS TO THIS PLAN FOR APPROVAL, BUT ANY CHANGE THAT ALTERS THE BASIC CONCEPTS OF THE PLAN MUST BE APPROVED BY THE NYSDOT REGIONAL DIRECTOR OR HIS DESIGNEE.





NOTES:

1. SHORT-TERM STATIONARY IS DAYTIME WORK THAT OCCUPIES A LOCATION FOR MORE THAN 1 HOUR WITHIN A SINGLE DAY PERIOD.
2. IN URBAN CONDITIONS, ADVANCE WARNING SIGN SPACINGS MAY BE ADJUSTED IN ORDER TO ACCOMMODATE SIDE STREETS AND DRIVEWAYS. IF THERE IS A CONFLICT, MOVE THE SIGN UPSTREAM.
3. CENTERLINE CONES MAY BE ADDED TO ENHANCE THE VISIBILITY OF THE FLAGGER STATION. IF CONES ARE USED, PLACE THEM 100 FT. (MINIMUM) FROM FLAGGER.
4. FLAGGER SYMBOL SIGN (W20-7) AND "ONE LANE ROAD AHEAD" SIGN (W20-4) SHALL BE REMOVED, COVERED OR TURNED AWAY FROM ROAD USERS WHEN FLAGGING OPERATIONS ARE NOT OCCURING.
5. IF THE TRAFFIC IS EXPECTED TO QUEUE PAST THE W20-4 SIGN, A W3-4 SIGN SHOULD BE ADDED.
6. PROTECTIVE VEHICLE WITH APPROPRIATE ROLL AHEAD DISTANCE MAY BE USED IN ADVANCE OF THE WORK AREA, IF DEEMED NECESSARY BY THE DOT ENGINEER OR THEIR DESIGNEE. TO USE PROTECTIVE VEHICLE, BUFFER SPACE SHALL BE PROVIDED ACCORDINGLY.
7. WHEN A SIDE ROAD OR DRIVEWAY INTERSECTS THE ROADWAY WITHIN A WORK ZONE TRAFFIC CONTROL AREA, ADDITIONAL TEMPORARY TRAFFIC CONTROL DEVICES AND/OR FLAGGERS SHALL BE PLACED AS NEEDED. ADDITIONAL FLAGGERS SHALL BE LOCATED AT ALL INTERSECTIONS AND COMMERCIAL DRIVEWAYS LOCATED WITHIN OR NEAR THE ACTIVE WORK SPACE.
8. CHANNELIZING DEVICE SPACING (CENTER TO CENTER) SHALL NOT EXCEED 40' IN THE ACTIVE WORK SPACE.
9. CHANNELIZING DEVICES SHALL BE PLACED TRANSVERSELY A MINIMUM OF EVERY 800' AS SHOWN WHEN A PAVED SHOULDER HAVING A WIDTH OF 8' OR GREATER IS CLOSED FOR A DISTANCE GREATER THAN 800'.
10. ALL FLAGGERS SHALL USE 24"(MIN.) OCTAGON SHAPED STOP/SLOW PADDLES HAVING 6' STAFF. THE PADDLE IS THE PREFERRED DEVICE, BUT THE FLAG MAY BE USED AT INTERSECTIONS WHERE THE STOP/SLOW PADDLE WOULD OFFER CONTRADICTING INFORMATION TO DRIVERS TRAVELING IN OPPOSITE DIRECTIONS/LEGS OF THE INTERSECTION OR DURING INCIDENT MANAGEMENT SITUATIONS.



REFER TO SHEET 2 OF 2 FOR ALL TABLES

New York State of Opportunity. Department of Transportation

U.S. CUSTOMARY STANDARD SHEET

WORK ZONE TRAFFIC CONTROL
TWO-LANE TWO-WAY ROADWAY
LANE CLOSURE WITH FLAGGERS
SHORT TERM OPERATION
(SHEET 1 OF 2)

ERRATA 2 EFF. 09/01/23 ISSUED WITH EB 23-016
ERRATA 1 EFF. 01/01/23 ISSUED WITH EB 22-050

APPROVED DECEMBER 2, 2021
Robert Limoges
ROBERT LIMOGES, P.E.
DIRECTOR, OTSM

ISSUED UNDER EI 21-028
619-307

TABLE 307-01: ADVANCE WARNING SIGN SPACING

ROAD TYPE	DISTANCE BETWEEN SIGNS A (FT.)	B (FT.)	C (FT.)	SIGN LEGEND XX	YY
URBAN (≤ 30 MPH*)	100	100	100	AHEAD	AHEAD
URBAN (35-40 MPH*)	200	200	200	AHEAD	AHEAD
URBAN (≥ 45 MPH*)	350	350	350	1000 FT.	AHEAD
RURAL	500	500	500	1500 FT.	1000 FT.

* PRECONSTRUCTION POSTED SPEED LIMIT

TABLE 307-02: LONGITUDINAL BUFFER SPACE

PRECONSTRUCTION POSTED SPEED LIMIT (MPH)	LONGITUDINAL BUFFER SPACE DISTANCE (FT.)/ # OF SKIP LINES
25	155/4
30	200/5
35	250/6
40	305/8
45	360/9
50	425/11
55	495/13

TABLE 307-03: REQUIRED SIGN SIZES*

SIGN	NON-FREEWAY	FREEWAY
G20-2	36x18	48x24
W3-4	36x36	48x48
W20-1	36x36	48x48
W20-4	36x36	48x48
W20-7	36x36	48x48
WARNING FLAG	18x18	18x18

*FREEWAY SIZES MAY BE USED ON NON-FREEWAY, IF SPACE CONSTRAINTS DO NOT EXIST.

TABLE 307B-01: PROTECTIVE VEHICLE REQUIREMENTS

CLOSURE TYPE	ROAD TYPE & SPEED / EXPOSURE CONDITIONS (SEE NOTE 1)	NON-FREEWAY ≥ 45 MPH	35 - 40 MPH	≤ 30 MPH
LANE CLOSURE OR ENCROACHMENT	WORKERS ON FOOT OR WORK VEHICLE EXPOSED TO TRAFFIC	PVH+TMIA	PVL+TMIA	PVL
	-NO WORKERS ON FOOT -NO WORK VEHICLE EXPOSED TO TRAFFIC -OTHER HAZARDS EXPOSED (IE EQUIPMENT, MATERIALS)	PVH+TMIA	PVL	SEE NOTE 2
SHOULDER CLOSURE OR ENCROACHMENT	WORKERS ON FOOT OR WORK VEHICLE EXPOSED TO TRAFFIC	PVH+TMIA	PVL	PVL
	-NO WORKERS ON FOOT -NO WORK VEHICLE EXPOSED TO TRAFFIC -OTHER HAZARDS EXPOSED (IE EQUIPMENT, MATERIALS, EXCAVATION)	PVH+TMIA	PVL	SEE NOTE 2

LEGEND
PVL - PROTECTIVE VEHICLE LIGHT (MINIMUM GROSS WEIGHT 9,500 LBS. OR GREATER) (SEE NOTE 4)
PVH - PROTECTIVE VEHICLE HEAVY (MINIMUM GROSS WEIGHT 22,000 LBS. OR GREATER)
TMIA - TRUCK/TRAILER MOUNTED IMPACT ATTENUATOR

NOTES
1. THE EXPOSURE CONDITIONS ASSUME THERE IS NO POSITIVE PROTECTION PRESENT.
2. EITHER A PROTECTIVE LIGHT (PVL) OR THE STANDARD BUFFER SPACE (SEE TABLE 011-03 SHALL BE PROVIDED.
3. TRUCK/TRAILER MOUNTED IMPACT ATTENUATORS (TMIA) SHALL NOT BE MOUNTED/INSTALLED ON VEHICLES WITH A GROSS VEHICLE WEIGHT (GVW) LESS THAN WHAT IS MINIMALLY REQUIRED BY THE MANUFACTURER OF THE TMIA.
4. THE USE OF A PROTECTIVE VEHICLE LIGHT (PVL) AS A SHADOW VEHICLE IS LIMITED TO NON-FREEWAY ROADWAYS WHERE THE POSTED SPEED LIMITS IS ≤ 40 MPH UNLESS OTHERWISE AUTHORIZED BY THE ENGINEER.

TABLE 307B-02: ROLL AHEAD DISTANCE FOR PROTECTIVE VEHICLES

ROLL AHEAD DISTANCE (FT.)/# OF SKIP LINES FOR VEHICLES

PRECONSTRUCTION POSTED SPEED LIMIT (MPH)	STATIONARY OPERATION: PROTECTIVE VEHICLES WEIGHING 9,500 TO 21,999 LBS. GVW	PROTECTIVE VEHICLES WEIGHING 22,000 LBS. OR GREATER GVW
45 - 55	160/4	120/3
≤ 40	120/3	80/2

PROJECT HIGHWAY CONDITIONSS

New York State of Opportunity. Department of Transportation
U.S. CUSTOMARY STANDARD SHEET

WORK ZONE TRAFFIC CONTROL
TWO-LANE TWO-WAY ROADWAY
LANE CLOSURE WITH FLAGGERS
SHORT TERM OPERATION
(SHEET 2 OF 2)

APPROVED DECEMBER 2, 2021
Robert Limoges
ROBERT LIMOGES, P.E.
DIRECTOR, OTSM
ISSUED UNDER EI 21-028
619-307

NOT FOR CONSTRUCTION

DRAWN BY:
CHECKED BY:
DATE: 07/22/2025
PHASE: 90% IFC PLANS

#	DATE:	DESCRIPTION OF REVISION:
1	08/22/2025	REVISED PER EQUIPMENT PAD RELOCATION
2	09/03/2025	REVISED MODULE & EQUIPMENT LAYOUT

HUNT ENGINEERS | ARCHITECTS | SURVEYORS
HORSEHEADS, NY 607 - 358 - 1000 ROCHESTER, NY 585 - 327 - 7950
TOWANDA, PA 570 - 265 - 4868 BINGHAMTON, NY 607 - 798 - 8081
ALBANY, NY 607 - 798 - 8081 WWW.HUNT-EAS.COM
NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC2203131464-1

TRAFFIC CONTROL PLAN
VAN BUREN SOLAR
DISTRIBUTED ENERGY INFRASTRUCTURE
1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C402

PROJECT NO: 3615-004

NOT FOR CONSTRUCTION

DRAWN BY:	
CHECKED BY:	
DATE:	07/22/2025
PHASE:	90% IFC PLANS

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#	DATE:	DESCRIPTION OF REVISION:
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2	09/03/2025	REVISED MODULE & EQUIPMENT LAYOUT

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HORSEHEADS, NY 607-358-1000 ROCHESTER, NY 585-327-7950
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NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC2203131464-1

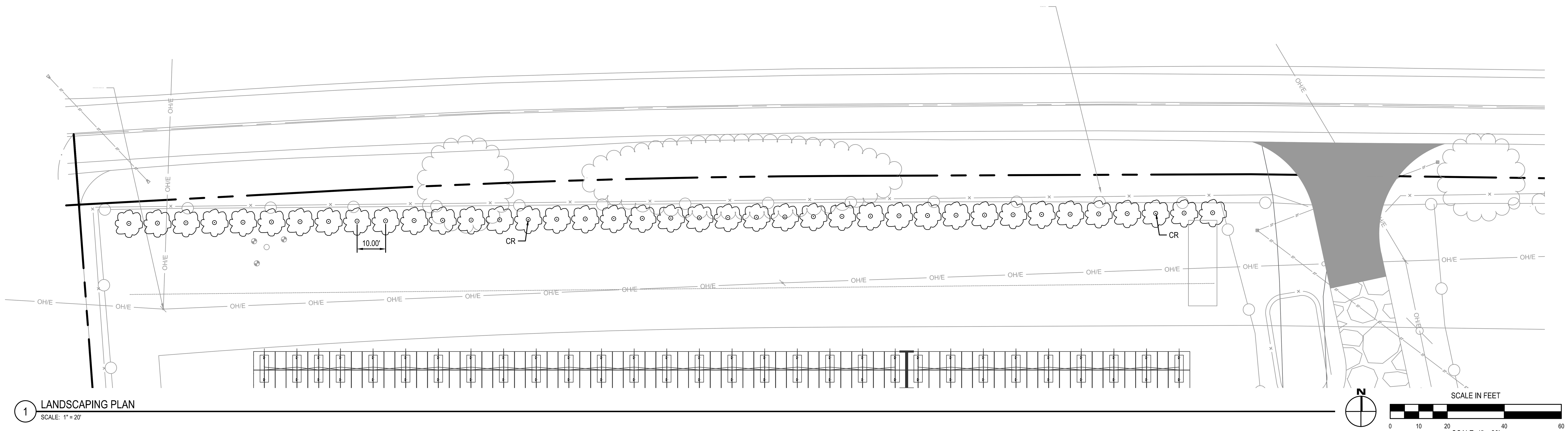
LANDSCAPING PLAN

VAN BUREN SOLAR DISTRIBUTED ENERGY INFRASTRUCTURE

1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C501

PROJECT NO: 3615-004



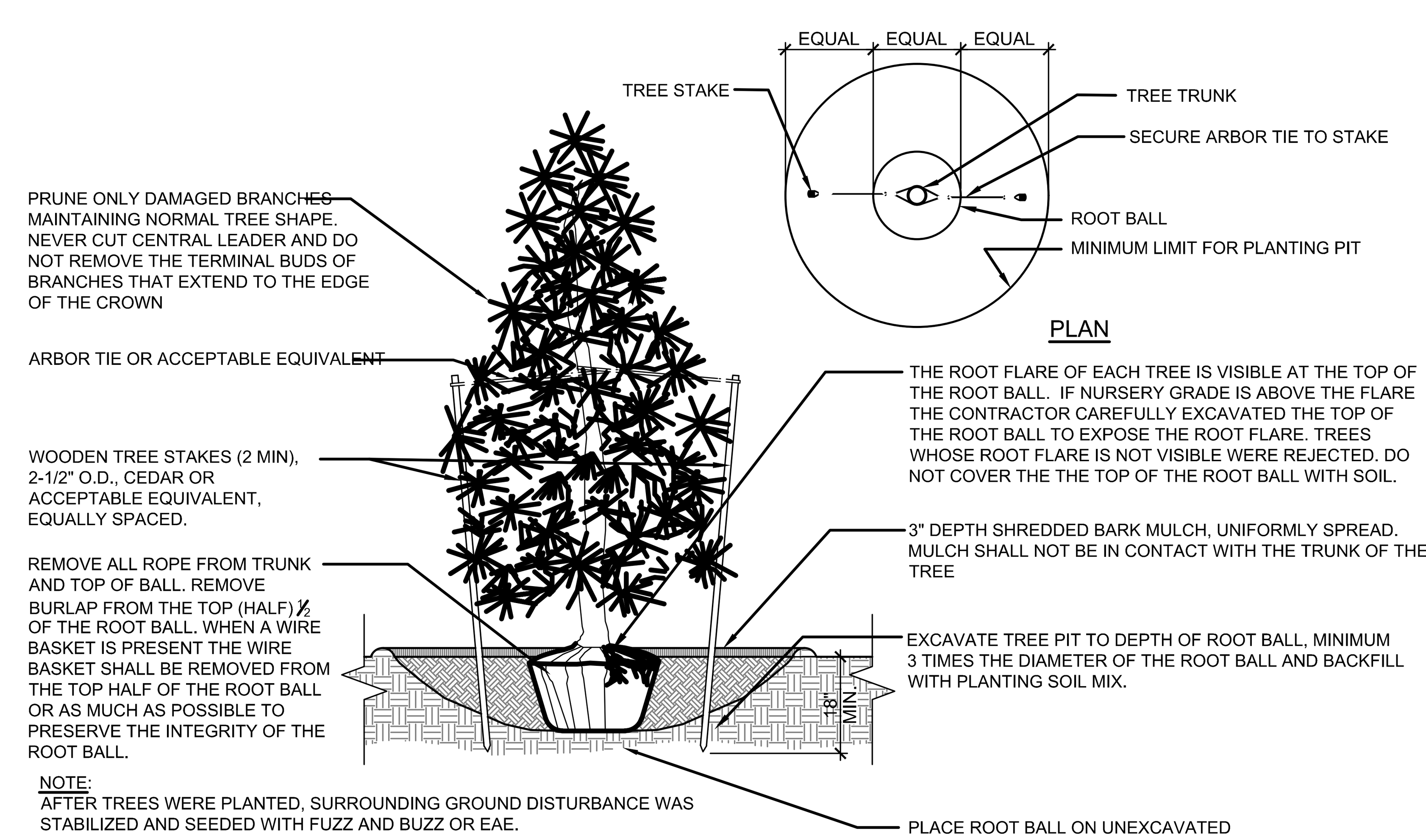
1 LANDSCAPING PLAN
SCALE: 1" = 20'

PLANT LIST

SYMBOL	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	REMARKS	SPACING
SHRUBS							
CR	39	COMUS RACEMOSA	GRAY DOGWOOD	#5 CONT.	B&B		10' O.C.

GENERAL NOTES:

1. TREES SHALL NOT BE PLANTED IN WETLANDS. TREES TO BE PLANTED IN WETLAND BUFFER SHALL BE PLANTED BY HAND AND NOT WITH HEAVY EQUIPMENT.
2. MAINTAIN 20' CLEAR ZONE BETWEEN THE LANDSCAPE PLANTINGS AND THE FENCING UNLESS NOTED OTHERWISE.
3. GAPS SHOWN BETWEEN PLANTING GROUPS SHALL BE NO WIDER THAN 30'.
4. TREES SHALL BE TRIMMED AS NEEDED TO AVOID SHADING/PRODUCTION IMPACTS.
5. ALL TREES AND SHRUBS ARE TO BE SET / INSTALLED IN A MINIMUM 4"-6" DEEP BED OF MULCH EXTENDING TO 4" PAST THE DRIP LINE OF EACH PLANTING.

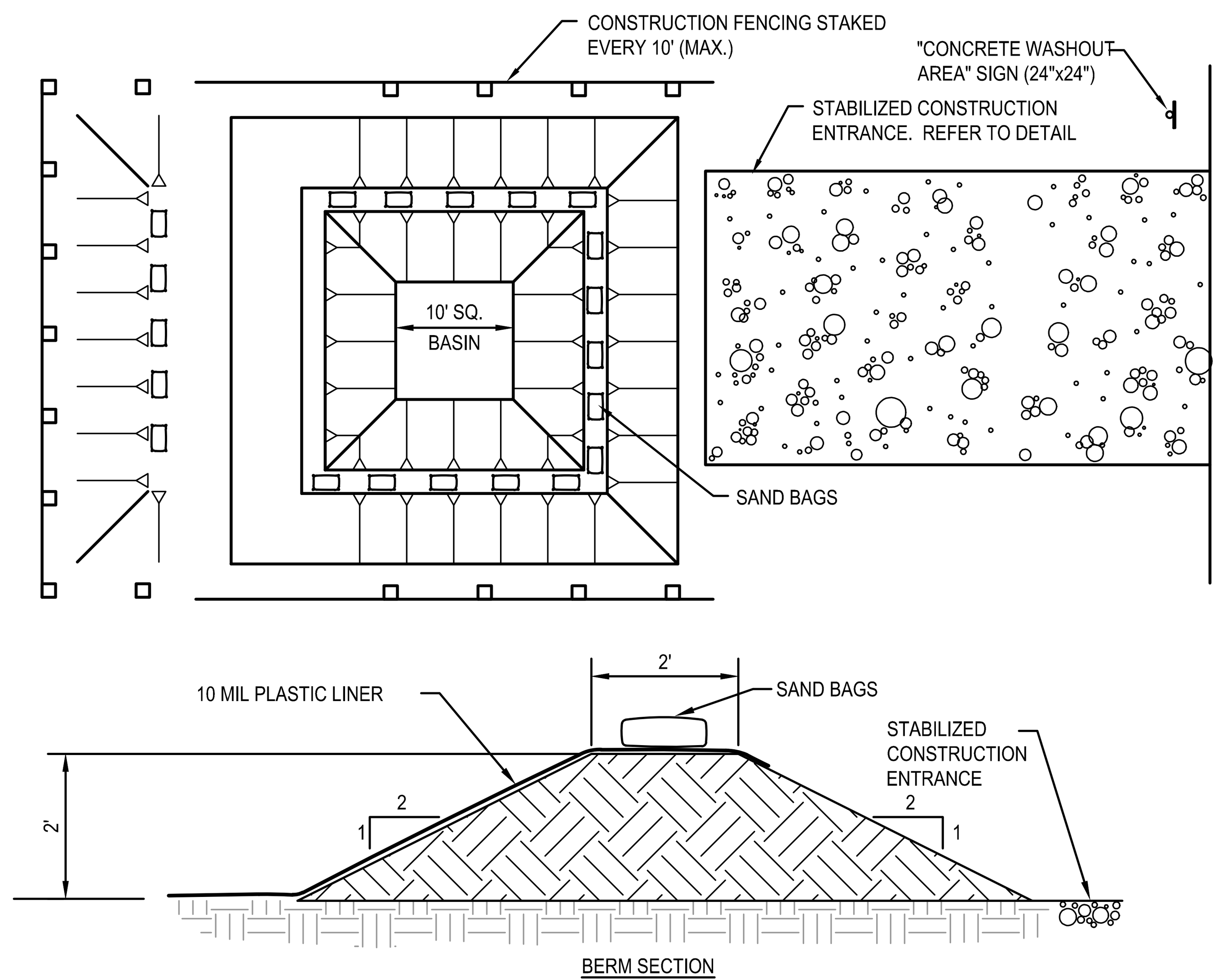


NOTE:
AFTER TREES WERE PLANTED, SURROUNDING GROUND DISTURBANCE WAS STABILIZED AND SEEDED WITH FUZZ AND BUZZ OR EAE.

2 EVERGREEN TREE PLANTING
SCALE: NTS

ANNUAL INSPECTION AND MAINTENANCE
ALL PLANTS THAT HAVE RECEIVED DEER DAMAGE, ARE DEAD OR NOT IN GOOD CONDITION, SHALL BE REPLACED WITHIN 1 YEAR. PLANTS THAT HAVE RECEIVED DEER DAMAGE SHALL NOT BE REPLACED IN-KIND. THE SITE SHALL BE INSPECTED ANNUALLY BY THE TOWN ENGINEER TO DETERMINE TREES AND SHRUBS THAT NEED TO BE REPLACED.

NOT FOR CONSTRUCTION

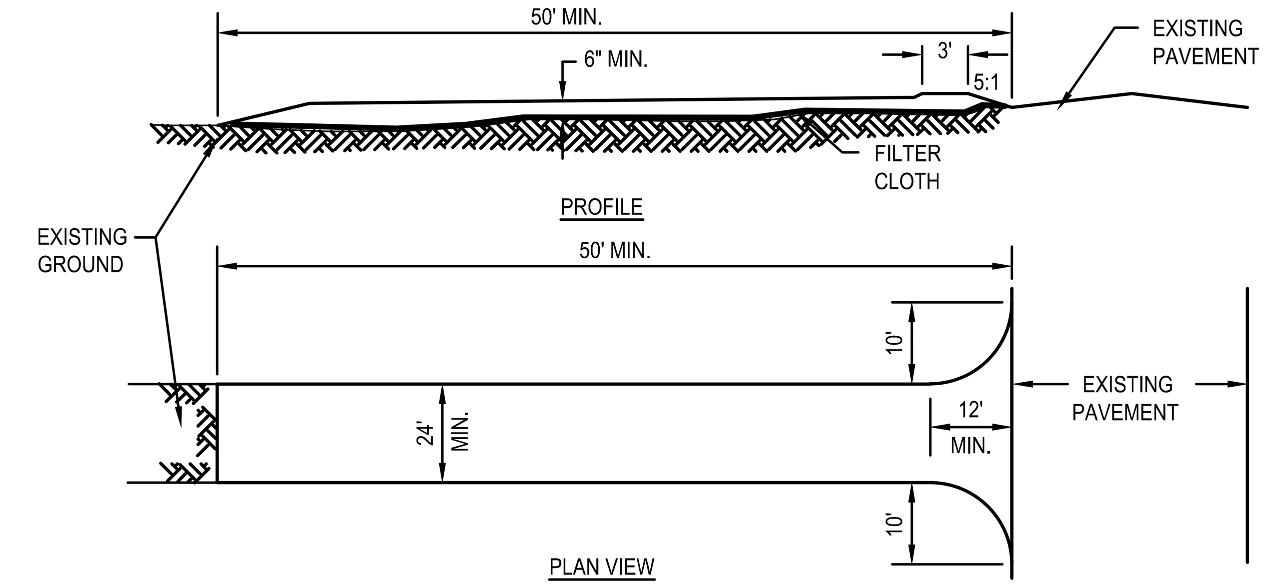


NOTES:

1. ALL TOOLS AND EQUIPMENT UTILIZED DURING ANY CONCRETE CONSTRUCTION, INCLUDING HAND TOOLS, WHEELBARROWS, TRUCKS, CHUTES SHALL UTILIZE THE CONCRETE WASHOUT AREA.
2. WASHOUT AREA TO BE MAINTAINED AND CLEANED OUT PERIODICALLY TO PREVENT WASHWATER AND/OR SOLIDS FROM EXITING THE WASHOUT TRAP.

5 CONCRETE WASH OUT DETAIL

SCALE: N.T.S.

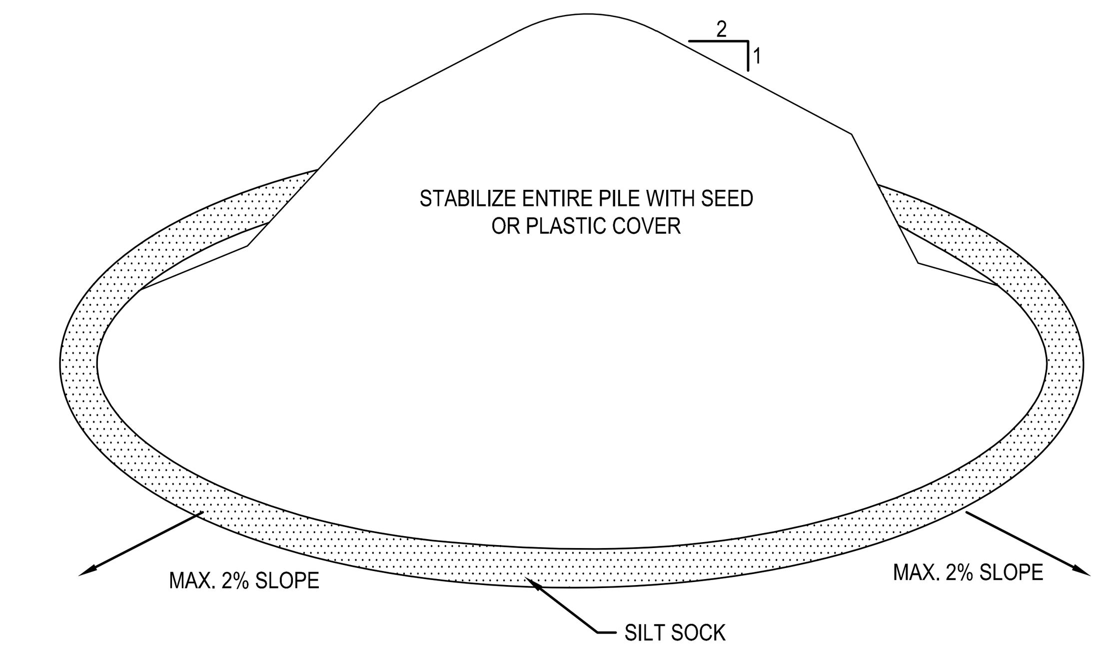


CONSTRUCTION NOTES FOR STABILIZED CONSTRUCTION ENTRANCE

1. STONE SIZE - USE 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - AS REQUIRED, BUT NOT LESS THAN 50 FEET .
3. THICKNESS - NOT LESS THAN 6 INCHES.
4. WIDTH - 24 FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. FILTER CLOTH - WILL BE PLACED OVER ENTIRE AREA PRIOR TO PLACING OF STONE. FILTER CLOTH WILL NOT BE REQUIRED ON A SINGLE RESIDENCE LOT
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIRECTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING IF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANEST OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAT MUST BE REMOVED IMMEDIATELY.
8. WASHING - WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHTS-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

4 STABILIZED CONSTRUCTION ENTRANCE

SCALE: N.T.S.

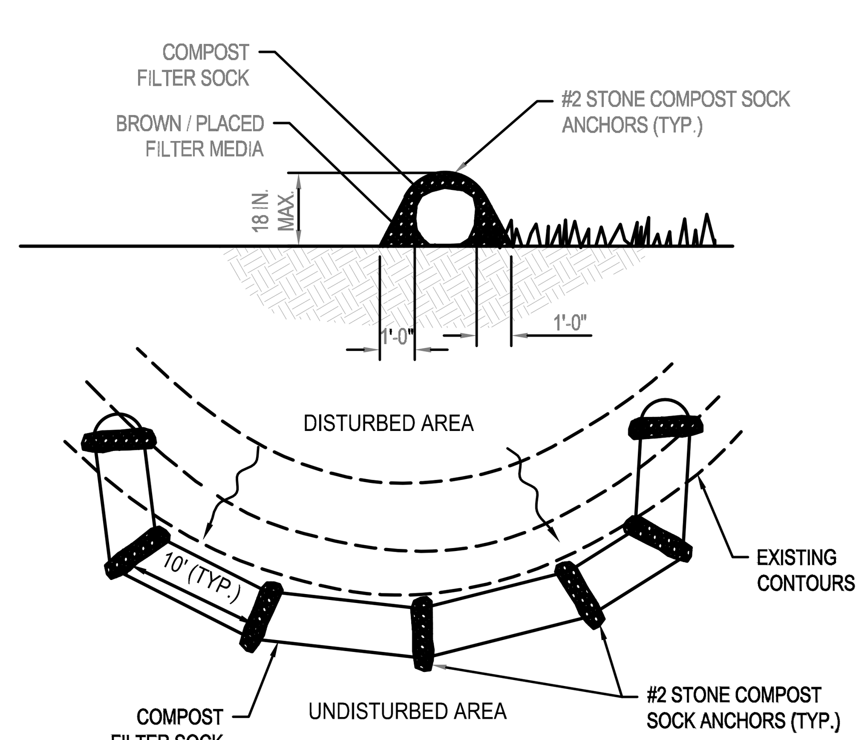


SOIL STOCKPILING NOTES:

1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 1:2.
3. UPON COMPLETION OF SOIL STOCKPILING, EACH PILE SHALL BE SURROUNDED WITH SILT SOCK AND THEN STABILIZED WITH SEED OR SECURED IMPERVIOUS COVER.
4. SEE SILT SOCK INSTALLATION DETAIL THIS SHEET.

3 SOIL STOCKPILE DETAIL

SCALE: N.T.S.



COMPOST SOCKS - WITHIN LIMITS OF LANDFILL CAP

INSTALLATION NOTES:

1. COMPOST SOCKS SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITIES.
2. COMPOST SOCKS SHALL BE 12" "SEDIMENT SOCK" PREFILLED FILTER SOCK OR EAE.
3. COMPOST SOCKS SHALL BE FILLED WITH WOOD CHIPS OR COMPOST. SEE SPECIFICATIONS FOR APPROVED COMPOSITION OF WOOD CHIPS OR COMPOST
4. NOT FOR USE IN CONCENTRATED FLOW AREAS.
5. COMPOST SOCKS SHALL BE INSTALLED PER MANUFACTURERS SPECIFICATIONS.
6. ON SLOPES, COMPOST SOCKS SHOULD BE INSTALLED ON CONTOUR WITH A SLIGHT DOWNWARD ANGLE AT THE END OF THE ROW IN ORDER TO PREVENT PONDING AT THE MID SECTION.
7. RUNNING LENGTHS OF SOCKS SHOULD BE ABUTTED FIRMLY TO ENSURE NO LEAKAGE AT THE ABUTMENTS.
8. COMPOST SOCK SHALL BE IN CONSTANT CONTACT WITH THE GROUND SURFACE.

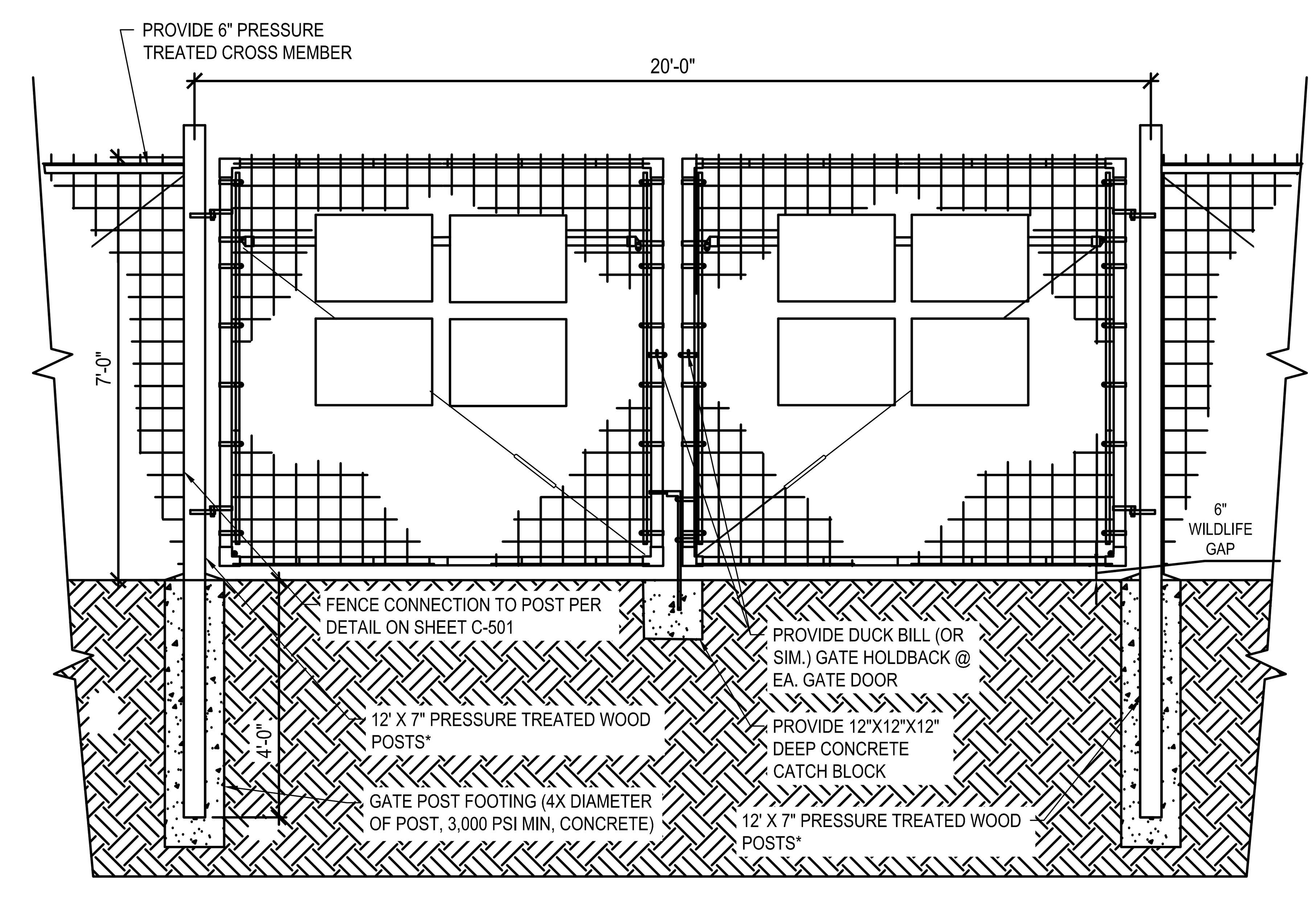
NOTES:

INSTALLATION:
WHEN INSTALLING RUNNING LENGTHS OF COMPOST SOCKS, BUTT THE SECOND SOCK TIGHTLY AGAINST THE FIRST, DO NOT OVERLAP THE ENDS. STAKE THE SOCKS AT EACH END AND FIVE FOOT ON CENTER.#2 STONE COMPOST SOCK ANCHORS SHALL BE UTILIZED TO HOLD SILT SOCK IN PLACE. STAKES SHALL NOT BE UTILIZED WITHIN THE CAP AREA.

MAINTENANCE:
SEDIMENT ACCUMULATED BEHIND WATTLE SHALL BE REMOVED WHEN SEDIMENT HAS ACCUMULATED TO ONE-HALF THE DIAMETER OF THE WATTLE.

2 COMPOST OR SILT SOCK INSTALLATION DETAIL

SCALE: N.T.S.



FENCE GATE NOTES:

1. DOUBLE SWING GATE TO OPEN INWARD, TOWARD SECURED AREA AS SHOWN ON THE SITE PLAN.
2. SIGNAGE SHALL BE AS REQUIRED BY CODE WITH DETAILS INCLUDING FACILITY NAME, OWNER, AND CONTACT PHONE NUMBER. WARNING SIGNAGE TO BE PLACED AT BASE OF ALL PAD-MOUNTED TRANSFORMERS AND ACCESS GATES.

1 TYPICAL FENCE GATE DETAIL

SCALE: N.T.S.

DRAWN BY:	DJT
CHECKED BY:	JMD
DATE:	07/22/2025
PHASE:	90% IFC PLANS

#	DATE:	DESCRIPTION OF REVISION:
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NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC2203131464-1

SITE DETAILS

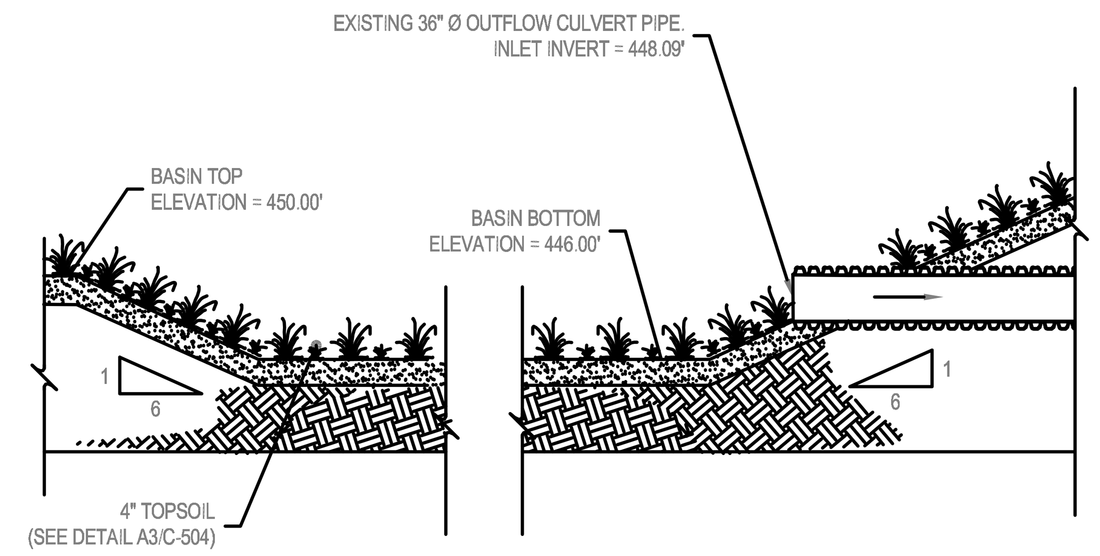
VAN BUREN SOLAR

DISTRIBUTED ENERGY INFRASTRUCTURE

1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

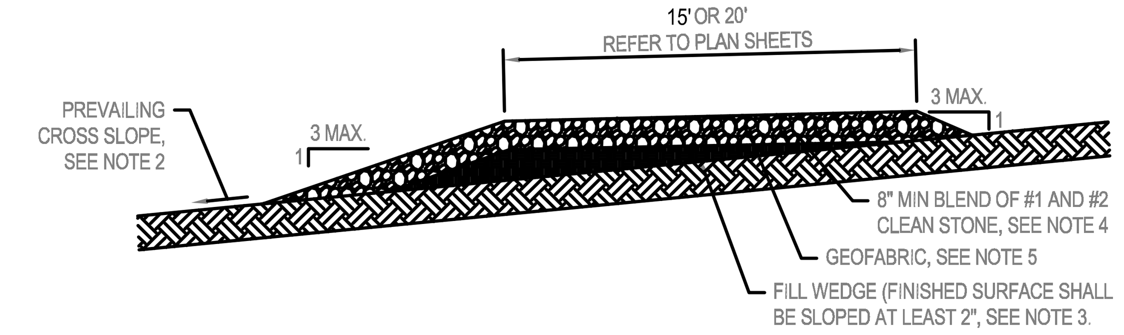
C601

PROJECT NO: 3615-004



5 **EXISTING STORMWATER BASIN DETAIL**

SCALE: N.T.S.



NOTES:

1. THIS ACCESS ROAD DETAIL IS LIMITED TO CONSTRUCTION AND OCCASIONAL MAINTENANCE TRAFFIC FOR RENEWABLE ENERGY PROJECTS IN NEW YORK STATE. EMERGENCY VEHICLES CAN ACCESS THE SITE VIA ACCESS ROAD ON AN AS NEEDED BASIS.
2. DESIGN LIMITATIONS
   - 2.1. ESAL - 10,000 LBS
   - 2.2. CLEAN STONE SHALL BE A MINIMUM OF 8" THICK
   - 2.3. CROSS SLOPE SHALL NOT EXCEED 5% RUNNING SLOPE AND RUNNING SLOPE SHALL NOT EXCEED 10%
3. CONSTRUCTION SPECIFICATIONS:
   - 3.1. IN AREAS OF NO EARTHWORK, THE ROAD SHALL BE INSTALLED ON UNCOMPACTED SURFACE GRADE. ALIGNMENT MAY BE MOWED BUT NOT GRUBBED. WHERE REQUIRED, A NATIVE SOIL FILL WEDGE, COMPACTED 80% MDD, MAY BE INSTALLED. FILL WEDGE SHALL BE SLOPED 2" MINIMUM TO SHED WATER.
   - 3.2. IN AREAS WITH BULK EARTHWORK, THE ROAD SHALL BE INSTALLED ON FINAL GRADE.
   - 3.3. THE ACCESS ROAD SHALL NOT BE CONSTRUCTED ON NYSDOT SUBBASE MATERIAL.
4. THE ACCESS ROAD SHALL BE CONSTRUCTED OF BLEND OF #1 AND #2 (2-1/2") CLEAN STONE. STONE MAY BE DEPOSITED AND SPREAD BY A TRACKED VEHICLE.
5. GEOFABRIC SHALL BE MIRAFI TENCATE RS 280I OR APPROVED EQUAL.
6. CONSTRUCTION AND MAINTENANCE LIMITATIONS:
   - 6.1. THE #2 CLEAN STONE SHALL NOT BE COMPACTED WITH VIBRATORY ROLLER, PLATE COMPACTOR OR OTHER MEANS.
   - 6.2. TOP DRESS ONLY WITH #2 CLEAN STONE.
   - 6.3. DO NOT OIL OR WATER BIND, SEAL COAT OR CHOCK STONE.
   - 6.4. DO NOT OVERLAY WITH CONCRETE, ASPHALT PAVEMENT, OR ANY MATERIAL THAT WILL CREATE AN IMPERVIOUS SURFACE.
7. REFER TO STORMWATER POLLUTION PREVENTION PLAN FOR ADDITIONAL INFORMATION.

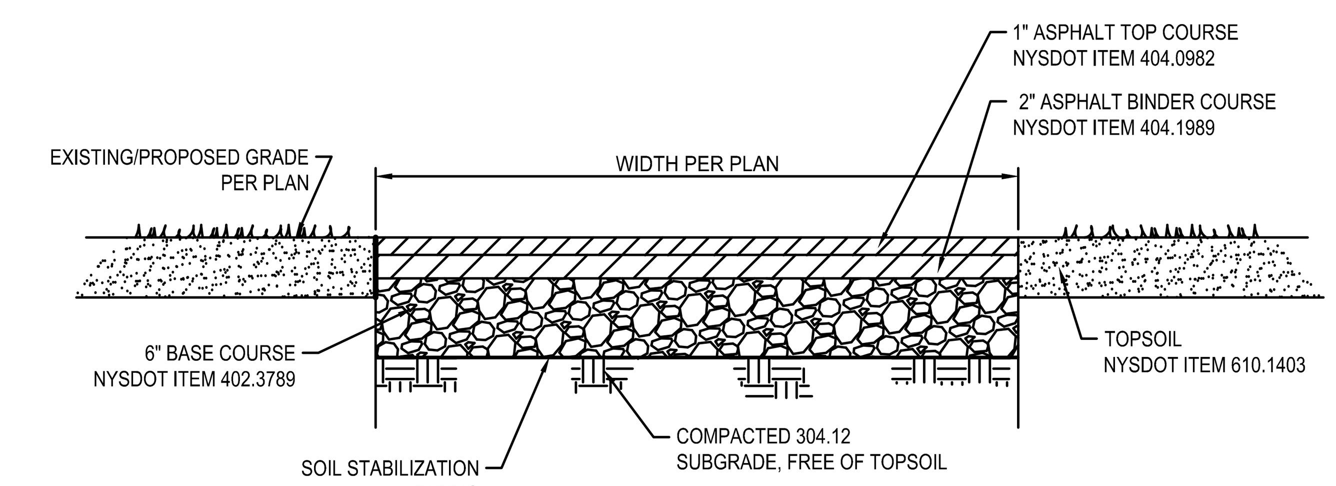
4 **LANDFILL CAP PERVIOUS ACCESS ROAD DETAIL**

SCALE: N.T.S.

NYSDEC SPDES GENERAL PERMIT (GP-0-25-001) COMPLIANCE

PER NYSDEC SPDES GENERAL PERMIT 0-25-001, AT NO POINT DURING CONSTRUCTION SHALL GREATER THAN 5 ACRES OF THE PROJECT SITE BE DISTURBED AT ONE TIME WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE DEPARTMENT. COMPLIANCE WITH THE CONDITIONS BELOW IS REQUIRED FOR PROJECTS WHICH EXCEED 5-ACRES OF DISTURBANCE AT ANY GIVEN TIME:

1. THE MAXIMUM DISTURBED AREA EXPECTED AT A SINGLE TIME IS APPROXIMATELY 12.8-ACRES.
2. THE OWNER OR OPERATOR SHALL HAVE A QUALIFIED INSPECTOR CONDUCT AT LEAST TWO (2) SITE INSPECTIONS IN ACCORDANCE WITH PART IV.C. OF THIS PERMIT EVERY SEVEN (7) CALENDAR DAYS, FOR AS LONG AS GREATER THAN FIVE (5) ACRES OF SOIL REMAIN DISTURBED. THE TWO (2) INSPECTIONS SHALL BE SEPARATED BY A MINIMUM OF TWO (2) FULL CALENDAR DAYS.
3. IN AREAS WHERE SOIL DISTURBANCE ACTIVITY HAS TEMPORARILY OR PERMANENTLY CEASED, THE APPLICATION OF SOIL STABILIZATION MEASURES MUST BE INITIATED BY THE END OF THE NEXT BUSINESS DAY AND COMPLETED WITHIN SEVEN (7) DAYS FROM THE DATE THE CURRENT SOIL DISTURBANCE ACTIVITY CEASED. THE SOIL STABILIZATION MEASURES SELECTED SHALL BE IN CONFORMANCE WITH THE TECHNICAL STANDARD, NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL, DATED NOVEMBER 2016.
4. THE OWNER OR OPERATOR SHALL PREPARE A PHASING PLAN THAT DEFINES MAXIMUM DISTURBED AREA PER PHASE AND SHOWS REQUIRED CUTS AND FILLS.
5. THE OWNER OR OPERATOR SHALL INSTALL ANY ADDITIONAL SITE-SPECIFIC PRACTICES NEEDED TO PROTECT WATER QUALITY.
6. THE OWNER OR OPERATOR SHALL INCLUDE THE REQUIREMENTS ABOVE IN THEIR SWPPP.



NOTE:

1. ALL IMPROVEMENTS ADHERE TO NYSDOT STANDARDS SECTION 608-03 FOR A FIELD ENTRANCE.

2. CONCRETE CULVERT ADHERES TO NYSDOT STANDARDS SECTION 203-04 (INSTALLATION DETAILS FOR REINFORCED CONCRETE PIPES), AND SECTION 204-01 (CONTROLLED LOW STRENGTH MATERIAL INSTALLATION DETAILS FOR REINFORCED CONCRETE PIPES)

3. TACK COAT APPLIED BETWEEN ASPHULT LAYERS. NYSDOT ITEM NUMBER 407.0104

4 JOINT ADHESIVE APPLIED ON VERTICAL JOINTS. NYSDOT ITEM NUMBER 418.7603

3 **NYSDOT PAVEMENT SECTION DETAIL**

SCALE: N.T.S.

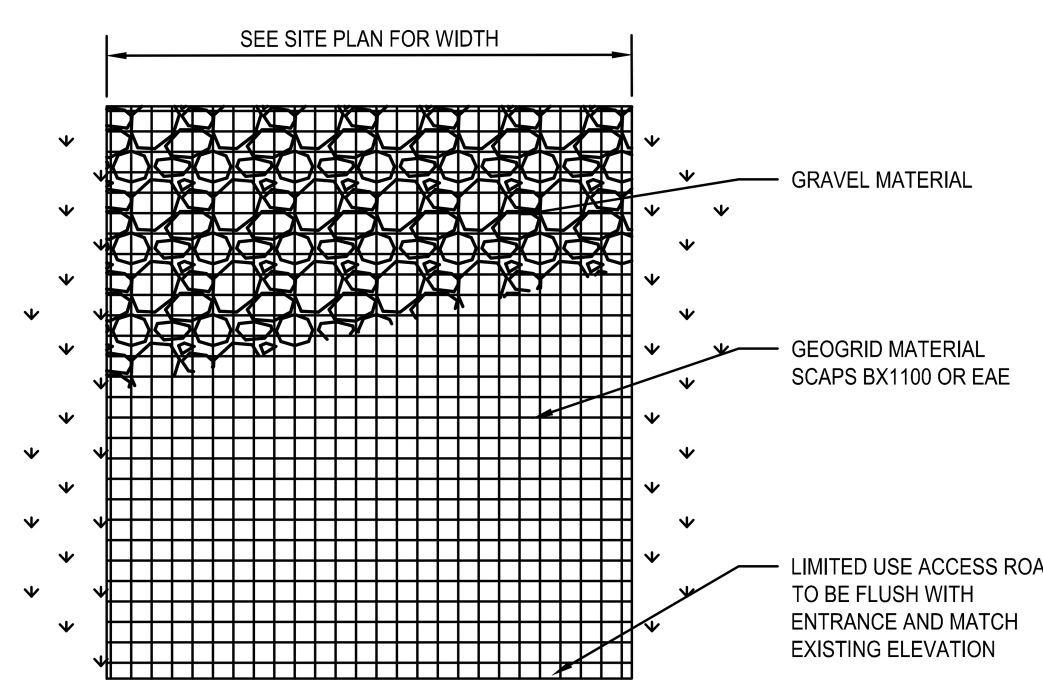
GENERAL NOTES:

1. USE OF THIS DETAIL/CRITERION IS LIMITED TO ACCESS ROADS USED ON AN OCCASIONAL BASIS ONLY (I.E. PROVIDE ACCESS FOR MOWING, EQUIPMENT REPAIR OR MAINTENANCE, ETC.).
2. LIMITED USE PERVIOUS ACCESS ROAD IS LIMITED TO LOW IMPACT IRREGULAR MAINTENANCE ACCESS ASSOCIATED WITH RENEWABLE ENERGY PROJECTS IN NEW YORK STATE.
3. REMOVE STUMPS, ROCKS AND DEBRIS AS NECESSARY. FILL VOIDS TO MATCH EXISTING NATIVE SOILS AND COMPACTION LEVEL.
4. REMOVED TOPSOIL MAY BE SPREAD IN ADJACENT AREAS AS DIRECTED BY THE PROJECT ENGINEER. COMPACT TO THE DEGREE OF THE NATIVE INSITU SOIL. DO NOT PLACE IN AN AREA THAT IMPEDES STORMWATER DRAINAGE.
5. GRADE ROADWAY, WHERE NECESSARY, TO MATIVE SOIL AND DESIRED ELEVATION. MINOR CRADING FOR CROSS SLOPE CUT AND FILL MAY BE REQUIRED.
6. REMOVE REFUSE SOILS AS DIRECTED BY THE PROJECT ENGINEER. DO NOT PLACE IN AN AREA THAT IMPEDES STORMWATER DRAINAGE.
7. ROADWAY WIDTH TO BE DETERMINED BY CLIENT.
8. THE LIMITED USE PERVIOUS ACCESS ROAD CROSS SLOPE SHALL BE 2% IN MOST CASES AND SHOULD NOT EXCEED 6%. THE LONGITUDINAL SLOPE OF THE ACCESS DRIVE SHOULD NOT EXCEED 15%.
9. LIMITED USE PERVIOUS ACCESS ROAD IS NOT INTENDED TO BE UTILIZED FOR CONSTRUCTION WHICH MAY SUBJECT THE ACCESS TO SEDIMENT TRACKING. THIS SPECIFICATION IS TO BE DEVELOPED FOR POST-CONSTRUCTION USE. SOIL RESTORATION PRACTICES MAY BE APPLICABLE TO RESTORE CONSTRUCTION RELATED COMPACTION TO PRE-EXISTING CONDITIONS AND SHOULD BE VERIFIED BY SOIL PENETROMETER READINGS. THE PENETROMETER READINGS SHALL BE COMPARED TO THE RESPECTIVE RECORDED READINGS TAKEN PRIOR TO CONSTRUCTION, EVERY 100 LINEAR FEET ALONG THE PROPOSED ROADWAY.
10. TO ENSURE THAT SOIL IS NOT TRACKED ONTO THE LIMITED USE PERVIOUS ACCESS ROAD, IT SHALL NOT BE USED BY CONSTRUCTION VEHICLES TRANSPORTING SOIL, FILL MATERIAL, ETC. IF THE LIMITED USE PERVIOUS ACCESS IS COMPLETED DURING THE INITIAL PHASES OF CONSTRUCTION, A STANDARD NEW YORK STATE STABILIZED CONSTRUCTION ACCESS SHALL BE CONSTRUCTED AND UTILIZED TO REMOVE SEDIMENT FROM CONSTRUCTION VEHICLES AND EQUIPMENT PRIOR TO ENTERING THE LIMITED USE PERVIOUS ACCESS ROAD FROM ANY LOCATION ON, OR OFF SITE. MAINTENANCE OF THE PERVIOUS ACCESS ROAD WILL BE REQUIRED IF SEDIMENT IS OBSERVED WITHIN THE CLEAN STONE.
11. THE LIMITED USE PERVIOUS ACCESS ROAD SHALL NOT BE CONSTRUCTED OR USED UNTIL ALL AREAS SUBJECT TO RUNOFF ONTO THE PERVIOUS ACCESS HAVE ACHIEVED FINAL STABILIZATION.
12. THE LIMITED USE PERVIOUS ACCESS ROAD SHALL HAVE A WELL-ESTABLISHED PERENNIAL VEGETATIVE COVER, WHICH SHALL CONSIST OF A UNIFORM VEGETATION (I.E. BUFFER), 20 FEET WIDE AND PARALLEL TO THE DOWN GRADIENT SIDE OF THE ACCESS ROAD. POST-CONSTRUCTION OPERATION AND MAINTENANCE PRACTICES WILL MAINTAIN THIS VEGETATIVE COVER TO ENSURE FINAL STABILIZATION FOR THE LIFE OF THE ACCESS ROAD.
13. CRUSHED STONE CAP TO BE INSTALLED ON ANY PORTION OF THE PERMANENT PERVIOUS ACCESS ROAD THAT WILL BE INSTALLED AND USED DURING CONSTRUCTION. UPON FINAL STABILIZATION, THE CAP SHALL BE REMOVED AND THE PERVIOUS STONE SECTION SHALL HAVE ADDITIONAL STONE ADDED AND GRADED AS NEEDED.

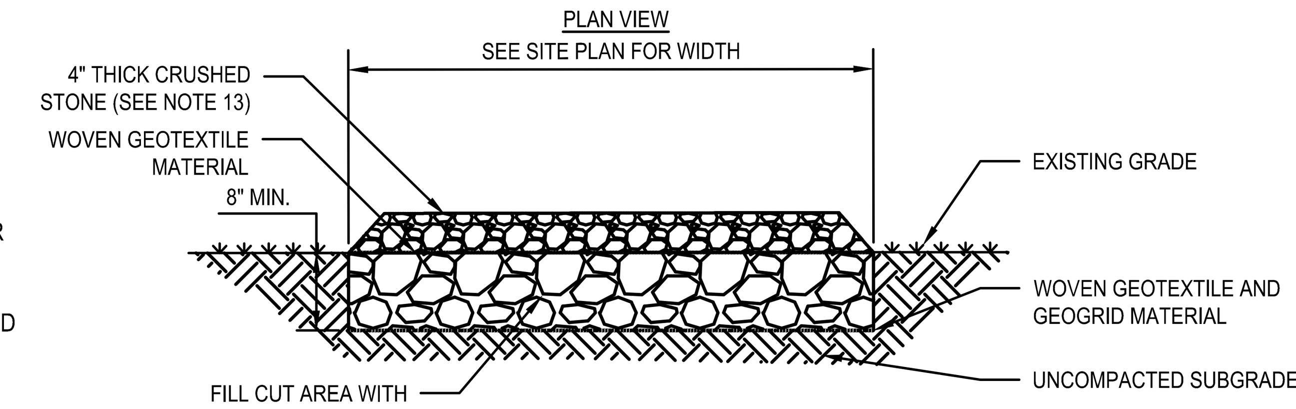
GEOGRID MATERIAL NOTES:

1. THE GEOGRID, OR COMPARABLE PRODUCT, IS INTENDED FOR USE FOR ALL CONDITIONS, IN ORDER TO ASSIST IN MATERIAL SEPARATION FROM NATIVE SOILS AND PRESERVE ACCESS LOADS.
2. GRAVEL FILL MATERIAL SHALL CONSIST OF 1-4" CLEAN, DURABLE, SHARP-ANGLED CRUSHED STONE OF UNIFORM QUALITY, MEETING THE SPECIFICATIONS OF NYSDOT ITEM 703-02, SIZE DESIGNATION 3-5 OF TABLE 703-4. STONE MAY BE PLACED IN FRONT OF, AND SPREAD WITH A TRACKED VEHICLE. GRAVEL SHALL NOT BE COMPACTED.
3. GEOGRID SHALL BE MIRAFI BXG110 OR APPROVED EQUAL. GEOGRID SHALL BE DESIGNATED BASED ON EXISTING SOIL CONDITIONS AND PROPOSED HAUL ROAD SLOPES.
4. WOVEN GEOTEXTILE SHALL BE INSTALLED BETWEEN GEOGRID AND NATIVE SOIL IN AREAS OF POOR DRAINAGE OR SOILS CONSISTING OF EXCESSIVE FINE MATERIAL.
5. IF MORE THAN ONE ROLL WIDTH IS REQUIRED, ROLLS SHOULD OVERLAP A MINIMUM OF 6 INCHES.
6. REFER TO MANUFACTURER'S SPECIFICATION FOR PROPER TYING AND CONNECTIONS.
7. LIMITED USE PERVIOUS ACCESS ROAD SHALL BE TOP DRESSED AS REQUIRED WITH ONLY 1-4" CRUSHED STONE MEETING NYSDOT ITEM 703-02 SPECIFICATIONS.

BASIS OF DESIGN: TENCATE MIRAFI BXG110 GEOGRIDS; 365 SOUTH HOLLAND DRIVE, PENDERGRASS, GA; (800) 685-9990 OR (706) 693-2226; WWW.MIRAFI.COM



PLAN VIEW



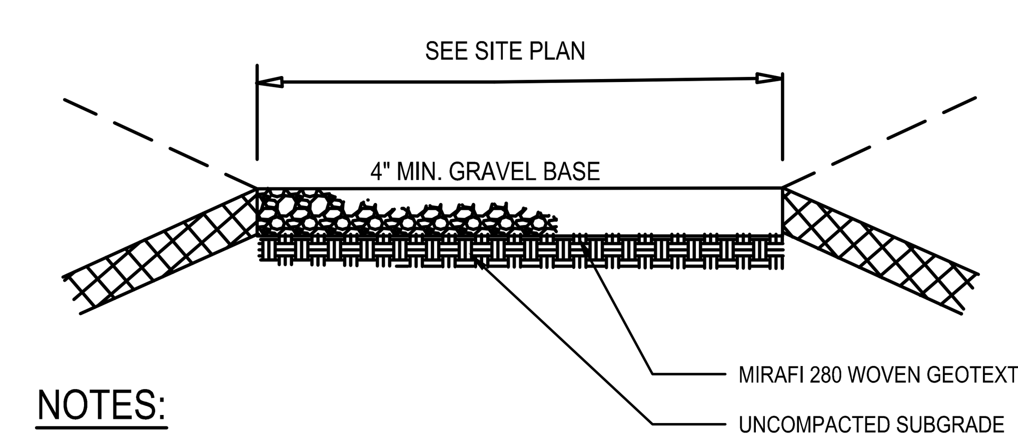
SECTION VIEW

INSTALLATION NOTE:

1. IN THE EVENT THAT PROJECT TIMELINES REQUIRE INSTALLATION OF PERMIABLE ACCESS DRIVE PRIOR TO COMPLETION OF SOLAR ARRAY & EQUIPMENT PERMEABLE ACCESS DRIVE MUST BE COVERED AND PROTECTED WITH SILT FABRIC AND A MINIMUM OF 3 INCHES OF CRUSHED STONE WEARING COURSE.

2 **PERVIOUS ACCESS ROAD DETAIL**

SCALE: N.T.S.



NOTES:

1. GRAVEL AREA TO SLOPE IN THE DIRECTION OF THE EXISTING GRADE AT A MINIMUM OF 2.0% TO ALLOW STORMWATER TO SHEET FLOW ACROSS AND TO PREVENT PONDING.

1 **TEMPORARY GRAVEL LAYDOWN AREA**

SCALE: N.T.S.

NOT FOR CONSTRUCTION

DRAWN BY:	MBP
CHECKED BY:	JMD
DATE:	07/22/2025
PHASE:	90% IFC PLANS

#	DATE:	DESCRIPTION OF REVISION:
1	08/22/2025	REVISED PER EQUIPMENT PAD RELOCATION
2	09/03/2025	REVISED MODULE & EQUIPMENT LAYOUT

"IT IS A VIOLATION OF THE LAW FOR ANY PERSON TO MAKE UNAUTHORIZED ALTERATIONS OR ADDITIONS TO PLANS BEARING A LICENSED ENGINEER'S, ARCHITECT'S OR SURVEYOR'S SEAL."

HUNT ENGINEERS | ARCHITECTS | SURVEYORS
HORSEHEADS, NY 607 - 358 - 1000 ROCHESTER, NY 585 - 327 - 7950
TOWANDA, PA 570 - 265 - 4868 BINGHAMTON, NY 607 - 798 - 8081
ALBANY, NY 607 - 798 - 8081 WWW.HUNT-EAS.COM
NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC2203131464-1

SITE DETAILS

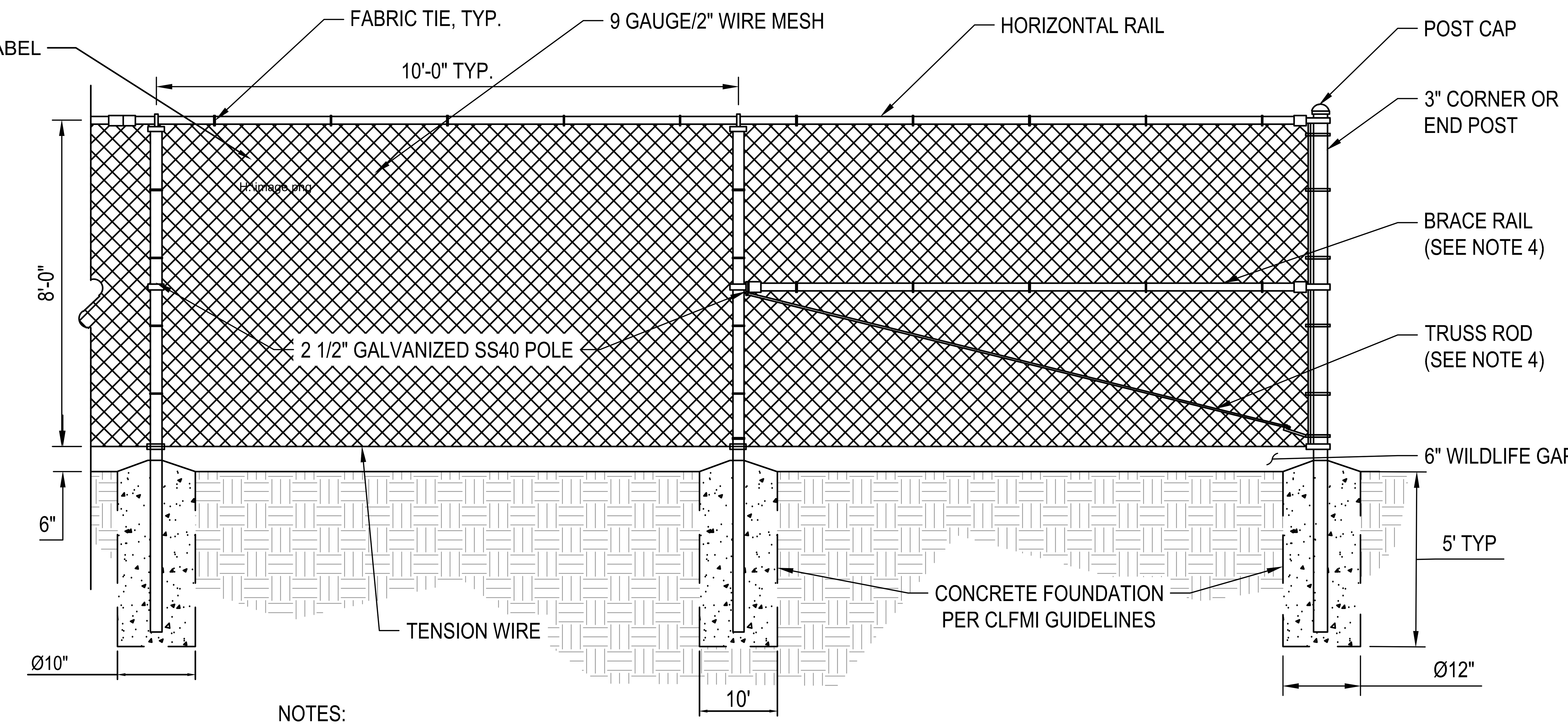
VAN BUREN SOLAR

DISTRIBUTED ENERGY INFRASTRUCTURE

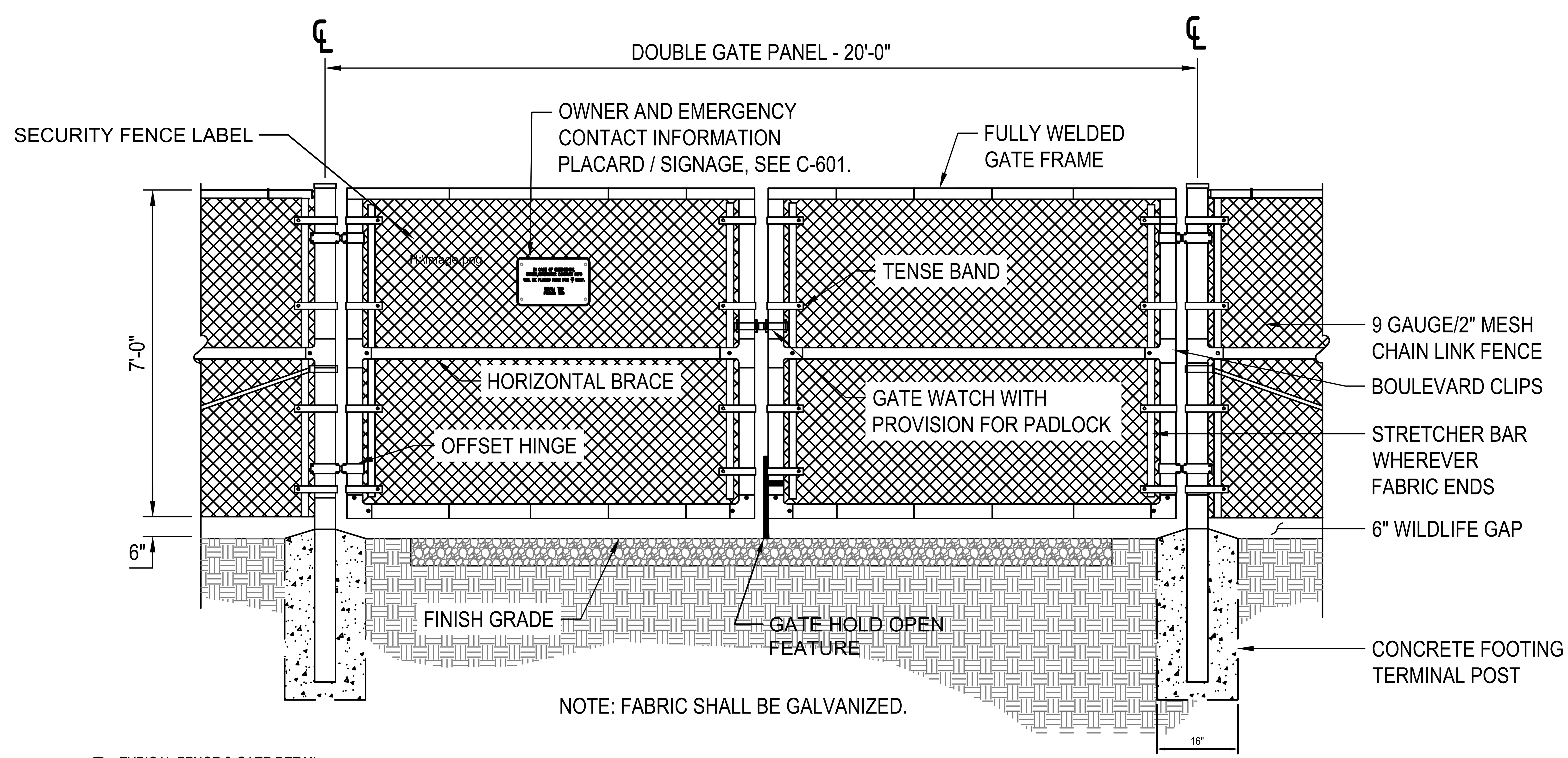
1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C602

PROJECT NO: 3615-004



NOTES:
1. FENCE MATERIAL AND COMPONENTS SHALL BE GALVANIZED, UNLESS OTHERWISE NOTED.
2. THIS DETAIL IS NOT APPLICABLE FOR PRIVACY FENCE OR FENCE WITH SLATS.
3. ADJUSTABLE TRUSS ROD AND BRACE RAIL AT CORNER OR END POSTS.
4. INSTALL SIGN EVERY 200'



NOTE: FABRIC SHALL BE GALVANIZED.

NOTES:
1. SIGNS MUST HAVE 1" CORNER RADIUS
2. SIGNS MUST HAVE PRE-DRILLED 1/4" HOLES AT EDGES.
3. SIGNS MUST BE MADE OF METAL SUCH AS ALUMINUM, OR GALVANIZED LIGHT GAGE STEEL. IF THESE MATERIALS ARE UNAVAILABLE, ACEPTABLE ALTERNATIVES INCLUDE PLEXIGLASS OR PHENOLIC MATERIAL THAT ARE RATED FOR UV AND WEATHER EXPOSURE.
4. SIGNS MUST BE ATTACHED TO FENCE WITH STAINLESS STEEL CABLE TIES, 304 GRADE STAINLESS STEEL REBAR TIES, OR STAINLESS STEEL OR PLASTIC FENCE BRACKETS.

2 TYPICAL FENCE & GATE SIGNAGE
SCALE: N.T.S.

1 TYPICAL FENCE & GATE DETAIL
SCALE: N.T.S.

NOT FOR CONSTRUCTION

DRAWN BY:	MBP
CHECKED BY:	JMD
DATE:	07/22/2025
PHASE:	90% IFC PLANS

#	DATE:	DESCRIPTION OF REVISION:
1	08/22/2025	REVISED PER EQUIPMENT PAD RELOCATION
2	09/03/2025	REVISED MODULE & EQUIPMENT LAYOUT

HUNT ENGINEERS | ARCHITECTS | SURVEYORS
HORSEHEADS, NY 607 - 358 - 1000 ROCHESTER, NY 585 - 327 - 7950
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ALBANY, NY 607 - 798 - 8081 WWW.HUNT-EAS.COM
NY CERTIFICATE NO. 0018220 PA CERTIFICATE NO. TSC2203131464-1

SITE DETAILS
VAN BUREN SOLAR
DISTRIBUTED ENERGY INFRASTRUCTURE
1320 KINGDOM ROAD, BALDWINSVILLE, NY, 13027

C603

PROJECT NO: 3615-004

terrasmart™

JOB TITLE	Van Buren Landfill		
JOB LOCATION	Belgium, NY		
JOB NO.	2535010	SHEET NO.	
CALCULATED BY	BDS	DATE	7/30/25
CHECKED BY		DATE	

STRUCTURAL CALCULATIONS: ABOVE GRADE BALLAST RACKING

FOR

Distributed Energy Infrastructure

Van Buren Landfill
Belgium, NY

STATE OF NEW YORK
MOHAMED AHMED ALY
082167
LICENSED PROFESSIONAL ENGINEER

JOB TITLE	Van Buren Landfill		
JOB LOCATION	Belgium, NY		
JOB NO.	2535010	SHEET NO.	
CALCULATED BY	BDS	DATE	7/30/2025
CHECKED BY		DATE	

VI. Seismic Loads:

Seismic Use Group	II
Importance Factor (Ie)	1.00
Site Class	D

Ss (0.2 sec) = 14.30 %g
S1 (1.0 sec) = 5.10 %g

Fa =	1.600	Sms =	0.229	Sds =	0.153	Design Category =	A
Fv =	2.400	Sm1 =	0.122	Sd1 =	0.082	Design Category =	B

Seismic Design Category = **B**

Number of Stories:	1
Structure Type:	Light Frame
Plan Structural Irregularities:	No plan Irregularity
'ertical Structural Irregularities:	No vertical Irregularity
Flexible Diaphrams:	No
Non-building Structure Type	**Inverted Pendulum Systems**
Seismic resisting system:	**Cantilevered column systems**
›ystem Building Height Limit:	**NL**
Actual Building Height (hn) =	6.8 ft

DESIGN COEFFICIENTS AND FACTORS

Response Modification Factor (R) = 2
System Over-Strength Factor (Ωo) = 2 Sds = 0.153
Deflection Amplification Factor (Cd) = 2 Sd1 = 0.082
Code Reference Section for Detailing : 12.2.5.3

PERMITTED ANALYTICAL PROCEDURES

Index Force Analysis (Seismic Category Method Not Permitted

Simplified Analysis - Permitted
Design Base Shear V=1.2SdsW/R = 0.092W

Equivalent Lateral-Force Anal - Permitted
Building period coef. (C_T) = 0.020
Approx fundamental period (Ta) = $C_T h_n^x$ = 0.084 x= 0.75
Seismic response coef. (Cs) = ›dsIe/R = 0.077
need not exceed Cs = .Ie/RTa = 0.486
but not less than Cs = .044SdsIe 0.007
USE Cs = 0.077
Design Base Shear V = 0.077W

Model, Linear & Nonlinear Response Aı - Permitted (see code for procedure)

DESIGN CRITERIA

North

Design Criteria:

Code:	**2020 New York State Building Code (IBC 2018)**
Dead Load:	4.0 psf
Roof Live Load:	0.0 psf
Ground Snow:	50.0 psf
Wind Speed:	110 mph (Exposure C Assumed)
Module Tilt:	30.0 deg
Purlin Trib Width:	3.27 ft (Horizontal Projection)

Snow Load Calculation: $p_f = 0.7C_sC_eC_tI_sp_g$

C_e =	0.9
C_t =	1.2
I_s =	1.0
C_s =	0.73
p_s=	**27.6 psf**

Wind Load Calculation: $q = 0.00256K_zK_dK_{zt}V^2$

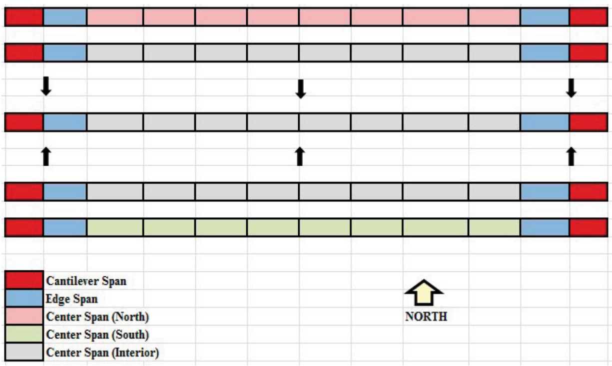
K_z =	0.85
K_d =	0.85
K_{zt} =	1.0
q =	**22.4 psf**

Mean Roof Height = 6.8 ft (Per RWDI Wind Tunnel Analysis)

WIND TUNNEL COEFFICIENTS (RWDI)			TILT	
				30.0 deg
PURLIN				
ZONE	**GCp Up**	**GCp Down**	**PSF Up**	**PSF Down**
Cantilever	-2.223	1.980	-49.75	44.31
Edge Span	-1.832	1.340	-40.99	29.98
North Row Center Span	-1.247	0.927	-27.90	20.75
South Row Center Span	-1.617	1.232	-36.18	27.57
Interior Center Span	-1.322	0.789	-29.58	17.67
TOP CHORD				
ZONE	**GCp Up**	**GCp Down**	**PSF Up**	**PSF Down**
Cantilever	-1.617	1.675	-36.20	37.49
Edge Span	-1.381	1.008	-30.91	22.56
North Row Center Span	-1.117	0.830	-25.01	18.57
South Row Center Span	-1.245	0.959	-27.87	21.46
Interior Row Center Span	-0.991	0.712	-22.18	15.93
BASE MOMENT				
ZONE	**GCmy (+)**	**GCmy (-)**	**q*GCmy (+)**	**q*GCmy (-)**
Cantilever	0.551	-0.237	12.32	-5.30
Edge Span	0.437	-0.174	9.79	-3.90
North Row Center Span	0.260	-0.169	5.82	-3.79
South Row Center Span	0.376	-0.101	8.41	-2.27
Interior Row Center Span	0.324	-0.162	7.25	-3.63

Note: See Figures 1 & 2 for clarity on zones

APPLIED LOADING		
DEAD LOAD:	5psf*Purlin Spacing/1000	0.01511 klf
LIVE LOAD:	N/A	0.000 klf
SNOW:	P_s*Purlin Trib. Width/1000:	0.09032 klf



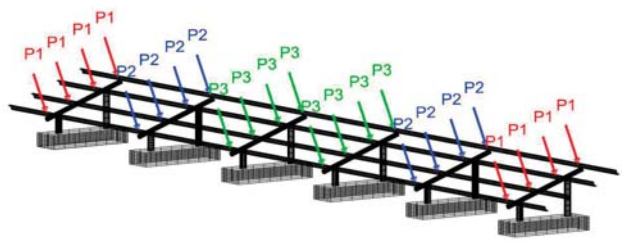


FIGURE 1 **FIGURE 2**

WIND: (Top Chord Pressures)	North
$P1_{up} = \frac{Upslope\ Length * q}{4}\left[Cantilever\ Width * GCp_{(cantilever)} + \frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)}\right]$	-1.183 kips
$P1_{down} = \frac{Upslope\ Length * q}{4}\left[Cantilever\ Width * GCp_{(cantilever)} + \frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)}\right]$	1.022 kips
$P2_{up} = \frac{Upslope\ Length * q}{4}\left[\frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)} + \frac{Center\ Span\ Width}{2} * GCp_{(center\ span)}\right]$	-1.202 kips
$P2_{down} = \frac{Upslope\ Length * q}{4}\left[\frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)} + \frac{Center\ Span\ Width}{2} * GCp_{(center\ span)}\right]$	0.884 kips
$P3_{up} = \frac{Upslope\ Length * q}{4}\left[Center\ Span\ Width * GCp_{(center\ span)}\right]$	-1.075 kips
$P3_{down} = \frac{Upslope\ Length * q}{4}\left[Center\ Span\ Width * GCp_{(center\ span)}\right]$	0.798 kips

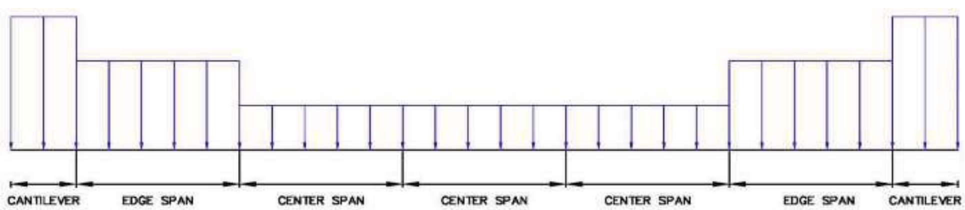


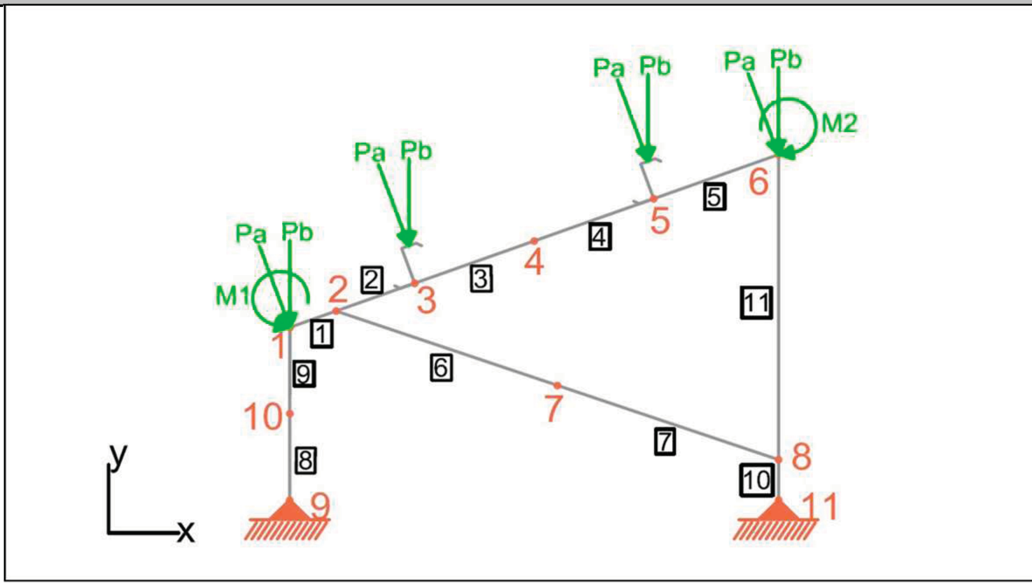
FIGURE 3

WIND: (Base Moments)

GC_{My}*q*A*Upslope Length

North		
POSITIVE		
Post 1	Post 2	Post 3
23.27 k-ft	20.17 k-ft	15.04 k-ft
NEGATIVE		
Post 1	Post 2	Post 3
-9.60 k-ft	-9.93 k-ft	-9.79 k-ft

North Frame Analysis



DIRECT STIFFNESS METHOD BEAM, NODE, AND RELEASE DEFINITIONS											
Member	Member Beginning	Member Ending Node	Node B Release	Node E Release	A	E	I	Length, L	θ	cos(θ)	sin(θ)
1	1	2	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	6.00 in	30.0 °	0.87	0.50
2	2	3	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	29.92 in	30.0 °	0.87	0.50
3	3	4	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	17.78 in	30.0 °	0.87	0.50
4	4	5	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	17.78 in	30.0 °	0.87	0.50
5	5	6	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	35.92 in	30.0 °	0.87	0.50
6	2	7	PINNED	FIXED	0.84 in^2	29000 ksi	0.49 in^4	45.68 in	-16.0 °	0.96	-0.28
7	8	7	PINNED	FIXED	0.84 in^2	29000 ksi	0.49 in^4	45.68 in	164.0 °	-0.96	0.28
8	9	10	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	14.22 in	90.0 °	0.00	1.00
9	1	10	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	14.22 in	-90.0 °	0.00	-1.00
10	11	8	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	6.25 in	90.0 °	0.00	1.00
11	6	8	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	75.90 in	-90.0 °	0.00	-1.00

STIFFNESS, k DETERMINATION VARIABLES					
Member	ka	kΔΔ	kΔθ	kθθ	kϕθ
1	8555.00	7088.89	21266.67	85066.67	42533.33
2	1715.68	57.18	855.33	17059.90	8529.95
3	2886.39	272.26	2420.86	28700.82	14350.41
4	2886.39	272.26	2420.86	28700.82	14350.41
5	1429.08	33.04	593.44	14210.10	7105.05
6	533.27	0.45	20.43	933.22	622.15
7	533.27	0.45	20.43	933.22	622.15
8	5464.10	495.82	7052.36	100311.09	66874.06
9	5464.10	495.82	7052.36	100311.09	66874.06
10	12435.20	5844.17	36526.08	228288.00	152192.00
11	1023.99	3.26	247.68	18798.65	12532.43

	FIXED-FIXED	PINNED-FIXED
ka=	(EA/L)	(EA/L)
kΔΔ=	$(12EI)/(L^3)$	$(3EI)/(L^3)$
kΔθ=	$(6EI)/(L^2)$	$(3EI)/(L^2)$
kθθ=	(4EI)/(L)	(3EI)/(L)
kϕθ=	(2EI)/(L)	(2EI)/(L)

c=cos(θ) s=sin(θ)

ELEMENT GLOBAL STIFFNESS MATRIX EQUATIONS

PINNED-FIXED

0	0	0	0	0	0
0	$c^2k_a + s^2k_{\Delta\Delta}$	$csk_a - csk_{\Delta\Delta}$	$-sk_{\Delta\theta}$	$-c^2k_a - s^2k_{\Delta\Delta}$	$-csk_a + csk_{\Delta\Delta}$
0		$s^2k_a + c^2k_{\Delta\Delta}$	$ck_{\Delta\theta}$	$-csk_a + csk_{\Delta\Delta}$	$-s^2k_a - c^2k_{\Delta\Delta}$
0			$k_{\theta\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
0	symmetrical			$c^2k_a + s^2k_{\Delta\Delta}$	$csk_a - csk_{\Delta\Delta}$
0					$s^2k_a + c^2k_{\Delta\Delta}$

FIXED-FIXED

$k_{\theta\theta}$	$-sk_{\Delta\theta}$	$ck_{\Delta\theta}$	$k_{\Phi\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
	$c^2k_a + s^2k_{\Delta\Delta}$	$csk_a - csk_{\Delta\Delta}$	$-sk_{\Delta\theta}$	$-c^2k_a - s^2k_{\Delta\Delta}$	$-csk_a + csk_{\Delta\Delta}$
		$s^2k_a + c^2k_{\Delta\Delta}$	$ck_{\Delta\theta}$	$-csk_a + csk_{\Delta\Delta}$	$-c^2k_a - s^2k_{\Delta\Delta}$
			$k_{\theta\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
symmetrical				$c^2k_a + s^2k_{\Delta\Delta}$	$csk_a - csk_{\Delta\Delta}$
					$s^2k_a + c^2k_{\Delta\Delta}$

Equilibrium: $\{P_e\}_G = [T]\{P_e\}_L$

Compatibility: $\{\Delta_e\}_L = \{T\}^T\{\Delta_e\}_G$

Force Displacement: $\{P_e\}_L = [k_e]_L\{\Delta_e\}_L$

$[T]\{P_e\}_L = [T][k_e]_L[T]^T\{\Delta_e\}_G$

$\{P_e\}_G = [k_e]_G\{\Delta_e\}_G$

$[k_e]_G = [T][k_e]_L[T]^T$

$$\begin{Bmatrix} P \\ R \end{Bmatrix} = \begin{bmatrix} K_{PP} & K_{PR} \\ K_{RP} & K_{RR} \end{bmatrix} \begin{Bmatrix} \Delta_P \\ \Delta_R \end{Bmatrix}$$

Structural Stiffness Method General Form

P=external load   Δ=displacement

T=transformation matrix

T^T=inverse transfromation matrix

e=element   G=global

L=local   k=element stiffness matrix

{}=vector   K=structure global stiffness matrix

[]=matrix   R=structural global reaction

Beam End Forces (Global Coordinate System)

TOP CHORD		BEAM 1					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	14.23 k-in	0.31 k	-0.06 k	-15.45 k-in	-0.31 k	0.06 k
	1*Dead+1*Snow	18.93 k-in	0.00 k	1.14 k	-13.01 k-in	0.00 k	-1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	23.67 k-in	0.23 k	0.74 k	-20.52 k-in	-0.23 k	-0.74 k
	1*Dead	2.40 k-in	0.00 k	0.14 k	-1.65 k-in	0.00 k	-0.14 k
	0.6*Dead+0.6*Wup	-12.27 k-in	-0.36 k	0.32 k	14.99 k-in	0.36 k	-0.32 k
FRAME 2	1*Dead+0.6*Wdown	13.12 k-in	0.27 k	0.00 k	-13.91 k-in	-0.27 k	0.00 k
	1*Dead+1*Snow	22.71 k-in	0.00 k	1.37 k	-15.62 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	25.43 k-in	0.20 k	0.94 k	-21.16 k-in	-0.20 k	-0.94 k
	1*Dead	2.88 k-in	0.00 k	0.17 k	-1.98 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-12.20 k-in	-0.36 k	0.34 k	15.04 k-in	0.36 k	-0.34 k
FRAME 3	1*Dead+0.6*Wdown	12.12 k-in	0.24 k	0.02 k	-12.76 k-in	-0.24 k	-0.02 k
	1*Dead+1*Snow	22.71 k-in	0.00 k	1.37 k	-15.62 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	24.69 k-in	0.18 k	0.95 k	-20.29 k-in	-0.18 k	-0.95 k
	1*Dead	2.88 k-in	0.00 k	0.17 k	-1.98 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-10.73 k-in	-0.32 k	0.31 k	13.33 k-in	0.32 k	-0.31 k

TOP CHORD		BEAM 2					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	15.45 k-in	-1.03 k	0.33 k	8.40 k-in	1.03 k	-0.33 k
	1*Dead+1*Snow	13.01 k-in	0.00 k	1.14 k	16.48 k-in	0.00 k	-1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	20.52 k-in	-0.77 k	1.03 k	17.62 k-in	0.77 k	-1.03 k
	1*Dead	1.65 k-in	0.00 k	0.14 k	2.09 k-in	0.00 k	-0.14 k
	0.6*Dead+0.6*Wup	-14.99 k-in	1.19 k	-0.13 k	-6.06 k-in	-1.19 k	0.13 k
FRAME 2	1*Dead+0.6*Wdown	13.91 k-in	-0.89 k	0.33 k	7.97 k-in	0.89 k	-0.33 k
	1*Dead+1*Snow	15.62 k-in	0.00 k	1.37 k	19.78 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	21.16 k-in	-0.67 k	1.19 k	19.56 k-in	0.67 k	-1.19 k
	1*Dead	1.98 k-in	0.00 k	0.17 k	2.50 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-15.04 k-in	1.21 k	-0.11 k	-5.93 k-in	-1.21 k	0.11 k
FRAME 3	1*Dead+0.6*Wdown	12.76 k-in	-0.80 k	0.32 k	7.44 k-in	0.80 k	-0.32 k
	1*Dead+1*Snow	15.62 k-in	0.00 k	1.37 k	19.78 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	20.29 k-in	-0.60 k	1.18 k	19.16 k-in	0.60 k	-1.18 k
	1*Dead	1.98 k-in	0.00 k	0.17 k	2.50 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-13.33 k-in	1.08 k	-0.09 k	-5.14 k-in	-1.08 k	0.09 k

TOP CHORD		BEAM 3					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-8.40 k-in	-0.72 k	-0.35 k	9.40 k-in	0.72 k	0.35 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	0.00 k	16.48 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-17.62 k-in	-0.54 k	-0.26 k	18.37 k-in	0.54 k	0.26 k
	1*Dead	-2.09 k-in	0.00 k	0.00 k	2.09 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	6.06 k-in	0.83 k	0.41 k	-7.21 k-in	-0.83 k	-0.41 k
FRAME 2	1*Dead+0.6*Wdown	-7.97 k-in	-0.62 k	-0.30 k	8.83 k-in	0.62 k	0.30 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.56 k-in	-0.47 k	-0.23 k	20.20 k-in	0.47 k	0.23 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	5.93 k-in	0.84 k	0.41 k	-7.10 k-in	-0.84 k	-0.41 k
FRAME 3	1*Dead+0.6*Wdown	-7.44 k-in	-0.56 k	-0.27 k	8.22 k-in	0.56 k	0.27 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.16 k-in	-0.42 k	-0.21 k	19.74 k-in	0.42 k	0.21 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	5.14 k-in	0.76 k	0.37 k	-6.19 k-in	-0.76 k	-0.37 k

TOP CHORD		BEAM 4					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-9.40 k-in	-0.72 k	-0.35 k	10.39 k-in	0.72 k	0.35 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	0.00 k	16.48 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-18.37 k-in	-0.54 k	-0.26 k	19.11 k-in	0.54 k	0.26 k
	1*Dead	-2.09 k-in	0.00 k	0.00 k	2.09 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	7.21 k-in	0.83 k	0.41 k	-8.36 k-in	-0.83 k	-0.41 k
FRAME 2	1*Dead+0.6*Wdown	-8.83 k-in	-0.62 k	-0.30 k	9.69 k-in	0.62 k	0.30 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-20.20 k-in	-0.47 k	-0.23 k	20.85 k-in	0.47 k	0.23 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	7.10 k-in	0.84 k	0.41 k	-8.26 k-in	-0.84 k	-0.41 k
FRAME 3	1*Dead+0.6*Wdown	-8.22 k-in	-0.56 k	-0.27 k	8.99 k-in	0.56 k	0.27 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.74 k-in	-0.42 k	-0.21 k	20.32 k-in	0.42 k	0.21 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	6.19 k-in	0.76 k	0.37 k	-7.23 k-in	-0.76 k	-0.37 k

TOP CHORD		BEAM 5					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-10.39 k-in	-0.41 k	-1.03 k	-14.23 k-in	0.41 k	1.03 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	-1.14 k	-18.93 k-in	0.00 k	1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.11 k-in	-0.31 k	-1.55 k	-23.67 k-in	0.31 k	1.55 k
	1*Dead	-2.09 k-in	0.00 k	-0.14 k	-2.40 k-in	0.00 k	0.14 k
	0.6*Dead+0.6*Wup	8.36 k-in	0.47 k	0.94 k	12.27 k-in	-0.47 k	-0.94 k
FRAME 2	1*Dead+0.6*Wdown	-9.69 k-in	-0.35 k	-0.94 k	-13.12 k-in	0.35 k	0.94 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	-1.37 k	-22.71 k-in	0.00 k	1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	-20.85 k-in	-0.27 k	-1.64 k	-25.43 k-in	0.27 k	1.64 k
	1*Dead	-2.50 k-in	0.00 k	-0.17 k	-2.88 k-in	0.00 k	0.17 k
	0.6*Dead+0.6*Wup	8.26 k-in	0.48 k	0.94 k	12.20 k-in	-0.48 k	-0.94 k
FRAME 3	1*Dead+0.6*Wdown	-8.99 k-in	-0.32 k	-0.86 k	-12.12 k-in	0.32 k	0.86 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	-1.37 k	-22.71 k-in	0.00 k	1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	-20.32 k-in	-0.24 k	-1.59 k	-24.69 k-in	0.24 k	1.59 k
	1*Dead	-2.50 k-in	0.00 k	-0.17 k	-2.88 k-in	0.00 k	0.17 k
	0.6*Dead+0.6*Wup	7.23 k-in	0.43 k	0.83 k	10.73 k-in	-0.43 k	-0.83 k

KNEE BRACE		BEAM 6					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	1.33 k	-0.38 k	0.00 k-in	-1.33 k	0.38 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	1.00 k	-0.29 k	0.00 k-in	-1.00 k	0.29 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.55 k	0.44 k	0.00 k-in	1.55 k	-0.44 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	1.15 k	-0.33 k	0.00 k-in	-1.15 k	0.33 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.87 k	-0.25 k	0.00 k-in	-0.87 k	0.25 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.57 k	0.45 k	0.00 k-in	1.57 k	-0.45 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	1.04 k	-0.30 k	0.00 k-in	-1.04 k	0.30 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.78 k	-0.22 k	0.00 k-in	-0.78 k	0.22 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.40 k	0.40 k	0.00 k-in	1.40 k	-0.40 k

KNEE BRACE		BEAM 7					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-1.33 k	0.38 k	0.00 k-in	1.33 k	-0.38 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-1.00 k	0.29 k	0.00 k-in	1.00 k	-0.29 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.55 k	-0.44 k	0.00 k-in	-1.55 k	0.44 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-1.15 k	0.33 k	0.00 k-in	1.15 k	-0.33 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.87 k	0.25 k	0.00 k-in	0.87 k	-0.25 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.57 k	-0.45 k	0.00 k-in	-1.57 k	0.45 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-1.04 k	0.30 k	0.00 k-in	1.04 k	-0.30 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.78 k	0.22 k	0.00 k-in	0.78 k	-0.22 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.40 k	-0.40 k	0.00 k-in	-1.40 k	0.40 k

FRONT POST		BEAM 8					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.62 k	0.00 k-in	0.00 k	-0.62 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.28 k	0.00 k-in	0.00 k	-2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.03 k	0.00 k-in	0.00 k	-2.03 k
	1*Dead	0.00 k-in	0.00 k	0.29 k	0.00 k-in	0.00 k	-0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.21 k	0.00 k-in	0.00 k	0.21 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.64 k	0.00 k-in	0.00 k	-0.64 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.35 k	0.00 k-in	0.00 k	-2.35 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.19 k	0.00 k-in	0.00 k	0.19 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.61 k	0.00 k-in	0.00 k	-0.61 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.33 k	0.00 k-in	0.00 k	-2.33 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.14 k	0.00 k-in	0.00 k	0.14 k

FRONT POST		BEAM 9					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.62 k	0.00 k-in	0.00 k	0.62 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.28 k	0.00 k-in	0.00 k	2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.03 k	0.00 k-in	0.00 k	2.03 k
	1*Dead	0.00 k-in	0.00 k	-0.29 k	0.00 k-in	0.00 k	0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.21 k	0.00 k-in	0.00 k	-0.21 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.64 k	0.00 k-in	0.00 k	0.64 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.35 k	0.00 k-in	0.00 k	2.35 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.19 k	0.00 k-in	0.00 k	-0.19 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.61 k	0.00 k-in	0.00 k	0.61 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.33 k	0.00 k-in	0.00 k	2.33 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.14 k	0.00 k-in	0.00 k	-0.14 k

BACK POST		BEAM 10					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-1.23 k	2.09 k	7.71 k-in	1.23 k	-2.09 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.28 k	0.00 k-in	0.00 k	-2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.92 k	3.13 k	5.78 k-in	0.92 k	-3.13 k
	1*Dead	0.00 k-in	0.00 k	0.29 k	0.00 k-in	0.00 k	-0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.43 k	-1.91 k	-8.92 k-in	-1.43 k	1.91 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-1.07 k	1.90 k	6.67 k-in	1.07 k	-1.90 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.80 k	3.30 k	5.00 k-in	0.80 k	-3.30 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.45 k	-1.91 k	-9.07 k-in	-1.45 k	1.91 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-0.96 k	1.75 k	6.02 k-in	0.96 k	-1.75 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.72 k	3.19 k	4.52 k-in	0.72 k	-3.19 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.30 k	-1.69 k	-8.11 k-in	-1.30 k	1.69 k

BACK POST		BEAM 11					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-0.10 k	-1.71 k	-7.71 k-in	0.10 k	1.71 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.28 k	0.00 k-in	0.00 k	2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.08 k	-2.84 k	-5.78 k-in	0.08 k	2.84 k
	1*Dead	0.00 k-in	0.00 k	-0.29 k	0.00 k-in	0.00 k	0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.12 k	1.47 k	8.92 k-in	-0.12 k	-1.47 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-0.09 k	-1.57 k	-6.67 k-in	0.09 k	1.57 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.07 k	-3.06 k	-5.00 k-in	0.07 k	3.06 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.12 k	1.46 k	9.07 k-in	-0.12 k	-1.46 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-0.08 k	-1.45 k	-6.02 k-in	0.08 k	1.45 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.06 k	-2.97 k	-4.52 k-in	0.06 k	2.97 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.11 k	1.28 k	8.11 k-in	-0.11 k	-1.28 k

PURLIN ANALYSIS

Purlin Selected=	6 z 16 ga (1)
Zone:	North
Purlin Spacing =	3.78 ft
Dead Load=	3.06 psf
Snow Load=	27.6 psf

(module wt + purlin self wt)

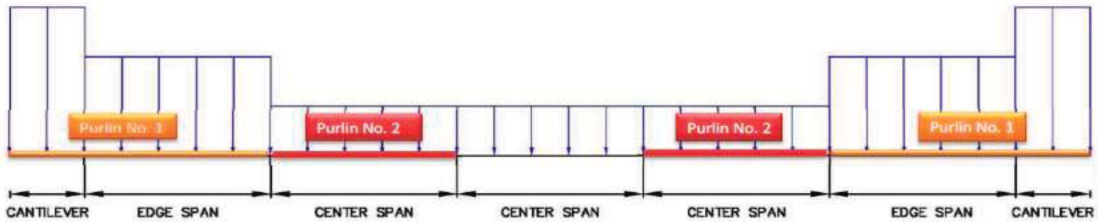


FIGURE 1

Strong Axis Applied Distributed Pressures

ASD Load Combos:	Cantilever		Edge Span		Center Span	
	positive, ↓	negative, ↑	positive, ↓	negative, ↑	positive, ↓	negative, ↑
D+0.6W=	29.24 psf	-	20.64 psf	-	15.10 psf	-
D+S=	23.35 psf	-	23.35 psf	-	23.35 psf	-
D+0.75(0.6W+S)=	38.12 psf	-	31.67 psf	-	27.51 psf	-
0.6D+0.6W=	-	-28.26 psf	-	-23.00 psf	-	-15.15 psf

Weak Axis Applied Distributed Pressures

ASD Load Combos:	Cantilever		Edge Span		Center Span	
	positive, ↓	negative, ↑	positive, ↓	negative, ↑	positive, ↓	negative, ↑
D+0.6W=	1.53 psf	-	1.53 psf	-	1.53 psf	-
D+S=	13.48 psf	-	13.48 psf	-	13.48 psf	-
D+0.75(0.6W+S)=	10.49 psf	-	10.49 psf	-	10.49 psf	-
0.6D+0.6W=	-	0.92 psf	-	0.92 psf	-	0.92 psf

Lengths

Cant. Length	3.81 ft
Edge Span Length	11.44 ft
Center Span Length	11.44 ft

Purlin Properties

D=	6.00 in	Ix=	3.54 in^4
B1=	2.00 in	Iy=	0.60 in^4
B2=	2.00 in	Sx=	1.18 in^3
d=	0.55 in	Sy=	0.25 in^3
t=	0.06 in	C_R=	0.70
R=	0.13 in	Ωb =	1.67
Area=	0.65 in^2	Cm=	1
Wt per foot=	2.20 lb/ft	Sy(group)=	16.65 in^3
Fy=	55 ksi	E=	29000 ksi
		Lu=	11.25 ft

ALL PRE-GALVANIZED PURLIN COIL MATERIAL IS PER ASTM A653 GRADE 55

Per AISI F2.1, Mne = Sf * Fn

Fcre > 2.78 * Fy, Fn = Fy

lateral torsional buckling does not control

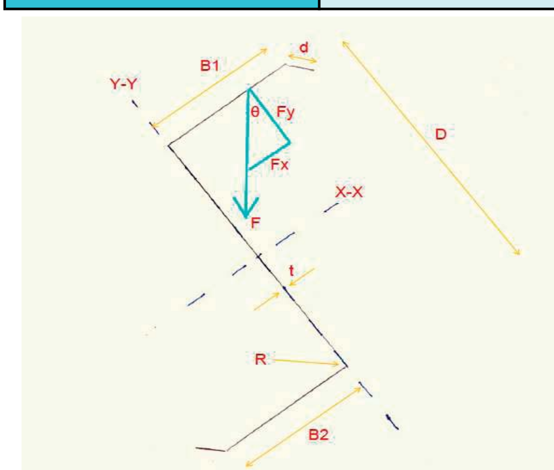
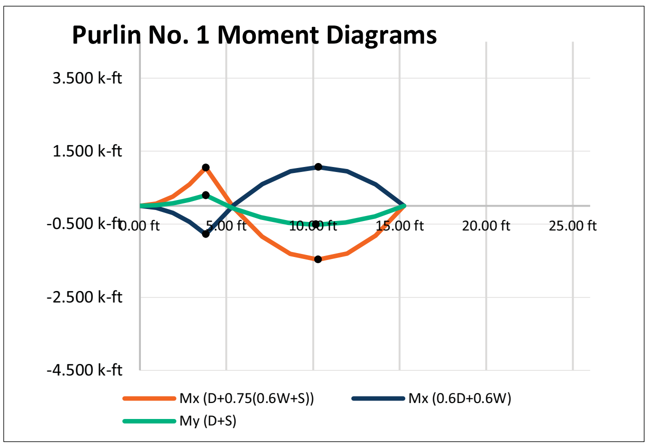


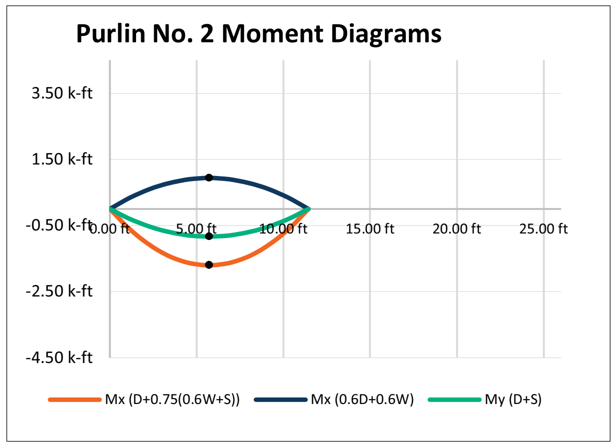
FIGURE 2

Stress Ratio Maximums

North Zone	Purlin Stress Ratios: Positive Shear, ↓				
	Mx	My	Governing Load Combo	S.R. = (Mx/Max)+(My/May) ≤ 1.0	
Cantilever	1.05 k-ft	0.29 k-ft	D+0.75(0.6W+S)=	0.47	OK
Edge Span	1.47 k-ft	0.51 k-ft	D+0.75(0.6W+S)=	0.47	OK
Center Span	1.70 k-ft	0.65 k-ft	D+0.75(0.6W+S)=	0.55	OK

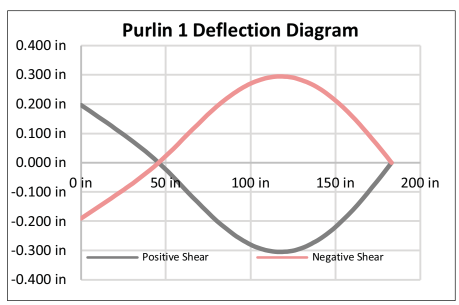
North Zone	Purlin Stress Ratios: Positive Shear, ↑				
	Mx	My	Governing Load Combo	S.R. = (Mx/Max)+(My/May) ≤ 1.0	
Cantilever	-0.78 k-ft	0.03 k-ft	0.6D+0.6W=	0.24	OK
Edge Span	-1.06 k-ft	0.04 k-ft	0.6D+0.6W=	0.47	OK
Center Span	-0.94 k-ft	0.06 k-ft	0.6D+0.6W=	0.41	OK



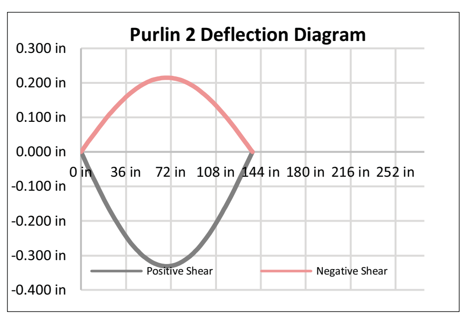


Deflection Checks

Purlin No. 1			
Allowable Deflection =	**L/120**		
Maximum Cantilever Deflection =	0.20 in	L/466	OK
Maximum Span Deflection =	0.30 in	L/451	OK



Purlin No. 2			
Allowable Deflection =	**L/120**		
Maximum Positive Deflection =	0.33 in	L/415	OK
Maximum Negative Deflection =	0.21 in	L/639	OK



ROLL-FORMED TOP CHORD ANALYSIS

TOP CHORD SECTION:	C4"x4.75"x0.88"x14ga

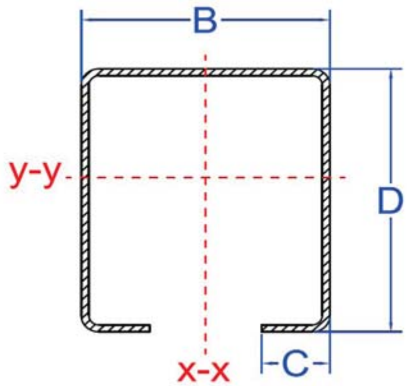


FIGURE 1

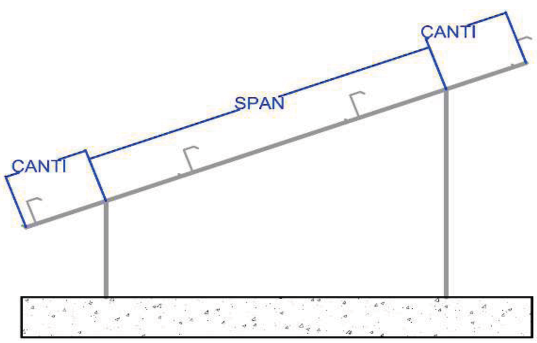


FIGURE 2

SECTION PROPERTIES					
	CANTI	SPAN		CANTI	SPAN
Lx=	19.20 in	35.92 in	J=	0.0021 in^4	0.0021 in^4
Ly=	19.20 in	139.80 in	Cw=	13.90 in^6	13.90 in^6
Lt=	19.20 in	35.92 in	ry=	1.73 in	1.73 in
Kx=	1.20	1.20 in	rx=	1.73 in	1.73 in
Ky=	2.10	1.20 in	ro=	5.10 in	5.10 in
Kt=	1.20	1.20 in	u=	0.20 in	0.20 in
B=	4.00 in	4.00 in	a=	3.68 in	3.68 in
D=	4.75 in	4.75 in	$\bar{a}$=	3.93 in	3.93 in
C=	0.88 in	0.88 in	b=	4.43 in	4.43 in
r=	0.13 in	0.13 in	$\bar{b}$=	4.68 in	4.68 in
t=	0.075 in	0.075 in	c=	0.71 in	0.71 in
E=	29500 ksi	29500 ksi	$\bar{c}$=	0.84 in	0.84 in
G=	11300.0 ksi	11300.0 ksi	A=	1.105 in^2	1.105 in^2
Fy=	55 ksi	55 ksi	$\bar{x}_c$=	1.98 in	1.98 in
Fu=	70 ksi	70 ksi	m=	2.49 in	2.49 in
Sx=	1.66 in^3	1.66 in^3	x_o=	-4.47 in	-4.47 in
c'=	2.73 in	2.73 in	β_w=	-3.04	-3.04
c''=	2.02 in	2.02 in	β_f=	2.36	2.36
Sy+=	1.21 in^3	1.21 in^3	β_l=	3.28	3.28
Sy-=	1.64 in^3	1.64 in^3	B'=	3.93 in	3.93 in
Iy=	3.315 in^4	3.315 in^4	D'=	4.68 in	4.68 in
Ix=	3.304 in^4	3.304 in^4	C'=	0.84 in	0.84 in

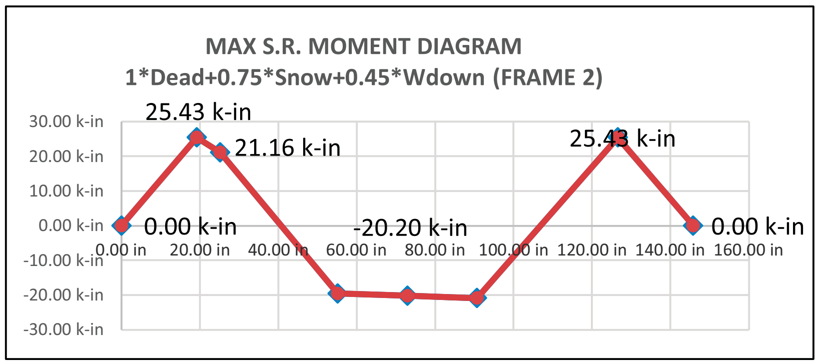
SHEAR		
	CANTI	SPAN
h=	4.35 in	4.35 in
h/t=	58	58
Aw=	0.65 in^2	0.65 in^2
k_v=	5.34	5.34
F_{cr}=	42.3 ksi	42.3 ksi
V_{cr}=	27.62 k	27.62 k
V_y=	21.53 k	21.53 k
λ_v=	0.88	0.88
V_{n1}=	21.53 k	21.53 k
V_{n2}=	19.87 k	19.87 k
V_{n3}=	13.81 k	13.81 k
V_n=	19.87 k	19.87 k
Ω_v=	1.60	1.60
V_a=	12.42 k	12.42 k

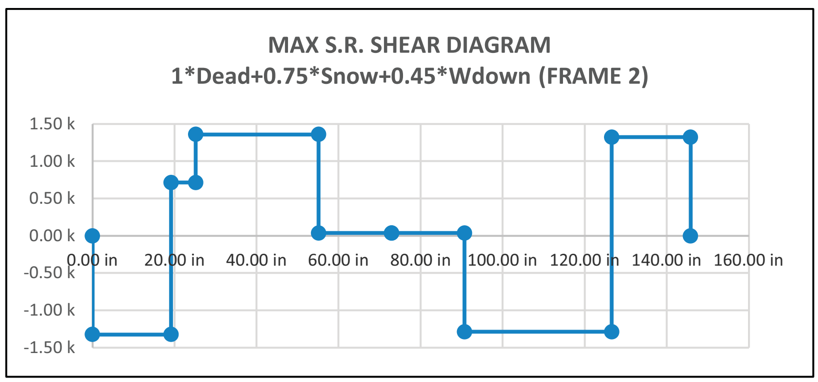
TENSION		
	CANTI	SPAN
A_g=	1.11 in^2	1.11 in^2
$T_{n(yield)}$=	60.78 k	60.78 k
Ω_y=	1.67	1.67
$T_{a(yield)}$=	36.40 k	36.40 k
A_n=	1.11 in^2	1.11 in^2
$T_{n(rupture)}$=	77.36 k	77.36 k
Ω_r=	2.00	2.00
$T_{a(rupture)}$=	38.68 k	38.68 k
T_a=	36.40 k	36.40 k

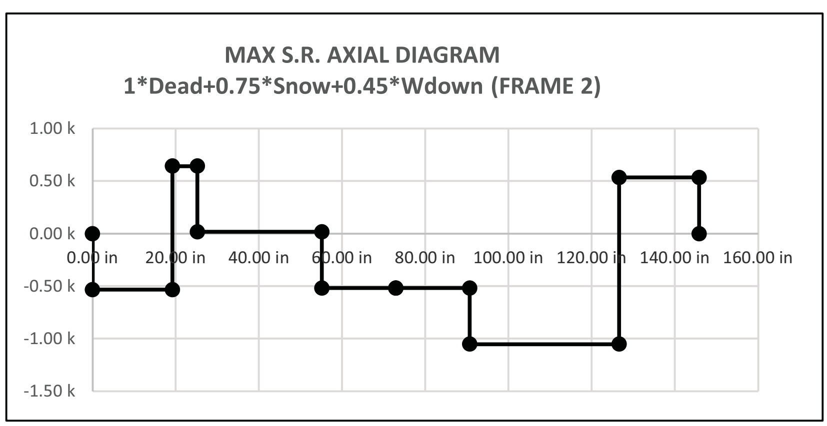
FLEXURE		
	CANTI	SPAN
My+=	66.5 k-in	66.5 k-in
My-=	90.0 k-in	90.0 k-in
Sfy+=	1.21 in^3	1.21 in^3
Sfy-=	1.64 in^3	1.64 in^3
C_S=	-1.00	-1.00
σ_{ex}=	1639.7	468.5
σ_{ey}=	537.2	31.0
C_{TF}=	1.00	1.00
σ_t=	266.14	76.63
j=	4.87 in	4.87 in
ro=	5.10 in	5.10 in
Fcre+=	622.76 ksi	179.26 ksi
Fcre-=	11236.84 ksi	3211.81 ksi
2.78*Fy=	152.9	152.9
.56*Fy=	30.8	30.8
Fn1=	55.0 ksi	55.0 ksi
Fn2+=	59.6 ksi	55.9 ksi
Fn2-=	61.0 ksi	60.8 ksi
Fn3+=	622.8 ksi	179.3 ksi
Fn3-=	11236.8 ksi	3211.8 ksi
Fn+=	55.0 ksi	55.0 ksi
Fn-=	55.0 ksi	55.0 ksi
Yield and LTB, Mne+=	66.5 k-in	66.5 k-in
Yield and LTB, Mne-=	90.0 k-in	90.0 k-in
Fcrllip=	141.5 ksi	141.5 ksi
Fcrlweb=	46.3 ksi	46.3 ksi
Fcrlflange=	31.7 ksi	31.7 ksi
Elastic Local Buckling, Mcrl+=	171.2 k-in	171.2 k-in
Elastic Local Buckling, Mcrl-=	62.0 k-in	62.0 k-in
λ_{l+}=	0.62	0.62
λ_{l-}=	1.20	1.20
Mnl1+=	66.52 k-in	66.52 k-in
Mnl2+=	75.83 k-in	75.83 k-in
Mnl1-=	90.05 k-in	90.05 k-in
Mnl2-=	67.55 k-in	67.55 k-in
Local Buckling, Mnl+=	66.52 k-in	66.52 k-in
Local Buckling, Mnl-=	67.55 k-in	67.55 k-in
Ωb=	1.67	1.67
Ma+=	39.8 k-in	39.8 k-in
Ma-=	40.5 k-in	40.5 k-in
Ma=	39.8 k-in	39.8 k-in

COMPRESSION	CANTI	SPAN
P_y=	60.78 k	60.78 k
σt=	266.1	76.6
σ_{ex}=	1639.7	468.5
σ_{ey}=	537.2	31.0
β=	0.23	0.23
F_{cre}=	235.69 ksi	67.80 ksi
λ_c=	0.48	0.90
Fn1=	49.88 ksi	39.17 ksi
Fn2=	206.7 ksi	59.5 ksi
Fn=	49.9 ksi	39.2 ksi
GLOBAL BUCKLING, P_{ne}=	55.13 k	43.28 k
klip=	0.43	0.43
µlip=	0.3	0.3
wlip=	0.68 in	0.68 in
kweb=	4	4
µweb=	0.3	0.3
wweb=	3.60 in	3.60 in
kflange=	4	4
µflange=	0.3	0.3
wflange=	4.35 in	4.35 in
Fcrllip=	141.5 ksi	141.5 ksi
Fcrlweb=	46.3 ksi	46.3 ksi
Fcrlflange=	31.7 ksi	31.7 ksi
F_{crl}=	31.7 ksi	31.7 ksi
Pcrl=	35.04 k	35.04 k
λ_l=	1.25	1.11
Pnl1=	55.13 k	43.28 k
Pnl2=	40.23	34.29
LOCAL BUCKLING, P_{crl}=	40.23 k	34.29 k
$k_{\phi fe}$=	4.973	0.651
$k_{\phi we}$=	0.570	0.570
k_{ϕ}=	0	0
$k_{\phi fg}$=	0.10667	0.03699
$k_{\phi wg}$=	0.00214	0.00074
L_m=	19.20 in	35.92 in
x_{of}=	1.98 in	1.98 in
h_{xf}=	-2.69	-2.69
h_o=	4.00 in	4.00 in
µ=	0.300	0.300
I_{xf}=	0.013	0.013
C_{wf}=	0	0
I_{xyf}=	0.052	0.052
I_{yf}=	0.930	0.930
L_{crd}=	32.60 in	32.60 in
L=	19.20 in	32.60 in
J_f=	0.00078	0.00078
A_f=	0.41 in^2	0.41 in^2
y_{of}=	-0.064	-0.064
F_{crd}=	50.9 ksi	32.4 ksi
P_{crd}=	56.29 k	35.76 k
λd=	1.039	1.304
P_{nd1}=	60.8 ksi	60.8 ksi
P_{nd2}=	44.2 ksi	36.2 ksi
DISTORTIONAL BUCKLING	44.19 k	36.17 k
Ω_c=	1.8	1.8
Pa=	22.35 k	19.05 k

MAX LOADING - BEAM STRESS RATIO SUMMARY			
S.R.	LOAD COMBO	S.R. FORMULA	BEAM
65.3%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	cantilever 1
NOT APPLIED		(P/Pa)+(M/Ma)	cantilever 1
64.7%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	cantilever 1
NOT APPLIED		(T/Ta)+(M/Ma)	cantilever 2
66.2%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(P/Pa)+(M/Ma)	cantilever 2
64.7%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	cantilever 2
31.2%	0.6*Dead+0.6*Wup (FRAME 1)	(T/Ta)+(M/Ma)	beam 1
67.2%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(P/Pa)+(M/Ma)	beam 1
64.1%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 1
51.9%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 1)	(T/Ta)+(M/Ma)	beam 2
53.2%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(P/Pa)+(M/Ma)	beam 2
54.2%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 2
50.5%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 3
20.1%	0.6*Dead+0.6*Wup (FRAME 1)	(P/Pa)+(M/Ma)	beam 3
49.7%	1*Dead+1*Snow (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 3
52.1%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 4
49.7%	1*Dead+1*Snow (FRAME 2)	(P/Pa)+(M/Ma)	beam 4
50.7%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 4
55.2%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 5
25.6%	0.6*Dead+0.6*Wup (FRAME 1)	(P/Pa)+(M/Ma)	beam 5
53.4%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 5
67.2%	**1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)**	**(P/Pa)+(M/Ma)**	**beam 1**







ROLL-FORMED POST ANALYSIS

POST SECTION:	C8"x3"x0.80"x10ga

COMPRESSION		
	FRONT	BACK
P_y=	109.44 k	109.44 k
σt=	233.7	31.9
σ_{ex}=	784.6	94.1
σ_{ey}=	91.8	11.0
β=	0.71	0.71
F_{cre}=	91.76 ksi	11.00 ksi
λ_c=	0.77	2.24
Fn1=	42.80 ksi	6.79 ksi
Fn2=	80.5 ksi	9.6 ksi
Fn=	42.8 ksi	9.6 ksi
GLOBAL BUCKLING, P_{ne}=	85.16 k	19.20 k
klip=	0.43	0.43
μlip=	0.3	0.3
wlip=	0.54 in	0.54 in
kweb=	4	4
μweb=	0.3	0.3
wweb=	7.48 in	7.48 in
kflange=	4	4
μflange=	0.3	0.3
wflange=	2.48 in	2.48 in
Fcrllip=	703.4 ksi	703.4 ksi
Fcrlweb=	34.2 ksi	34.2 ksi
Fcrlflange=	310.9 ksi	310.9 ksi
F_{crl}=	34.2 ksi	34.2 ksi
Pcrl=	68.07 k	68.07 k
λ_l=	1.12	0.53
Pnl1=	85.16 k	19.20 k
Pnl2=	67.18	23.93
LOCAL BUCKLING, P_{crl}=	67.18 k	19.20 k
$k_{\phi fe}$=	2.413	2.413
$k_{\phi we}$=	1.625	1.625
k_{ϕ}=	0	0
$k_{\phi fg}$=	0.04671	0.04671
$k_{\phi wg}$=	0.02762	0.02762
L_m=	28.45 in	82.15 in
x_{of}=	1.14 in	1.14 in
h_{xf}=	-1.72	-1.72
h_o=	8.00 in	8.00 in
μ=	0.300	0.300
I_{xf}=	0.015	0.015
C_{wf}=	0	0
I_{xyf}=	0.041	0.041
I_{yf}=	0.423	0.423
L_{crd}=	20.21 in	20.21 in
L=	20.21 in	20.21 in
J_f=	0.003 in^4	0.003 in^4
A_f=	0.48 in^2	0.48 in^2
y_{of}=	-0.075	-0.075
F_{crd}=	54.3 ksi	54.3 ksi
P_{crd}=	108.09 k	108.09 k
λd=	1.006	1.006
P_{nd1}=	109.4 ksi	109.4 ksi
P_{nd2}=	81.7 ksi	81.7 ksi
DISTORTIONAL BUCKLING, P	81.67 k	81.67 k
Ω_c=	1.8	1.8
Pa=	37.32 k	10.67 k

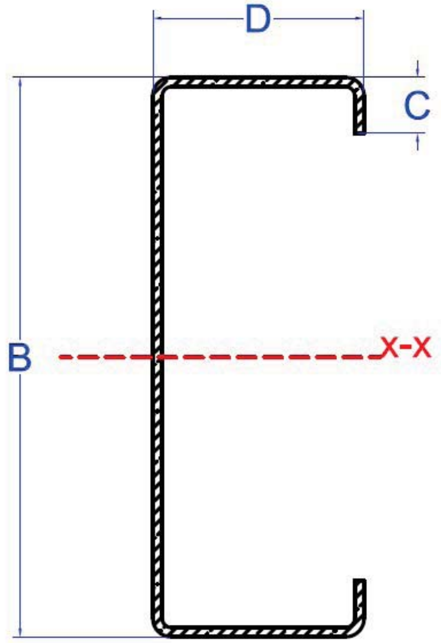


FIGURE 1

SECTION PROPERTIES					
	FRONT	BACK		FRONT	BACK
Lx=	28.45 in	82.15 in	J=	0.01 in^4	0.01 in^4
Ly=	28.45 in	82.15 in	Cw=	27.73 in^6	27.73 in^6
Lt=	28.45 in	82.15 in	ry=	1.06 in	1.06 in
Kx=	2.10	2.10 in	rx=	3.10 in	3.10 in
Ky=	2.10	2.10 in	ro=	3.90 in	3.90 in
Kt=	1.20	1.20 in	u=	0.20 in	0.20 in
B=	8.00 in	8.00 in	a=	7.62 in	7.62 in
D=	3.00 in	3.00 in	ā=	7.87 in	7.87 in
C=	0.80 in	0.80 in	b=	2.62 in	2.62 in
r=	0.13 in	0.13 in	$\bar{b}$=	2.87 in	2.87 in
t=	0.134 in	0.134 in	c=	0.61 in	0.61 in
E=	29500 ksi	29500 ksi	ć=	0.73 in	0.73 in
G=	11300 ksi	11300 ksi	A=	1.99 in^2	1.99 in^2
Fy=	55 ksi	55 ksi	$\ddot{x}_c$=	0.82 in	0.82 in
Fu=	70 ksi	70 ksi	m=	1.29 in	1.29 in
Sx=	4.78 in^3	4.78 in^3	x_o=	-2.11 in	-2.11 in
c'=	2.12 in	2.12 in	β_w=	-5.00	-5.00
c''=	0.88 in	0.88 in	β_f=	8.49	8.49
Sy+=	1.06 in^3	1.06 in^3	β_l=	6.84	6.84
Sy-=	2.54 in^3	2.54 in^3	B'=	7.87 in	7.87 in
Iy=	2.24 in^4	2.24 in^4	D'=	2.87 in	2.87 in
Ix=	19.14 in^4	19.14 in^4	C'=	0.73 in	0.73 in

FLEXURE		
	FRONT	BACK
Mxy=	263.1 k-in	263.1 k-in
Sfx=	4.78 in^3	4.78 in^3
Cb=	1.000	1.000
σ_{ey}=	91.76 ksi	11.00 ksi
σ_t=	233.67 ksi	31.94 ksi
Fcre=	237.34 ksi	30.39 ksi
2.78*Fy=	152.90 ksi	152.90 ksi
.56*Fy=	30.80 ksi	30.80 ksi
Fn1=	55.00 ksi	55.00 ksi
Fn2=	57.18 ksi	30.39 ksi
Fn3=	237.34 ksi	30.39 ksi
Fn=	55.00 ksi	30.39 ksi
Yield and LTB, Mne=	263.13 k-in	145.38 k-in
Fcrllip=	703.4 ksi	703.4 ksi
Fcrlweb=	34.2 ksi	34.2 ksi
Fcrlflange=	310.9 ksi	310.9 ksi
Elastic Local Buckling, Mcrl=	1487.2 k-in	1487.2 k-in
λ_l=	0.42	0.31
Mnl1=	263.13 k-in	145.38 k-in
Mnl2=	368.32 k-in	228.39 k-in
Local Buckling, Mnl=	263.1 ksi	145.4 ksi
Ωb=	1.67	1.67
Ma=	157.6 k-in	87.1 k-in

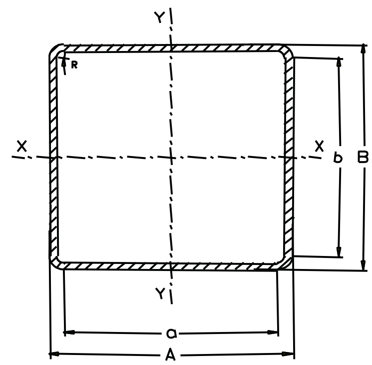
SHEAR		
	FRONT	BACK
h=	7.48 in	7.48 in
h/t=	55.84	55.84
Aw=	1.00 in^2	1.00 in^2
k_v=	5.34	5.34
F_{cr}=	45.7 ksi	45.7 ksi
V_{cr}=	45.79 k	45.79 k
V_y=	33.09 k	33.09 k
λ_v=	0.85	0.85
V_{n1}=	33.09 k	33.09 k
V_{n2}=	31.72 k	31.72 k
V_{n3}=	45.80 k	45.80 k
V_n=	31.72 k	31.72 k
Ω_v=	1.60	1.60
V_a=	19.83 k	19.83 k

TENSION		
	FRONT	BACK
A_g=	1.99 in^2	1.99 in^2
$T_{n(yield)}$=	109.44 k	109.44 k
Ω_y=	1.67	1.67
$T_{a(yield)}$=	65.53 k	65.53 k
A_n=	1.99 in^2	1.99 in^2
$T_{n(rupture)}$=	139.29 k	139.29 k
Ω_r=	2.00	2.00
$T_{a(rupture)}$=	69.64 k	69.64 k
T_a=	65.53 k	65.53 k

		Local Coordinates						
	GOVERNING LOAD COMBO	BEAM	Mx	Fy	Fx	(T/Ta)+(M/Ma)	(P/Pa)+(M/Ma)	((V/Va)^2+(M/Ma)^2)^.5
FRONT:	1*Dead+1*Snow	8	0.00 k-in	0.00 k	2.73 k	NO TENSION	7.32%	0.00%
BACK:	*Dead+0.75*Snow+0.45*Wdown	11	-5.00 k-in	0.07 k	3.06 k	NO TENSION	34.39%	5.75%

Knee Brace Design - Compression Member

Input Data			KNEE BRACE
Member Section	**2x2x15ga**		
A = Tube Width	2	in	
B = Tube Length	2	in	
R = Corner Inner Radius	0.09375	in	
t = Thickness	0.072	in	
KL_x= Buckling around x-x	7.61	ft	
KL_y= Buckling around y-y	7.61	ft	
E = Modulus of Elasticity	29500	ksi	
F_y = Yield Stress	50	ksi	
G = Shear Modulus	11300	ksi	



Calculated Parameter		
1- Properties of 90° corner		
r = R + t/2, Centerline of Dimension	0.130	in
u = π. r/2, Arc Length	0.204	in
c=0.637.r Distance of c.g. from center	0.083	in
2- Flat widths of flanges and webs		
Flat width of Dim. a= A - (2.r + t)	1.6685	in
Flat width of Dim. b= B - (2.r + t)	1.6685	in

Applied Forces		
M	**0.000**	kip.ft
P	**1.33**	kips
BEAMS 6 & 7		

Calculation of I_x

Element	L, Length (in)		Y, Distance to the center (in)		L xY^2	I_x'
Flanges	2.a	3.337	B/2 - t/2	0.964	3.101	0.000
Web	2.b	3.337	0	0.000	0.000	0.774
Corners	4.u	0.815	b/2 + c	0.917	0.685	0.000
Sum	7.489		1.881		3.786	0.774

Calculation of I_y

Element	L, Length (in)		X, Distance to the center (in)		L x X^2	I_y'
Flanges	2.a	3.337	0	0.000	0.000	0.774
Web	2.b	3.337	A/2 - t/2	0.964	3.101	0.000
Corners	4.u	0.815	a/2 + c	0.917	0.685	0.000
Sum	7.489		1.881		3.786	0.774

Section Properties

A	L x t	0.5392	in^2
I_X	t x (L x Y^2 +I_x')	0.3284	in^4
I_Y	t x (L x X^2 +I_y')	0.3284	in^4
S_x	I_X /(B/2)	0.3284	in^3
S_Y	I_Y /(A/2)	0.3284	in^3
r_x	$(I_x /A)^{0.5}$	0.7804	in
r_Y	$(I_Y /A)^{0.5}$	0.7804	in

Nominal Buckling Stress			
KL_x/r_x		117.08	
KL_y/r_y		117.08	
KL/r		117.08	
F_e	$\pi^2 . E/(KL/r)^2$	21.24	ksi
λ_c	$(Fy/Fe)^{0.5}$	1.53	
	F_n	18.63	ksi

Effective Area			
effective width of compression flange			
w/t = a/t		23.17	
λ	$1.052/(k)^{0.5} \times (w/t) \times (F_n/E)^{0.5}$	0.31	
ρ	$(1-0.22 / \lambda) / \lambda$	0.92	
	a_e	1.67	in
effective width of web element			
w/t = b/t		23.17	
λ	$1.052/(k)^{0.5} \times (w/t) \times (F_n/E)^{0.5}$	0.31	
ρ	$(1-0.22 / \lambda) / \lambda$	0.92	
	b_e	1.67	in

Allowable Axial Load			
A_e	$A_e = A - 2 \times t \times [(a-a_e) + (b-b_e)]$	0.54	in^2
P_n	$P_n = A_e \times F_n$	10.05	kips
Ω_c		1.80	
	$P_a = P_n / \Omega_c$	5.58	kips

Check Compression Stresses				
			Loads from Wind?	
C_{b1}	$Cb1=(P / P_a)$	0.24	NO	
			Allowable Stress Unity	1
		0.24	**Section is OK**	

Computing of M_{nx}

By using the effective width of compression flange and assuming the web is fully effective, the neutral axis can be located as follow:

Element	L, Length (in)		y, Distance to top fiber (in)		L.y	$L.y^2$
C. Flanges	a_e	1.669	t/2	0.036	0.060	0.002
Web	2.b	3.337	B/2	1.000	3.337	3.337
C. Corners	2.u	0.408	c+t/2	0.119	0.048	0.006
T. Flanges	a_e	1.669	B-t/2	1.964	3.277	6.436
T.Corners	2.u	0.408	B-c-t/2	1.881	0.767	1.443
Sum	7.489		5.000		7.489	11.224

$y_{cg} =$ L.y/ L 1.000 Z=R+t 0.166 in

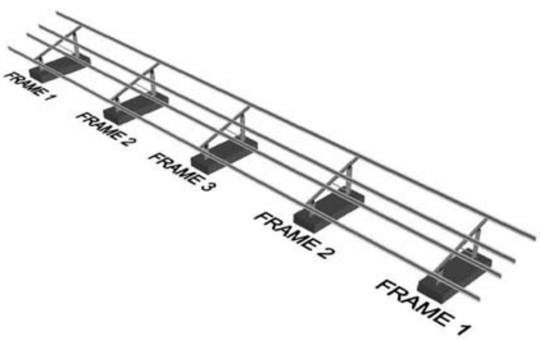
The max. stress of 50 ksi ocurs in the compression flange as assumed in the calculation

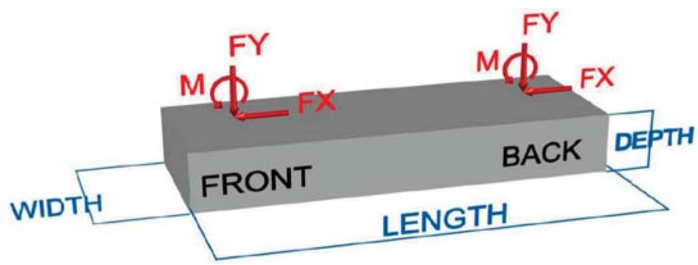
Check the effectiveness of the Web			
f_1	$(y_{cg}- Z)F_y/y_{cg}$	41.71	ksi
f_2	$- (B-y_{cg}- Z)F_y/y_{cg}$	-41.71	ksi
ψ	f_2/f_1	-1.00	
k	$4+2(1-\psi)^3+2(1-\psi)$	24.00	
h/t	b_e/t	23.17	
λ	$1.052/(k)^{0.5}$ x (h/t) x $(f1/E)^{0.5}$	0.19	
ρ	$(1-0.22 / \lambda) / \lambda$	-0.94	
b_e		1.67	in
b_1	$b_e/(3-\psi)$	0.42	in
b_2		0.83	in
	b_1+b_2	1.25	in
$2\ I'_{web}$	$2(1/12)(b)^3$	0.77	in^4
	$\Sigma(Ly^2)$	11.22	in^4
	$(-)(\Sigma L)(y_{cg})^2$	7.49	in^4
	I'_x	4.51	in^4
	$I_x=I'_x.t$	0.32	in^4
	$S_{ex}=I_x/y_{cg}$	0.32	in^3
	C_b=1.0 for combined axial load and bending moment		
j	$2b^2d^2t/(b+d)$	0.33	in^4
S_f	$fullS_x$	0.33	in^4
L_u	$0.36C_b\pi.(E\ I.G.j)^{0.5}/(F_y.\ S_f)$	34.73	ft
F_e'	$C_b\pi.(E\ I.G.j)^{0.5}/(L.\ Sf)$	633.60	ksi
Allowable Bending Moment			
	M_{nx}	1.353	kip.ft
	Ω_b	1.670	
	$M_a = M_{nx} /\Omega_b$	0.810	kip.ft

Check Stresses				
C_{mx}	$0.6-0.4*M_1/M_2$	0.60	Loads from Wind?	
C_{b1}	$(P / P_a) + (C_{mx}\ M_x / M_a)$	0.24	NO	
C_{b2}	$(P / P_a) + (M_x / M_a)$	0.24	Allowable Stress Unity	1
C_b	If((P / P_a) <= 0.15,C_{b2},C_{b1})	0.24	**Section is OK**	

North Zones Ballast Analysis (ASD)

unit weight of concrete =	0.15 k/ft^3	depth below grade =	0.00 ft
sliding coeff of friction =	0.40	allowable bearing pressure=	1.00 ksf





BALLAST INPUTS:

		LENGTH		WIDTH		DEPTH
BLOCKS 1+2:	**DIMENSIONS =**	**9.50 ft**	**x**	**3.58 ft**	**x**	**1.50 ft**
	VOLUME =	51.02 ft^3				
	WEIGHT =	7.65 k		EDGE DISTANCE =	0.87 ft	

		LENGTH		WIDTH		DEPTH
BLOCKS 3+:	**DIMENSIONS =**	**9.50 ft**	**x**	**3.58 ft**	**x**	**1.50 ft**
	VOLUME =	51.02 ft^3				
	WEIGHT =	7.65 k		EDGE DISTANCE =	0.87 ft	

SLIDING CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.21 k	
		BACK	0.00 k-ft	1.43 k	-1.91 k	OK
	RESISTANCE TO SLIDING =		2.21 k	**SAFETY FACTOR =**		1.55
FRAME 2:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.19 k	
		BACK	0.00 k-ft	1.45 k	-1.91 k	OK
	RESISTANCE TO SLIDING =		2.22 k	**SAFETY FACTOR =**		1.53
FRAME 3:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.14 k	
		BACK	0.00 k-ft	1.30 k	-1.69 k	OK
	RESISTANCE TO SLIDING =		2.33 k	**SAFETY FACTOR =**		1.79

UPLIFT CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.21 k	
		BACK	0.00 k-ft	1.43 k	-1.91 k	OK
	RESISTANCE TO UPLIFT =		7.65 k	**SAFETY FACTOR =**		3.60
FRAME 2:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.19 k	
		BACK	0.00 k-ft	1.45 k	-1.91 k	OK
	RESISTANCE TO UPLIFT =		7.65 k	**SAFETY FACTOR =**		3.65
FRAME 3:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.14 k	
		BACK	0.00 k-ft	1.30 k	-1.69 k	OK
	RESISTANCE TO UPLIFT =		7.65 k	**SAFETY FACTOR =**		4.18

OVERTURNING CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**		
		FRONT	0.00 k-ft	0.00 k-ft	-0.21 k-ft		
		BACK	0.00 k-ft	1.43 k-ft	-1.91 k-ft		
	OVERTURN AT A =		18.82 k-ft	**OVERTURN RESISTANCE AT A =**		36.35 k-ft	
	OVERTURN AT B =		1.38 k-ft	**OVERTURN RESISTANCE AT B =**		36.35 k-ft	
	SAFETY FACTOR FOR OT AT A =		1.93	OK			
	SAFETY FACTOR FOR OT AT B =		26.29	OK			
FRAME 2:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**		
		FRONT	0.00 k-ft	0.00 k-ft	-0.19 k-ft		
		BACK	0.00 k-ft	1.45 k-ft	-1.91 k-ft		
	OVERTURN AT A =		18.82 k-ft	**OVERTURN RESISTANCE AT A =**		36.35 k-ft	
	OVERTURN AT B =		1.10 k-ft	**OVERTURN RESISTANCE AT B =**		36.35 k-ft	
	SAFETY FACTOR FOR OT AT A =		1.93	OK			
	SAFETY FACTOR FOR OT AT B =		32.97	OK			
FRAME 3:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**		
		FRONT	0.00 k-ft	0.00 k-ft	-0.14 k-ft		
		BACK	0.00 k-ft	1.30 k-ft	-1.69 k-ft		
	OVERTURN AT A =		16.62 k-ft	**OVERTURN RESISTANCE AT A =**		36.35 k-ft	
	OVERTURN AT B =		0.78 k-ft	**OVERTURN RESISTANCE AT B =**		36.35 k-ft	
	SAFETY FACTOR FOR OT AT A =		2.19	OK			
	SAFETY FACTOR FOR OT AT B =		46.74	OK			

BEARING CHECK: APPLIED BEARING ≤ MAX ALLOWABLE BEARING									
FRAME 1:	**GOVERNING LOAD COMBINATION =**				1*Dead+0.6*Wnodal+				
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.70 ft		
		FRONT	6.98 k-ft	0.00 k	0.29 k	L/6 =	1.58 ft		
		BACK	6.98 k-ft	0.00 k	0.29 k	L/2 =	4.75 ft		
	MAX APPLIED BEARING PRESSURE =				0.50 ksf	≤	1.00 ksf	OK	
FRAME 2:	**GOVERNING LOAD COMBINATION =**				1*Dead+0.6*Wnodal+				
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.45 ft		
		FRONT	6.05 k-ft	0.00 k	0.35 k	L/6 =	1.58 ft		
		BACK	6.05 k-ft	0.00 k	0.35 k	L/2 =	4.75 ft		
	MAX APPLIED BEARING PRESSURE =				0.47 ksf	≤	1.00 ksf	OK	
FRAME 3:	**GOVERNING LOAD COMBINATION =**				1*Dead+0.6*Wnodal+				
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.08 ft		
		FRONT	4.51 k-ft	0.00 k	0.35 k	L/6 =	1.58 ft		
		BACK	4.51 k-ft	0.00 k	0.35 k	L/2 =	4.75 ft		
	MAX APPLIED BEARING PRESSURE =				0.41 ksf	≤	1.00 ksf	OK	

REINFORCEMENT:

BLOCKS 1+2

Length=	9.50 ft	min steel (shrinkage), longitudinal direction=			1.39 in^2
Width=	3.58 ft	min steel (shrinkage), transverse direction=			3.69 in^2
Depth=	1.50 ft	minimum bar spacing=			18 in
rows of bars=	2	As (#4 bar)=	0.20 in^2	As (#5 bar)=	0.31 in^2
longitudinal bars per row by max spacing (18 in)=	4	transverse bars per row by max spacing (18 in)=			7
longitudinal #4 bars/row, min steel=	4	transverse #4 bars/row, min steel=			10
longitudinal #5 bars/row, min steel=	3	transverse #5 bars/row, min steel=			7

Reinforcement (#4 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#4 bars)=	10	transverse bars Top and Bottom
Reinforcement (#5 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#5 bars)=	7	transverse bars Top and Bottom

BLOCKS 3+

Length=	9.50 ft	min steel (shrinkage), longitudinal direction=			1.39 in^2
Width=	3.58 ft	min steel (shrinkage), transverse direction=			3.69 in^2
Depth=	1.50 ft	minimum bar spacing=			18 in
rows of bars=	2	As (#4 bar)=	0.20 in^2	As (#5 bar)=	0.31 in^2
longitudinal bars/row, min spacing=	4	transverse bars/row, min spacing=			7
longitudinal #4 bars/row, min steel=	4	transverse #4 bars/row, min steel=			10
longitudinal #5 bars/row, min steel=	3	transverse #5 bars/row, min steel=			7

Reinforcement (#4 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#4 bars)=	10	transverse bars Top and Bottom
Reinforcement (#5 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#5 bars)=	7	transverse bars Top and Bottom

Alternatively, reinforcement may be fiber mesh for shrinkage and cracking requirments. A minimum of 5 lbs per 1 yd^3 BASF MasterFiber MAC 2200 CB Fiber or approved equal required.

DESIGN CRITERIA

South

Design Criteria:

Code:	**2020 New York State Building Code (IBC 2018)**	
Dead Load:	4.0 psf	
Roof Live Load:	0.0 psf	
Ground Snow:	50.0 psf	
Wind Speed:	110 mph	(Exposure C Assumed)
Module Tilt:	30.0 deg	
Purlin Trib Width:	3.27 ft	(Horizontal Projection)

Snow Load Calculation: $p_f = 0.7C_sC_eC_tI_sp_g$

C_e =	0.9
C_t =	1.2
I_s =	1.0
C_s =	0.73
p_s=	**27.6 psf**

Wind Load Calculation: $q = 0.00256K_zK_dK_{zt}V^2$

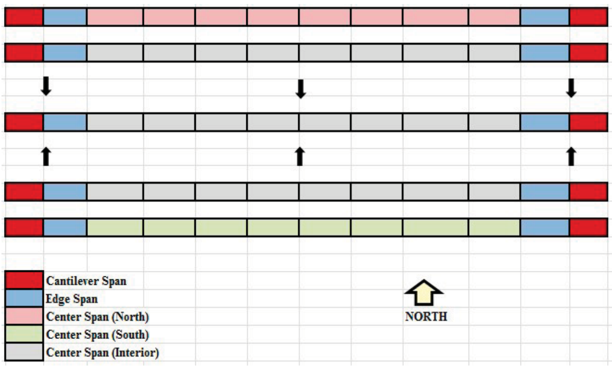
K_z =	0.85
K_d =	0.85
K_{zt} =	1.0
q =	**22.4 psf**

Mean Roof Height = 6.8 ft (Per RWDI Wind Tunnel Analysis)

WIND TUNNEL COEFFICIENTS (RWDI)				**TILT: 30.0 deg**
PURLIN				
ZONE	**GCp Up**	**GCp Down**	**PSF Up**	**PSF Down**
Cantilever	-2.223	1.980	-49.75	44.31
Edge Span	-1.832	1.340	-40.99	29.98
North Row Center Span	-1.247	0.927	-27.90	20.75
South Row Center Span	-1.617	1.232	-36.18	27.57
Interior Center Span	-1.322	0.789	-29.58	17.67
TOP CHORD				
ZONE	**GCp Up**	**GCp Down**	**PSF Up**	**PSF Down**
Cantilever	-1.617	1.675	-36.20	37.49
Edge Span	-1.381	1.008	-30.91	22.56
North Row Center Span	-1.117	0.830	-25.01	18.57
South Row Center Span	-1.245	0.959	-27.87	21.46
Interior Row Center Span	-0.991	0.712	-22.18	15.93
BASE MOMENT				
ZONE	**GCmy (+)**	**GCmy (-)**	**q*GCmy (+)**	**q*GCmy (-)**
Cantilever	0.551	-0.237	12.32	-5.30
Edge Span	0.437	-0.174	9.79	-3.90
North Row Center Span	0.260	-0.169	5.82	-3.79
South Row Center Span	0.376	-0.101	8.41	-2.27
Interior Row Center Span	0.324	-0.162	7.25	-3.63

Note: See Figures 1 & 2 for clarity on zones

APPLIED LOADING		
DEAD LOAD:	5psf*Purlin Spacing/1000	0.01511 klf
LIVE LOAD:	N/A	0.000 klf
SNOW:	P_s*Purlin Trib. Width/1000:	0.09032 klf



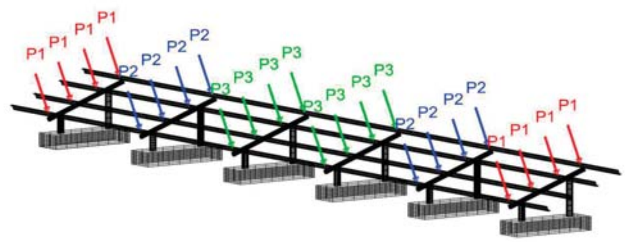


FIGURE 1

FIGURE 2

WIND: (Top Chord Pressures)	South
$P1_{up} = \frac{Upslope\ Length*q}{4}\left[Cantilever\ Width * GCp_{(cantilever)} + \frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)}\right]$	-1.183 kips
$P1_{down} = \frac{Upslope\ Length*q}{4}\left[Cantilever\ Width * GCp_{(cantilever)} + \frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)}\right]$	1.022 kips
$P2_{up} = \frac{Upslope\ Length*q}{4}\left[\frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)} + \frac{Center\ Span\ Width}{2} * GCp_{(center\ span)}\right]$	-1.264 kips
$P2_{down} = \frac{Upslope\ Length*q}{4}\left[\frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)} + \frac{Center\ Span\ Width}{2} * GCp_{(center\ span)}\right]$	0.946 kips
$P3_{up} = \frac{Upslope\ Length*q}{4}\left[Center\ Span\ Width * GCp_{(center\ span)}\right]$	-1.198 kips
$P3_{down} = \frac{Upslope\ Length*q}{4}\left[Center\ Span\ Width * GCp_{(center\ span)}\right]$	0.923 kips

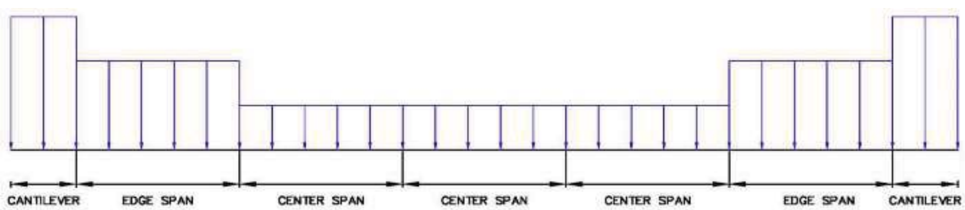


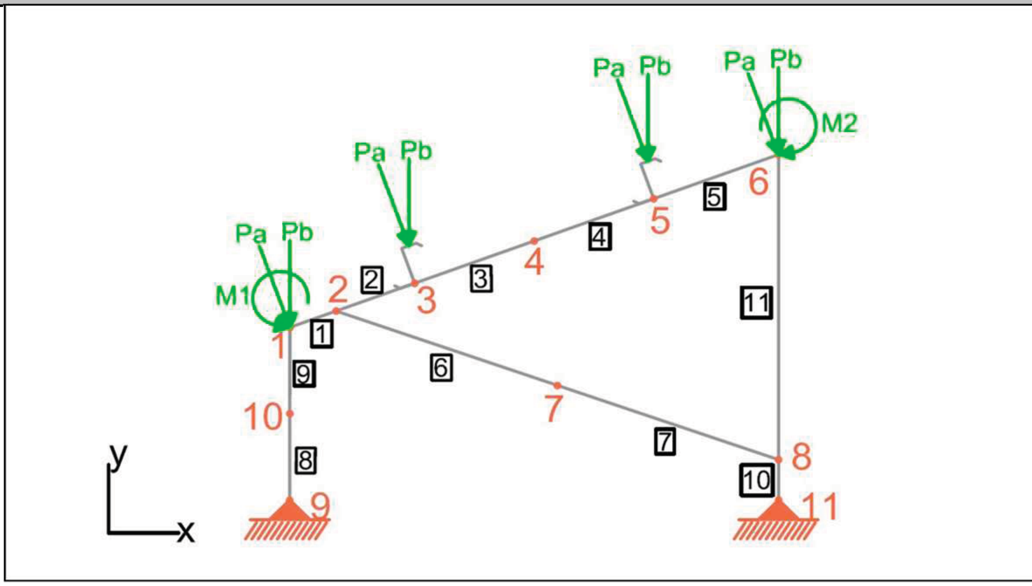
FIGURE 3

WIND: (Base Moments)

GC_{My}*q*A*Upslope Length

South		
POSITIVE		
Post 1	Post 2	Post 3
23.27 k-ft	23.52 k-ft	21.73 k-ft
NEGATIVE		
Post 1	Post 2	Post 3
-9.60 k-ft	-7.97 k-ft	-5.87 k-ft

South Frame Analysis



DIRECT STIFFNESS METHOD BEAM, NODE, AND RELEASE DEFINITIONS											
Member	Member Beginning	Member Ending Node	Node B Release	Node E Release	A	E	I	Length, L	θ	cos(θ)	sin(θ)
1	1	2	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	6.00 in	30.0 °	0.87	0.50
2	2	3	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	29.92 in	30.0 °	0.87	0.50
3	3	4	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	17.78 in	30.0 °	0.87	0.50
4	4	5	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	17.78 in	30.0 °	0.87	0.50
5	5	6	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	35.92 in	30.0 °	0.87	0.50
6	2	7	PINNED	FIXED	0.84 in^2	29000 ksi	0.49 in^4	45.68 in	-16.0 °	0.96	-0.28
7	8	7	PINNED	FIXED	0.84 in^2	29000 ksi	0.49 in^4	45.68 in	164.0 °	-0.96	0.28
8	9	10	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	14.22 in	90.0 °	0.00	1.00
9	1	10	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	14.22 in	-90.0 °	0.00	-1.00
10	11	8	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	6.25 in	90.0 °	0.00	1.00
11	6	8	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	75.90 in	-90.0 °	0.00	-1.00

STIFFNESS, k DETERMINATION VARIABLES					
Member	ka	kΔΔ	kΔθ	kθθ	kϕθ
1	8555.00	7088.89	21266.67	85066.67	42533.33
2	1715.68	57.18	855.33	17059.90	8529.95
3	2886.39	272.26	2420.86	28700.82	14350.41
4	2886.39	272.26	2420.86	28700.82	14350.41
5	1429.08	33.04	593.44	14210.10	7105.05
6	533.27	0.45	20.43	933.22	622.15
7	533.27	0.45	20.43	933.22	622.15
8	5464.10	495.82	7052.36	100311.09	66874.06
9	5464.10	495.82	7052.36	100311.09	66874.06
10	12435.20	5844.17	36526.08	228288.00	152192.00
11	1023.99	3.26	247.68	18798.65	12532.43

	FIXED-FIXED	PINNED-FIXED
ka=	(EA/L)	(EA/L)
kΔΔ=	$(12EI)/(L^3)$	$(3EI)/(L^3)$
kΔθ=	$(6EI)/(L^2)$	$(3EI)/(L^2)$
kθθ=	(4EI)/(L)	(3EI)/(L)
kϕθ=	(2EI)/(L)	(2EI)/(L)

c=cos(θ) s=sin(θ)

ELEMENT GLOBAL STIFFNESS MATRIX EQUATIONS

PINNED-FIXED

0	0	0	0	0	0
0	$c^2k_a + s^2k_{\Delta\Delta}$	$csk_a - csk_{\Delta\Delta}$	$-sk_{\Delta\theta}$	$-c^2k_a - s^2k_{\Delta\Delta}$	$-csk_a + csk_{\Delta\Delta}$
0		$s^2k_a + c^2k_{\Delta\Delta}$	$ck_{\Delta\theta}$	$-csk_a + csk_{\Delta\Delta}$	$-s^2k_a - c^2k_{\Delta\Delta}$
0			$k_{\theta\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
0	symmetrical			$c^2k_a + s^2k_{\Delta\Delta}$	$csk_a - csk_{\Delta\Delta}$
0					$s^2k_a + c^2k_{\Delta\Delta}$

FIXED-FIXED

$k_{\theta\theta}$	$-sk_{\Delta\theta}$	$ck_{\Delta\theta}$	$k_{\Phi\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
	$c^2k_a + s^2k_{\Delta\Delta}$	$csk_a - csk_{\Delta\Delta}$	$-sk_{\Delta\theta}$	$-c^2k_a - s^2k_{\Delta\Delta}$	$-csk_a + csk_{\Delta\Delta}$
		$s^2k_a + c^2k_{\Delta\Delta}$	$ck_{\Delta\theta}$	$-csk_a + csk_{\Delta\Delta}$	$-c^2k_a - s^2k_{\Delta\Delta}$
			$k_{\theta\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
symmetrical				$c^2k_a + s^2k_{\Delta\Delta}$	$csk_a - csk_{\Delta\Delta}$
					$s^2k_a + c^2k_{\Delta\Delta}$

Equilibrium: $\{P_e\}_G = [T]\{P_e\}_L$

Compatibility: $\{\Delta_e\}_L = \{T\}^T\{\Delta_e\}_G$

Force Displacement: $\{P_e\}_L = [k_e]_L\{\Delta_e\}_L$

$[T]\{P_e\}_L = [T][k_e]_L[T]^T\{\Delta_e\}_G$

$\{P_e\}_G = [k_e]_G\{\Delta_e\}_G$

$[k_e]_G = [T][k_e]_L[T]^T$

$$\begin{Bmatrix} P \\ R \end{Bmatrix} = \begin{bmatrix} K_{PP} & K_{PR} \\ K_{RP} & K_{RR} \end{bmatrix} \begin{Bmatrix} \Delta_P \\ \Delta_R \end{Bmatrix}$$

Structural Stiffness Method General Form

P=external load Δ=displacement

T=transformation matrix

T^T=inverse transfromation matrix

e=element G=global

L=local k=element stiffness matrix

{}=vector K=structure global stiffness matrix

[]=matrix R=structural global reaction

Beam End Forces (Global Coordinate System)

TOP CHORD		BEAM 1					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	14.23 k-in	0.31 k	-0.06 k	-15.45 k-in	-0.31 k	0.06 k
	1*Dead+1*Snow	18.93 k-in	0.00 k	1.14 k	-13.01 k-in	0.00 k	-1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	23.67 k-in	0.23 k	0.74 k	-20.52 k-in	-0.23 k	-0.74 k
	1*Dead	2.40 k-in	0.00 k	0.14 k	-1.65 k-in	0.00 k	-0.14 k
	0.6*Dead+0.6*Wup	-12.27 k-in	-0.36 k	0.32 k	14.99 k-in	0.36 k	-0.32 k
FRAME 2	1*Dead+0.6*Wdown	13.83 k-in	0.29 k	-0.01 k	-14.75 k-in	-0.29 k	0.01 k
	1*Dead+1*Snow	22.71 k-in	0.00 k	1.37 k	-15.62 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	25.97 k-in	0.21 k	0.93 k	-21.79 k-in	-0.21 k	-0.93 k
	1*Dead	2.88 k-in	0.00 k	0.17 k	-1.98 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-12.91 k-in	-0.38 k	0.35 k	15.87 k-in	0.38 k	-0.35 k
FRAME 3	1*Dead+0.6*Wdown	13.56 k-in	0.28 k	-0.01 k	-14.43 k-in	-0.28 k	0.01 k
	1*Dead+1*Snow	22.71 k-in	0.00 k	1.37 k	-15.62 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	25.77 k-in	0.21 k	0.93 k	-21.55 k-in	-0.21 k	-0.93 k
	1*Dead	2.88 k-in	0.00 k	0.17 k	-1.98 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-12.15 k-in	-0.36 k	0.34 k	14.99 k-in	0.36 k	-0.34 k

TOP CHORD		BEAM 2					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	15.45 k-in	-1.03 k	0.33 k	8.40 k-in	1.03 k	-0.33 k
	1*Dead+1*Snow	13.01 k-in	0.00 k	1.14 k	16.48 k-in	0.00 k	-1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	20.52 k-in	-0.77 k	1.03 k	17.62 k-in	0.77 k	-1.03 k
	1*Dead	1.65 k-in	0.00 k	0.14 k	2.09 k-in	0.00 k	-0.14 k
	0.6*Dead+0.6*Wup	-14.99 k-in	1.19 k	-0.13 k	-6.06 k-in	-1.19 k	0.13 k
FRAME 2	1*Dead+0.6*Wdown	14.75 k-in	-0.95 k	0.34 k	8.35 k-in	0.95 k	-0.34 k
	1*Dead+1*Snow	15.62 k-in	0.00 k	1.37 k	19.78 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	21.79 k-in	-0.71 k	1.20 k	19.85 k-in	0.71 k	-1.20 k
	1*Dead	1.98 k-in	0.00 k	0.17 k	2.50 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-15.87 k-in	1.27 k	-0.12 k	-6.31 k-in	-1.27 k	0.12 k
FRAME 3	1*Dead+0.6*Wdown	14.43 k-in	-0.93 k	0.34 k	8.21 k-in	0.93 k	-0.34 k
	1*Dead+1*Snow	15.62 k-in	0.00 k	1.37 k	19.78 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	21.55 k-in	-0.69 k	1.19 k	19.74 k-in	0.69 k	-1.19 k
	1*Dead	1.98 k-in	0.00 k	0.17 k	2.50 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-14.99 k-in	1.20 k	-0.11 k	-5.91 k-in	-1.20 k	0.11 k

TOP CHORD		BEAM 3					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-8.40 k-in	-0.72 k	-0.35 k	9.40 k-in	0.72 k	0.35 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	0.00 k	16.48 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-17.62 k-in	-0.54 k	-0.26 k	18.37 k-in	0.54 k	0.26 k
	1*Dead	-2.09 k-in	0.00 k	0.00 k	2.09 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	6.06 k-in	0.83 k	0.41 k	-7.21 k-in	-0.83 k	-0.41 k
FRAME 2	1*Dead+0.6*Wdown	-8.35 k-in	-0.66 k	-0.32 k	9.27 k-in	0.66 k	0.32 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.85 k-in	-0.50 k	-0.24 k	20.54 k-in	0.50 k	0.24 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	6.31 k-in	0.89 k	0.43 k	-7.54 k-in	-0.89 k	-0.43 k
FRAME 3	1*Dead+0.6*Wdown	-8.21 k-in	-0.65 k	-0.32 k	9.10 k-in	0.65 k	0.32 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.74 k-in	-0.49 k	-0.24 k	20.41 k-in	0.49 k	0.24 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	5.91 k-in	0.84 k	0.41 k	-7.07 k-in	-0.84 k	-0.41 k

TOP CHORD		BEAM 4					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-9.40 k-in	-0.72 k	-0.35 k	10.39 k-in	0.72 k	0.35 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	0.00 k	16.48 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-18.37 k-in	-0.54 k	-0.26 k	19.11 k-in	0.54 k	0.26 k
	1*Dead	-2.09 k-in	0.00 k	0.00 k	2.09 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	7.21 k-in	0.83 k	0.41 k	-8.36 k-in	-0.83 k	-0.41 k
FRAME 2	1*Dead+0.6*Wdown	-9.27 k-in	-0.66 k	-0.32 k	10.19 k-in	0.66 k	0.32 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-20.54 k-in	-0.50 k	-0.24 k	21.22 k-in	0.50 k	0.24 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	7.54 k-in	0.89 k	0.43 k	-8.76 k-in	-0.89 k	-0.43 k
FRAME 3	1*Dead+0.6*Wdown	-9.10 k-in	-0.65 k	-0.32 k	10.00 k-in	0.65 k	0.32 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-20.41 k-in	-0.49 k	-0.24 k	21.08 k-in	0.49 k	0.24 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	7.07 k-in	0.84 k	0.41 k	-8.23 k-in	-0.84 k	-0.41 k

TOP CHORD		BEAM 5					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-10.39 k-in	-0.41 k	-1.03 k	-14.23 k-in	0.41 k	1.03 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	-1.14 k	-18.93 k-in	0.00 k	1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.11 k-in	-0.31 k	-1.55 k	-23.67 k-in	0.31 k	1.55 k
	1*Dead	-2.09 k-in	0.00 k	-0.14 k	-2.40 k-in	0.00 k	0.14 k
	0.6*Dead+0.6*Wup	8.36 k-in	0.47 k	0.94 k	12.27 k-in	-0.47 k	-0.94 k
FRAME 2	1*Dead+0.6*Wdown	-10.19 k-in	-0.38 k	-0.99 k	-13.83 k-in	0.38 k	0.99 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	-1.37 k	-22.71 k-in	0.00 k	1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	-21.22 k-in	-0.28 k	-1.68 k	-25.97 k-in	0.28 k	1.68 k
	1*Dead	-2.50 k-in	0.00 k	-0.17 k	-2.88 k-in	0.00 k	0.17 k
	0.6*Dead+0.6*Wup	8.76 k-in	0.51 k	0.99 k	12.91 k-in	-0.51 k	-0.99 k
FRAME 3	1*Dead+0.6*Wdown	-10.00 k-in	-0.37 k	-0.97 k	-13.56 k-in	0.37 k	0.97 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	-1.37 k	-22.71 k-in	0.00 k	1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	-21.08 k-in	-0.28 k	-1.67 k	-25.77 k-in	0.28 k	1.67 k
	1*Dead	-2.50 k-in	0.00 k	-0.17 k	-2.88 k-in	0.00 k	0.17 k
	0.6*Dead+0.6*Wup	8.23 k-in	0.48 k	0.93 k	12.15 k-in	-0.48 k	-0.93 k

KNEE BRACE		BEAM 6					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	1.33 k	-0.38 k	0.00 k-in	-1.33 k	0.38 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	1.00 k	-0.29 k	0.00 k-in	-1.00 k	0.29 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.55 k	0.44 k	0.00 k-in	1.55 k	-0.44 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	1.24 k	-0.35 k	0.00 k-in	-1.24 k	0.35 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.93 k	-0.27 k	0.00 k-in	-0.93 k	0.27 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.65 k	0.47 k	0.00 k-in	1.65 k	-0.47 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	1.20 k	-0.35 k	0.00 k-in	-1.20 k	0.35 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.90 k	-0.26 k	0.00 k-in	-0.90 k	0.26 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.56 k	0.45 k	0.00 k-in	1.56 k	-0.45 k

KNEE BRACE		BEAM 7					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-1.33 k	0.38 k	0.00 k-in	1.33 k	-0.38 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-1.00 k	0.29 k	0.00 k-in	1.00 k	-0.29 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.55 k	-0.44 k	0.00 k-in	-1.55 k	0.44 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-1.24 k	0.35 k	0.00 k-in	1.24 k	-0.35 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.93 k	0.27 k	0.00 k-in	0.93 k	-0.27 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.65 k	-0.47 k	0.00 k-in	-1.65 k	0.47 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-1.20 k	0.35 k	0.00 k-in	1.20 k	-0.35 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.90 k	0.26 k	0.00 k-in	0.90 k	-0.26 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.56 k	-0.45 k	0.00 k-in	-1.56 k	0.45 k

FRONT POST		BEAM 8					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.62 k	0.00 k-in	0.00 k	-0.62 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.28 k	0.00 k-in	0.00 k	-2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.03 k	0.00 k-in	0.00 k	-2.03 k
	1*Dead	0.00 k-in	0.00 k	0.29 k	0.00 k-in	0.00 k	-0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.21 k	0.00 k-in	0.00 k	0.21 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.66 k	0.00 k-in	0.00 k	-0.66 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.37 k	0.00 k-in	0.00 k	-2.37 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.21 k	0.00 k-in	0.00 k	0.21 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.65 k	0.00 k-in	0.00 k	-0.65 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.36 k	0.00 k-in	0.00 k	-2.36 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.19 k	0.00 k-in	0.00 k	0.19 k

FRONT POST		BEAM 9					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.62 k	0.00 k-in	0.00 k	0.62 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.28 k	0.00 k-in	0.00 k	2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.03 k	0.00 k-in	0.00 k	2.03 k
	1*Dead	0.00 k-in	0.00 k	-0.29 k	0.00 k-in	0.00 k	0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.21 k	0.00 k-in	0.00 k	-0.21 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.66 k	0.00 k-in	0.00 k	0.66 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.37 k	0.00 k-in	0.00 k	2.37 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.21 k	0.00 k-in	0.00 k	-0.21 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.65 k	0.00 k-in	0.00 k	0.65 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.36 k	0.00 k-in	0.00 k	2.36 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.19 k	0.00 k-in	0.00 k	-0.19 k

BACK POST		BEAM 10					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-1.23 k	2.09 k	7.71 k-in	1.23 k	-2.09 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.28 k	0.00 k-in	0.00 k	-2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.92 k	3.13 k	5.78 k-in	0.92 k	-3.13 k
	1*Dead	0.00 k-in	0.00 k	0.29 k	0.00 k-in	0.00 k	-0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.43 k	-1.91 k	-8.92 k-in	-1.43 k	1.91 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-1.14 k	2.01 k	7.14 k-in	1.14 k	-2.01 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.86 k	3.39 k	5.35 k-in	0.86 k	-3.39 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.52 k	-2.02 k	-9.53 k-in	-1.52 k	2.02 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-1.11 k	1.97 k	6.96 k-in	1.11 k	-1.97 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.83 k	3.35 k	5.22 k-in	0.83 k	-3.35 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.45 k	-1.90 k	-9.04 k-in	-1.45 k	1.90 k

BACK POST		BEAM 11					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-0.10 k	-1.71 k	-7.71 k-in	0.10 k	1.71 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.28 k	0.00 k-in	0.00 k	2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.08 k	-2.84 k	-5.78 k-in	0.08 k	2.84 k
	1*Dead	0.00 k-in	0.00 k	-0.29 k	0.00 k-in	0.00 k	0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.12 k	1.47 k	8.92 k-in	-0.12 k	-1.47 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-0.09 k	-1.66 k	-7.14 k-in	0.09 k	1.66 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.07 k	-3.12 k	-5.35 k-in	0.07 k	3.12 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.13 k	1.55 k	9.53 k-in	-0.13 k	-1.55 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-0.09 k	-1.63 k	-6.96 k-in	0.09 k	1.63 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.07 k	-3.10 k	-5.22 k-in	0.07 k	3.10 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.12 k	1.46 k	9.04 k-in	-0.12 k	-1.46 k

PURLIN ANALYSIS

Purlin Selected=	6 z 16 ga (1)
Zone:	South
Purlin Spacing =	3.78 ft
Dead Load=	3.06 psf
Snow Load=	27.6 psf

(module wt + purlin self wt)

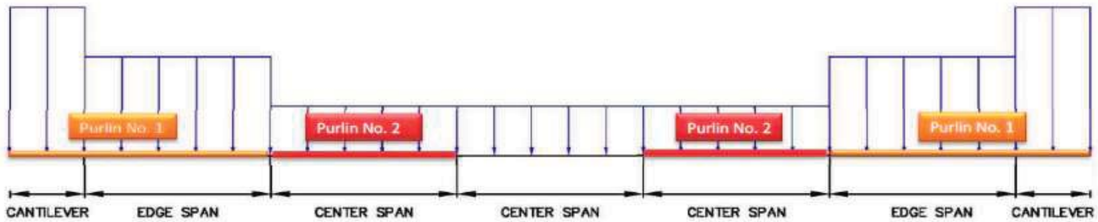


FIGURE 1

Strong Axis Applied Distributed Pressures						
ASD Load Combos:	Cantilever		Edge Span		Center Span	
	positive, ↓	negative, ↑	positive, ↓	negative, ↑	positive, ↓	negative, ↑
D+0.6W=	29.24 psf	-	20.64 psf	-	19.19 psf	-
D+S=	23.35 psf	-	23.35 psf	-	23.35 psf	-
D+0.75(0.6W+S)=	38.12 psf	-	31.67 psf	-	30.58 psf	-
0.6D+0.6W=	-	-28.26 psf	-	-23.00 psf	-	-20.12 psf

Weak Axis Applied Distributed Pressures						
ASD Load Combos:	Cantilever		Edge Span		Center Span	
	positive, ↓	negative, ↑	positive, ↓	negative, ↑	positive, ↓	negative, ↑
D+0.6W=	1.53 psf	-	1.53 psf	-	1.53 psf	-
D+S=	13.48 psf	-	13.48 psf	-	13.48 psf	-
D+0.75(0.6W+S)=	10.49 psf	-	10.49 psf	-	10.49 psf	-
0.6D+0.6W=	-	0.92 psf	-	0.92 psf	-	0.92 psf

Lengths	
Cant. Length	3.81 ft
Edge Span Length	11.44 ft
Center Span Length	11.44 ft

Purlin Properties			
D=	6.00 in	Ix=	3.54 in^4
B1=	2.00 in	Iy=	0.60 in^4
B2=	2.00 in	Sx=	1.18 in^3
d=	0.55 in	Sy=	0.25 in^3
t=	0.06 in	C_R=	0.70
R=	0.13 in	Ωb =	1.67
Area=	0.65 in^2	Cm=	1
Wt per foot=	2.20 lb/ft	Sy(group)=	16.65 in^3
Fy=	55 ksi	E=	29000 ksi
		Lu=	11.25 ft

ALL PRE-GALVANIZED PURLIN COIL MATERIAL IS PER ASTM A653 GRADE 55

Per AISI F2.1, Mne = Sf * Fn

Fcre > 2.78 * Fy, Fn = Fy

lateral torsional buckling does not control

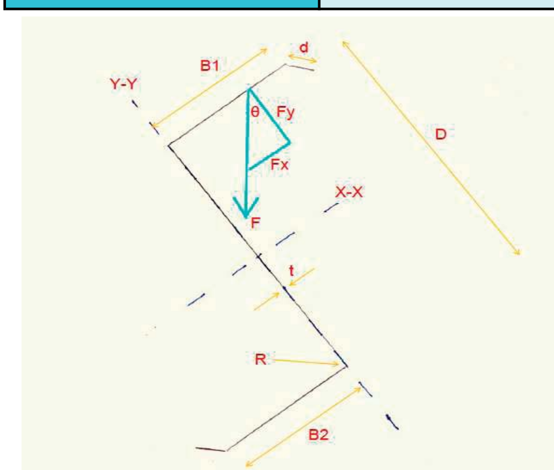
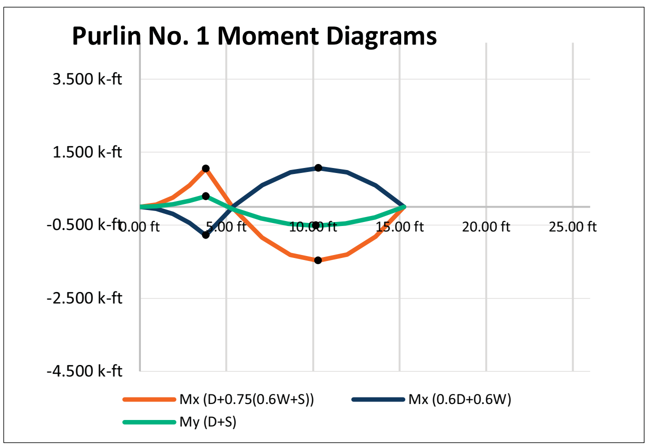


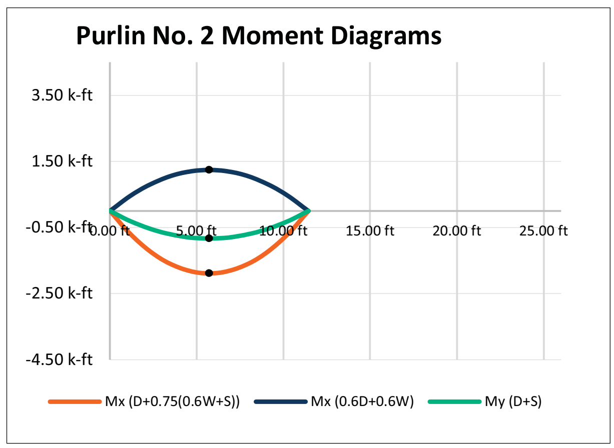
FIGURE 2

Stress Ratio Maximums

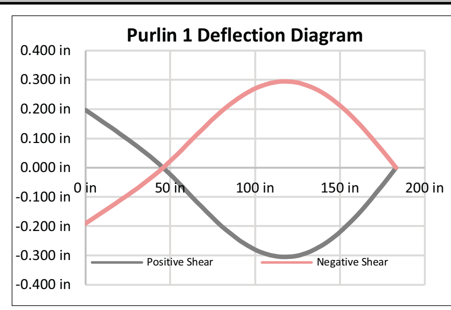
South Zone	Purlin Stress Ratios: Positive Shear, ↓				
	Mx	My	Governing Load Combo	S.R. = (Mx/Max)+(My/May) ≤ 1.0	
Cantilever	1.05 k-ft	0.29 k-ft	D+0.75(0.6W+S)=	0.47	OK
Edge Span	1.47 k-ft	0.51 k-ft	D+0.75(0.6W+S)=	0.47	OK
Center Span	1.89 k-ft	0.65 k-ft	D+0.75(0.6W+S)=	0.60	OK

South Zone	Purlin Stress Ratios: Positive Shear, ↑				
	Mx	My	Governing Load Combo	S.R. = (Mx/Max)+(My/May) ≤ 1.0	
Cantilever	-0.78 k-ft	0.03 k-ft	0.6D+0.6W=	0.24	OK
Edge Span	-1.06 k-ft	0.04 k-ft	0.6D+0.6W=	0.47	OK
Center Span	-1.24 k-ft	0.06 k-ft	0.6D+0.6W=	0.55	OK

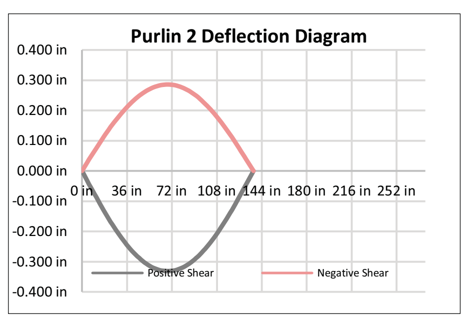




Deflection Checks



Purlin No. 1			
Allowable Deflection =	L/120		
Maximum Cantilver Deflection =	0.20 in	L/466	OK
Maximum Span Deflection =	0.30 in	L/451	OK



Purlin No. 2			
Allowable Deflection =	L/120		
Maximum Positive Deflection =	0.33 in	L/415	OK
Maximum Negative Deflection =	0.29 in	L/481	OK

ROLL-FORMED TOP CHORD ANALYSIS

TOP CHORD SECTION:	C4"x4.75"x0.88"x14ga

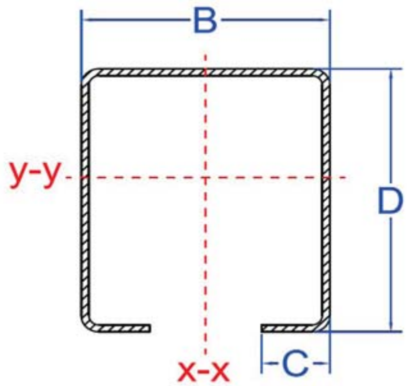


FIGURE 1

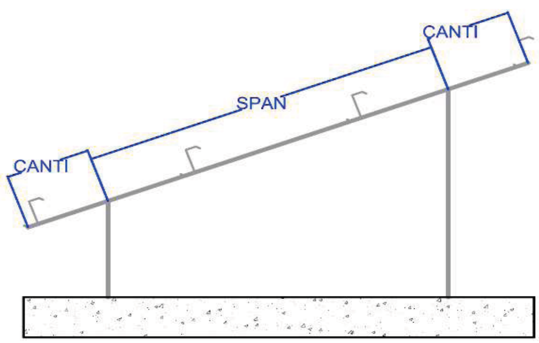


FIGURE 2

SECTION PROPERTIES					
	CANTI	SPAN		CANTI	SPAN
Lx=	19.20 in	35.92 in	J=	0.0021 in^4	0.0021 in^4
Ly=	19.20 in	139.80 in	Cw=	13.90 in^6	13.90 in^6
Lt=	19.20 in	35.92 in	ry=	1.73 in	1.73 in
Kx=	1.20	1.20 in	rx=	1.73 in	1.73 in
Ky=	2.10	1.20 in	ro=	5.10 in	5.10 in
Kt=	1.20	1.20 in	u=	0.20 in	0.20 in
B=	4.00 in	4.00 in	a=	3.68 in	3.68 in
D=	4.75 in	4.75 in	ā=	3.93 in	3.93 in
C=	0.88 in	0.88 in	b=	4.43 in	4.43 in
r=	0.13 in	0.13 in	b̄=	4.68 in	4.68 in
t=	0.075 in	0.075 in	c=	0.71 in	0.71 in
E=	29500 ksi	29500 ksi	ć=	0.84 in	0.84 in
G=	11300.0 ksi	11300.0 ksi	A=	1.105 in^2	1.105 in^2
Fy=	55 ksi	55 ksi	$\ddot{x}_c$=	1.98 in	1.98 in
Fu=	70 ksi	70 ksi	m=	2.49 in	2.49 in
Sx=	1.66 in^3	1.66 in^3	x_o=	-4.47 in	-4.47 in
c'=	2.73 in	2.73 in	β_w=	-3.04	-3.04
c''=	2.02 in	2.02 in	β_f=	2.36	2.36
Sy+=	1.21 in^3	1.21 in^3	β_l=	3.28	3.28
Sy-=	1.64 in^3	1.64 in^3	B'=	3.93 in	3.93 in
Iy=	3.315 in^4	3.315 in^4	D'=	4.68 in	4.68 in
Ix=	3.304 in^4	3.304 in^4	C'=	0.84 in	0.84 in

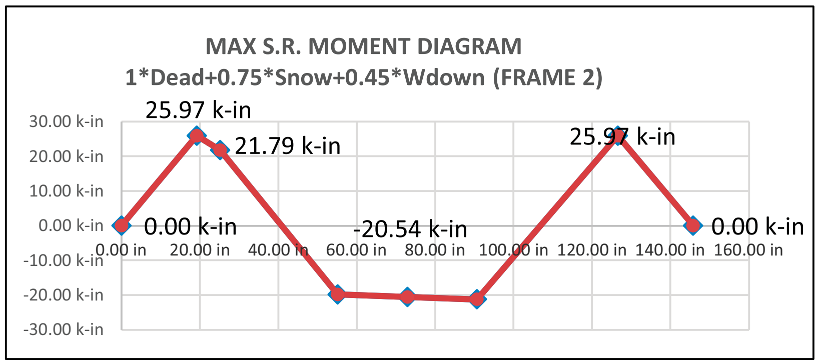
SHEAR		
	CANTI	SPAN
h=	4.35 in	4.35 in
h/t=	58	58
Aw=	0.65 in^2	0.65 in^2
k_v=	5.34	5.34
F_{cr}=	42.3 ksi	42.3 ksi
V_{cr}=	27.62 k	27.62 k
V_y=	21.53 k	21.53 k
λ_v=	0.88	0.88
V_{n1}=	21.53 k	21.53 k
V_{n2}=	19.87 k	19.87 k
V_{n3}=	13.81 k	13.81 k
V_n=	19.87 k	19.87 k
Ω_v=	1.60	1.60
V_a=	12.42 k	12.42 k

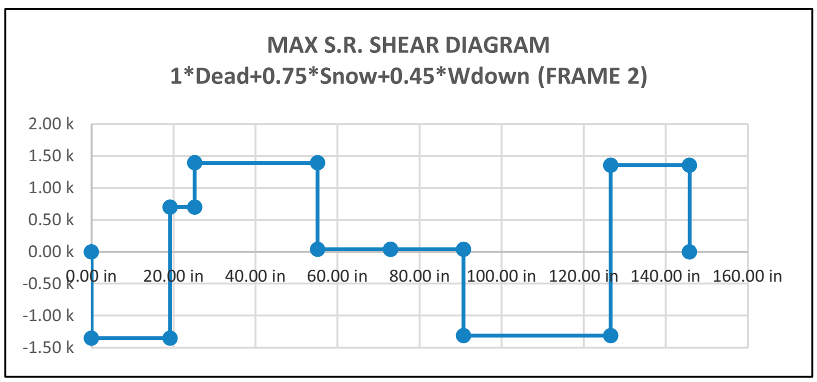
TENSION		
	CANTI	SPAN
A_g=	1.11 in^2	1.11 in^2
$T_{n(yield)}$=	60.78 k	60.78 k
Ω_y=	1.67	1.67
$T_{a(yield)}$=	36.40 k	36.40 k
A_n=	1.11 in^2	1.11 in^2
$T_{n(rupture)}$=	77.36 k	77.36 k
Ω_r=	2.00	2.00
$T_{a(rupture)}$=	38.68 k	38.68 k
T_a=	36.40 k	36.40 k

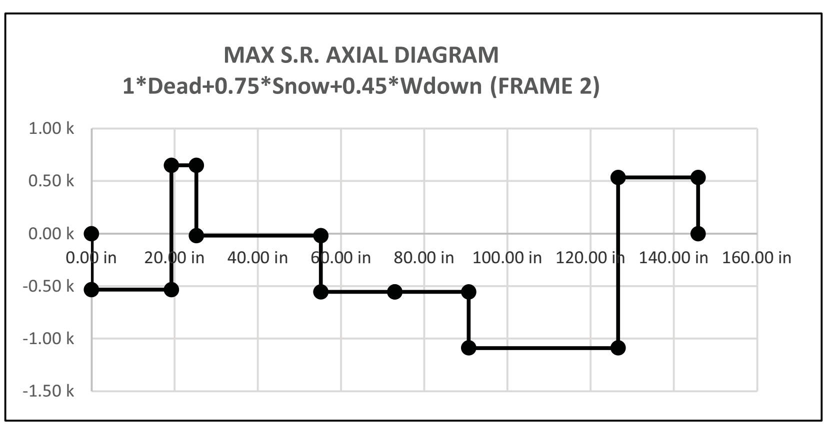
FLEXURE		
	CANTI	SPAN
My+=	66.5 k-in	66.5 k-in
My-=	90.0 k-in	90.0 k-in
Sfy+=	1.21 in^3	1.21 in^3
Sfy-=	1.64 in^3	1.64 in^3
C_S=	-1.00	-1.00
σ_{ex}=	1639.7	468.5
σ_{ey}=	537.2	31.0
C_{TF}=	1.00	1.00
σ_t=	266.14	76.63
j=	4.87 in	4.87 in
ro=	5.10 in	5.10 in
Fcre+=	622.76 ksi	179.26 ksi
Fcre-=	11236.84 ksi	3211.81 ksi
2.78*Fy=	152.9	152.9
.56*Fy=	30.8	30.8
Fn1=	55.0 ksi	55.0 ksi
Fn2+=	59.6 ksi	55.9 ksi
Fn2-=	61.0 ksi	60.8 ksi
Fn3+=	622.8 ksi	179.3 ksi
Fn3-=	11236.8 ksi	3211.8 ksi
Fn+=	55.0 ksi	55.0 ksi
Fn-=	55.0 ksi	55.0 ksi
Yield and LTB, Mne+=	66.5 k-in	66.5 k-in
Yield and LTB, Mne-=	90.0 k-in	90.0 k-in
Fcrllip=	141.5 ksi	141.5 ksi
Fcrlweb=	46.3 ksi	46.3 ksi
Fcrlflange=	31.7 ksi	31.7 ksi
Elastic Local Buckling, Mcrl+=	171.2 k-in	171.2 k-in
Elastic Local Buckling, Mcrl-=	62.0 k-in	62.0 k-in
λ_{l+}=	0.62	0.62
λ_{l-}=	1.20	1.20
Mnl1+=	66.52 k-in	66.52 k-in
Mnl2+=	75.83 k-in	75.83 k-in
Mnl1-=	90.05 k-in	90.05 k-in
Mnl2-=	67.55 k-in	67.55 k-in
Local Buckling, Mnl+=	66.52 k-in	66.52 k-in
Local Buckling, Mnl-=	67.55 k-in	67.55 k-in
Ωb=	1.67	1.67
Ma+=	39.8 k-in	39.8 k-in
Ma-=	40.5 k-in	40.5 k-in
Ma=	39.8 k-in	39.8 k-in

COMPRESSION	CANTI	SPAN
P_y=	60.78 k	60.78 k
σt=	266.1	76.6
σ_{ex}=	1639.7	468.5
σ_{ey}=	537.2	31.0
β=	0.23	0.23
F_{cre}=	235.69 ksi	67.80 ksi
λ_c=	0.48	0.90
Fn1=	49.88 ksi	39.17 ksi
Fn2=	206.7 ksi	59.5 ksi
Fn=	49.9 ksi	39.2 ksi
GLOBAL BUCKLING, P_{ne}=	55.13 k	43.28 k
klip=	0.43	0.43
μlip=	0.3	0.3
wlip=	0.68 in	0.68 in
kweb=	4	4
μweb=	0.3	0.3
wweb=	3.60 in	3.60 in
kflange=	4	4
μflange=	0.3	0.3
wflange=	4.35 in	4.35 in
Fcrllip=	141.5 ksi	141.5 ksi
Fcrlweb=	46.3 ksi	46.3 ksi
Fcrlflange=	31.7 ksi	31.7 ksi
F_{crl}=	31.7 ksi	31.7 ksi
Pcrl=	35.04 k	35.04 k
λ_l=	1.25	1.11
Pnl1=	55.13 k	43.28 k
Pnl2=	40.23	34.29
LOCAL BUCKLING, P_{crl}=	40.23 k	34.29 k
$k_{\phi fe}$=	4.973	0.651
$k_{\phi we}$=	0.570	0.570
k_{ϕ}=	0	0
$k_{\phi fg}$=	0.10667	0.03699
$k_{\phi wg}$=	0.00214	0.00074
L_m=	19.20 in	35.92 in
x_{of}=	1.98 in	1.98 in
h_{xf}=	-2.69	-2.69
h_o=	4.00 in	4.00 in
μ=	0.300	0.300
I_{xf}=	0.013	0.013
C_{wf}=	0	0
I_{xyf}=	0.052	0.052
I_{yf}=	0.930	0.930
L_{crd}=	32.60 in	32.60 in
L=	19.20 in	32.60 in
J_f=	0.00078	0.00078
A_f=	0.41 in^2	0.41 in^2
y_{of}=	-0.064	-0.064
F_{crd}=	50.9 ksi	32.4 ksi
P_{crd}=	56.29 k	35.76 k
λd=	1.039	1.304
P_{nd1}=	60.8 ksi	60.8 ksi
P_{nd2}=	44.2 ksi	36.2 ksi
DISTORTIONAL BUCKLING	44.19 k	36.17 k
Ω_c=	1.8	1.8
Pa=	22.35 k	19.05 k

MAX LOADING - BEAM STRESS RATIO SUMMARY			
S.R.	LOAD COMBO	S.R. FORMULA	BEAM
66.7%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	cantilever 1
NOT APPLIED		(P/Pa)+(M/Ma)	cantilever 1
66.1%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	cantilever 1
NOT APPLIED		(T/Ta)+(M/Ma)	cantilever 2
67.6%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(P/Pa)+(M/Ma)	cantilever 2
66.1%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	cantilever 2
32.8%	0.6*Dead+0.6*Wup (FRAME 2)	(T/Ta)+(M/Ma)	beam 1
68.6%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(P/Pa)+(M/Ma)	beam 1
65.5%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 1
54.8%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 2
45.3%	0.6*Dead+0.6*Wup (FRAME 2)	(P/Pa)+(M/Ma)	beam 2
55.8%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 2
51.3%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 3
21.0%	0.6*Dead+0.6*Wup (FRAME 2)	(P/Pa)+(M/Ma)	beam 3
49.8%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 3
53.1%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 4
49.7%	1*Dead+1*Snow (FRAME 2)	(P/Pa)+(M/Ma)	beam 4
51.6%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 4
56.3%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 5
26.9%	0.6*Dead+0.6*Wup (FRAME 2)	(P/Pa)+(M/Ma)	beam 5
54.3%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 5
68.6%	**1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)**	**(P/Pa)+(M/Ma)**	**beam 1**







ROLL-FORMED POST ANALYSIS

POST SECTION:	C8"x3"x0.80"x10ga

COMPRESSION		
	FRONT	BACK
P_y=	109.44 k	109.44 k
σt=	233.7	31.9
σ_{ex}=	784.6	94.1
σ_{ey}=	91.8	11.0
β=	0.71	0.71
F_{cre}=	91.76 ksi	11.00 ksi
λ_c=	0.77	2.24
Fn1=	42.80 ksi	6.79 ksi
Fn2=	80.5 ksi	9.6 ksi
Fn=	42.8 ksi	9.6 ksi
GLOBAL BUCKLING, P_{ne}=	85.16 k	19.20 k
klip=	0.43	0.43
μlip=	0.3	0.3
wlip=	0.54 in	0.54 in
kweb=	4	4
μweb=	0.3	0.3
wweb=	7.48 in	7.48 in
kflange=	4	4
μflange=	0.3	0.3
wflange=	2.48 in	2.48 in
Fcrllip=	703.4 ksi	703.4 ksi
Fcrlweb=	34.2 ksi	34.2 ksi
Fcrlflange=	310.9 ksi	310.9 ksi
F_{crl}=	34.2 ksi	34.2 ksi
Pcrl=	68.07 k	68.07 k
λ_l=	1.12	0.53
Pnl1=	85.16 k	19.20 k
Pnl2=	67.18	23.93
LOCAL BUCKLING, P_{crl}=	67.18 k	19.20 k
$k_{\phi fe}$=	2.413	2.413
$k_{\phi we}$=	1.625	1.625
k_{ϕ}=	0	0
$k_{\phi fg}$=	0.04671	0.04671
$k_{\phi wg}$=	0.02762	0.02762
L_m=	28.45 in	82.15 in
x_{of}=	1.14 in	1.14 in
h_{xf}=	-1.72	-1.72
h_o=	8.00 in	8.00 in
μ=	0.300	0.300
I_{xf}=	0.015	0.015
C_{wf}=	0	0
I_{xyf}=	0.041	0.041
I_{yf}=	0.423	0.423
L_{crd}=	20.21 in	20.21 in
L=	20.21 in	20.21 in
J_f=	0.003 in^4	0.003 in^4
A_f=	0.48 in^2	0.48 in^2
y_{of}=	-0.075	-0.075
F_{crd}=	54.3 ksi	54.3 ksi
P_{crd}=	108.09 k	108.09 k
λd=	1.006	1.006
P_{nd1}=	109.4 ksi	109.4 ksi
P_{nd2}=	81.7 ksi	81.7 ksi
DISTORTIONAL BUCKLING, P	81.67 k	81.67 k
Ω_c=	1.8	1.8
Pa=	37.32 k	10.67 k

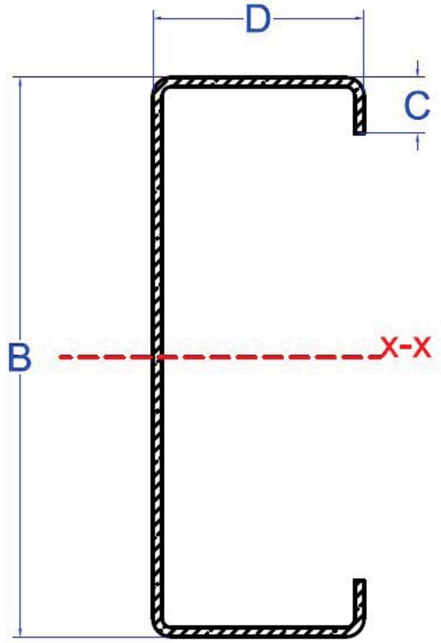


FIGURE 1

SECTION PROPERTIES					
	FRONT	BACK		FRONT	BACK
Lx=	28.45 in	82.15 in	J=	0.01 in^4	0.01 in^4
Ly=	28.45 in	82.15 in	Cw=	27.73 in^6	27.73 in^6
Lt=	28.45 in	82.15 in	ry=	1.06 in	1.06 in
Kx=	2.10	2.10 in	rx=	3.10 in	3.10 in
Ky=	2.10	2.10 in	ro=	3.90 in	3.90 in
Kt=	1.20	1.20 in	u=	0.20 in	0.20 in
B=	8.00 in	8.00 in	a=	7.62 in	7.62 in
D=	3.00 in	3.00 in	$\bar{a}$=	7.87 in	7.87 in
C=	0.80 in	0.80 in	b=	2.62 in	2.62 in
r=	0.13 in	0.13 in	$\bar{b}$=	2.87 in	2.87 in
t=	0.134 in	0.134 in	c=	0.61 in	0.61 in
E=	29500 ksi	29500 ksi	$\bar{c}$=	0.73 in	0.73 in
G=	11300 ksi	11300 ksi	A=	1.99 in^2	1.99 in^2
Fy=	55 ksi	55 ksi	$\bar{x}_c$=	0.82 in	0.82 in
Fu=	70 ksi	70 ksi	m=	1.29 in	1.29 in
Sx=	4.78 in^3	4.78 in^3	x_o=	-2.11 in	-2.11 in
c'=	2.12 in	2.12 in	β_w=	-5.00	-5.00
c''=	0.88 in	0.88 in	β_f=	8.49	8.49
Sy+=	1.06 in^3	1.06 in^3	β_l=	6.84	6.84
Sy-=	2.54 in^3	2.54 in^3	B'=	7.87 in	7.87 in
Iy=	2.24 in^4	2.24 in^4	D'=	2.87 in	2.87 in
Ix=	19.14 in^4	19.14 in^4	C'=	0.73 in	0.73 in

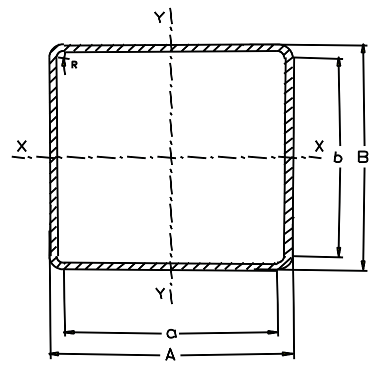
FLEXURE		
	FRONT	BACK
Mxy=	263.1 k-in	263.1 k-in
Sfx=	4.78 in^3	4.78 in^3
Cb=	1.000	1.000
σ_{ey}=	91.76 ksi	11.00 ksi
σ_t=	233.67 ksi	31.94 ksi
Fcre=	237.34 ksi	30.39 ksi
2.78*Fy=	152.90 ksi	152.90 ksi
.56*Fy=	30.80 ksi	30.80 ksi
Fn1=	55.00 ksi	55.00 ksi
Fn2=	57.18 ksi	30.39 ksi
Fn3=	237.34 ksi	30.39 ksi
Fn=	55.00 ksi	30.39 ksi
Yield and LTB, Mne=	263.13 k-in	145.38 k-in
Fcrllip=	703.4 ksi	703.4 ksi
Fcrlweb=	34.2 ksi	34.2 ksi
Fcrlflange=	310.9 ksi	310.9 ksi
Elastic Local Buckling, Mcrl=	1487.2 k-in	1487.2 k-in
λ_l=	0.42	0.31
Mnl1=	263.13 k-in	145.38 k-in
Mnl2=	368.32 k-in	228.39 k-in
Local Buckling, Mnl=	263.1 ksi	145.4 ksi
Ωb=	1.67	1.67
Ma=	157.6 k-in	87.1 k-in

SHEAR		
	FRONT	BACK
h=	7.48 in	7.48 in
h/t=	55.84	55.84
Aw=	1.00 in^2	1.00 in^2
k_v=	5.34	5.34
F_{cr}=	45.7 ksi	45.7 ksi
V_{cr}=	45.79 k	45.79 k
V_y=	33.09 k	33.09 k
λ_v=	0.85	0.85
V_{n1}=	33.09 k	33.09 k
V_{n2}=	31.72 k	31.72 k
V_{n3}=	45.80 k	45.80 k
V_n=	31.72 k	31.72 k
Ω_v=	1.60	1.60
V_a=	19.83 k	19.83 k

TENSION		
	FRONT	BACK
A_g=	1.99 in^2	1.99 in^2
$T_{n(yield)}$=	109.44 k	109.44 k
Ω_y=	1.67	1.67
$T_{a(yield)}$=	65.53 k	65.53 k
A_n=	1.99 in^2	1.99 in^2
$T_{n(rupture)}$=	139.29 k	139.29 k
Ω_r=	2.00	2.00
$T_{a(rupture)}$=	69.64 k	69.64 k
T_a=	65.53 k	65.53 k

	GOVERNING LOAD COMBO	Local Coordinates						
		BEAM	Mx	Fy	Fx	(T/Ta)+(M/Ma)	(P/Pa)+(M/Ma)	((V/Va)^2+(M/Ma)^2)^.5
FRONT:	1*Dead+1*Snow	8	0.00 k-in	0.00 k	2.73 k	NO TENSION	7.32%	0.00%
BACK:	*Dead+0.75*Snow+0.45*Wdown	11	-5.35 k-in	0.07 k	3.12 k	NO TENSION	35.40%	6.16%

Knee Brace Design - Compression Member

Input Data			KNEE BRACE
Member Section	**2x2x15ga**		
A = Tube Width	2	in	
B = Tube Length	2	in	
R = Corner Inner Radius	0.09375	in	
t = Thickness	0.072	in	
KL_x= Buckling around x-x	7.61	ft	
KL_y= Buckling around y-y	7.61	ft	
E = Modulus of Elasticity	29500	ksi	
F_y = Yield Stress	50	ksi	
G = Shear Modulus	11300	ksi	

Calculated Parameter		
1- Properties of 90° corner		
r = R + t/2, Centerline of Dimension	0.130	in
u = π. r/2, Arc Length	0.204	in
c=0.637.r Distance of c.g. from center	0.083	in
2- Flat widths of flanges and webs		
Flat width of Dim. a= A - (2.r + t)	1.6685	in
Flat width of Dim. b= B - (2.r + t)	1.6685	in

Applied Forces		
M	**0.000**	kip.ft
P	**1.33**	kips
BEAMS 6 & 7		

Calculation of I_x

Element	L, Length (in)		Y, Distance to the center (in)		L xY^2	I_x'
Flanges	2.a	3.337	B/2 - t/2	0.964	3.101	0.000
Web	2.b	3.337	0	0.000	0.000	0.774
Corners	4.u	0.815	b/2 + c	0.917	0.685	0.000
Sum	7.489		1.881		3.786	0.774

Calculation of I_y

Element	L, Length (in)		X, Distance to the center (in)		L x X^2	I_y'
Flanges	2.a	3.337	0	0.000	0.000	0.774
Web	2.b	3.337	A/2 - t/2	0.964	3.101	0.000
Corners	4.u	0.815	a/2 + c	0.917	0.685	0.000
Sum	7.489		1.881		3.786	0.774

Section Properties

A	L x t	0.5392	in^2
I_X	t x (L x Y^2 +I_x')	0.3284	in^4
I_Y	t x (L x X^2 +I_y')	0.3284	in^4
S_x	I_X /(B/2)	0.3284	in^3
S_Y	I_Y /(A/2)	0.3284	in^3
r_x	$(I_x /A)^{0.5}$	0.7804	in
r_Y	$(I_Y /A)^{0.5}$	0.7804	in

Nominal Buckling Stress			
KL_x/r_x		117.08	
KL_y/r_y		117.08	
KL/r		117.08	
F_e	$\pi^2 . E/(KL/r)^2$	21.24	ksi
λ_c	$(Fy/Fe)^{0.5}$	1.53	
	F_n	18.63	ksi

Effective Area			
effective width of compression flange			
w/t = a/t		23.17	
λ	$1.052/(k)^{0.5}$ x (w/t) x $(F_n/E)^{0.5}$	0.31	
ρ	$(1\text{-}0.22 / \lambda) / \lambda$	0.92	
	a_e	1.67	in
effective width of web element			
w/t = b/t		23.17	
λ	$1.052/(k)^{0.5}$ x (w/t) x $(F_n/E)^{0.5}$	0.31	
ρ	$(1\text{-}0.22 / \lambda) / \lambda$	0.92	
	b_e	1.67	in

Allowable Axial Load			
A_e	$A_e = A - 2 \times t \times [(a-a_e) + (b-b_e)]$	0.54	in^2
P_n	$P_n = A_e \times F_n$	10.05	kips
Ω_c		1.80	
	P_a $= P_n / \Omega_c$	5.58	kips

Check Compression Stresses				
			Loads from Wind?	
C_{b1}	$Cb1=(P / P_a)$	0.24	NO	
			Allowable Stress Unity	1
		0.24	**Section is OK**	

Computing of M_{nx}

By using the effective width of compression flange and assuming the web is fully effective, the neutral axis can be located as follow:

Element	L, Length (in)		y, Distance to top fiber (in)		L.y	$L.y^2$
C. Flanges	a_e	1.669	t/2	0.036	0.060	0.002
Web	2.b	3.337	B/2	1.000	3.337	3.337
C. Corners	2.u	0.408	c+t/2	0.119	0.048	0.006
T. Flanges	a_e	1.669	B-t/2	1.964	3.277	6.436
T.Corners	2.u	0.408	B-c-t/2	1.881	0.767	1.443
Sum	7.489		5.000		7.489	11.224

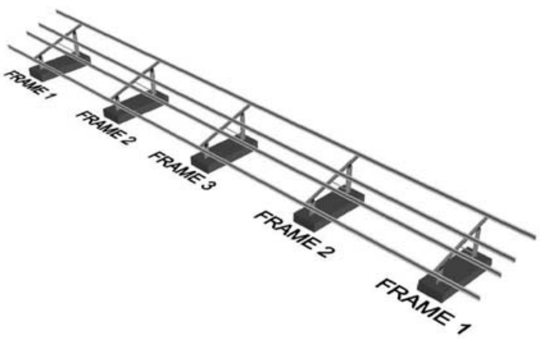
$y_{cg} =$ L.y/ L 1.000 Z=R+t 0.166 in

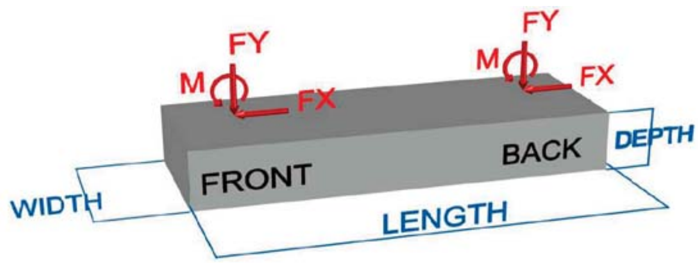
The max. stress of 50 ksi ocurs in the compression flange as assumed in the calculation

Check the effectiveness of the Web					
f_1	$(y_{cg}- Z)F_y/y_{cg}$			41.71	ksi
f_2	$- (B-y_{cg}- Z)F_y/y_{cg}$			-41.71	ksi
ψ	**f_2/f_1**			-1.00	
k	$4+2(1-\psi)^3+2(1-\psi)$			24.00	
h/t	b_e/t			23.17	
λ	$1.052/(k)^{0.5}$ x (h/t) x $(f1/E)^{0.5}$			0.19	
ρ	$(1-0.22 / \lambda) / \lambda$			-0.94	
b_e				1.67	in
b_1	$b_e/(3-\psi)$			0.42	in
b_2				0.83	in
	b_1+b_2			1.25	in
$2\ I'_{web}$	$2(1/12)(b)^3$			0.77	in^4
	$\Sigma(Ly^2)$			11.22	in^4
	$(-)(\Sigma L)(y_{cg})^2$			7.49	in^4
	I'_x			4.51	in^4
	I_x $=I'_x.t$			0.32	in^4
	S_{ex} $=I_x/y_{cg}$			0.32	in^3
	C_b=1.0 for combined axial load and bending moment				
j	$2b^2d^2t/(b+d)$			0.33	in^4
S_f	$fullS_x$			0.33	in^4
L_u	$0.36C_b\pi.(E\ I.G.j)^{0.5}/(F_y.\ S_f)$			34.73	ft
F_e'	$C_b\pi.(E\ I.G.j)^{0.5}/(L.\ Sf)$			633.60	ksi
Allowable Bending Moment					
	M_{nx}			1.353	kip.ft
	Ω_b			1.670	
	M_a $= M_{nx} /\Omega_b$			0.810	kip.ft
Check Stresses					
C_{mx}	$0.6-0.4*M_1/M_2$	0.60	Loads from Wind?		
C_{b1}	$(P / P_a) + (C_{mx}\ M_x / M_a)$	0.24	NO		
C_{b2}	$(P / P_a) + (M_x / M_a)$	0.24	Allowable Stress Unity		1
C_b	$If((P / P_a) <= 0.15,C_{b2},C_{b1})$	0.24	**Section is OK**		

South Zones Ballast Analysis (ASD)

unit weight of concrete =	0.15 k/ft^3	depth below grade =	0.00 ft
sliding coeff of friction =	0.40	allowable bearing pressure=	1.00 ksf





BALLAST INPUTS:

		LENGTH		WIDTH		DEPTH
BLOCKS 1+2:	**DIMENSIONS =**	**9.50 ft**	**x**	**3.75 ft**	**x**	**1.50 ft**
	VOLUME =	53.44 ft^3				
	WEIGHT =	8.02 k		EDGE DISTANCE =	0.87 ft	
		LENGTH		WIDTH		DEPTH
BLOCKS 3+:	**DIMENSIONS =**	**9.50 ft**	**x**	**3.58 ft**	**x**	**1.50 ft**
	VOLUME =	51.02 ft^3				
	WEIGHT =	7.65 k		EDGE DISTANCE =	0.87 ft	

SLIDING CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.21 k	
		BACK	0.00 k-ft	1.43 k	-1.91 k	OK
	RESISTANCE TO SLIDING =		2.36 k		**SAFETY FACTOR =**	1.65
FRAME 2:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.21 k	
		BACK	0.00 k-ft	1.52 k	-2.02 k	OK
	RESISTANCE TO SLIDING =		2.32 k		**SAFETY FACTOR =**	1.52
FRAME 3:	**GOVERNING LOAD COMBINATION =**		0.6*Dead+0.6*Wup			
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.19 k	
		BACK	0.00 k-ft	1.45 k	-1.90 k	OK
	RESISTANCE TO SLIDING =		2.23 k		**SAFETY FACTOR =**	1.54

UPLIFT CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.21 k	
		BACK	0.00 k-ft	1.43 k	-1.91 k	OK
	RESISTANCE TO UPLIFT =	8.02 k		**SAFETY FACTOR =**		3.77
FRAME 2:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.21 k	
		BACK	0.00 k-ft	1.52 k	-2.02 k	OK
	RESISTANCE TO UPLIFT =	8.02 k		**SAFETY FACTOR =**		3.60
FRAME 3:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.19 k	
		BACK	0.00 k-ft	1.45 k	-1.90 k	OK
	RESISTANCE TO UPLIFT =	7.65 k		**SAFETY FACTOR =**		3.66

OVERTURNING CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k-ft	-0.21 k-ft	
		BACK	0.00 k-ft	1.43 k-ft	-1.91 k-ft	
	OVERTURN AT A =	18.82 k-ft		**OVERTURN RESISTANCE AT A =**		38.07 k-ft
	OVERTURN AT B =	1.38 k-ft		**OVERTURN RESISTANCE AT B =**		38.07 k-ft
	SAFETY FACTOR FOR OT AT A =	2.02	OK			
	SAFETY FACTOR FOR OT AT B =	27.53	OK			
FRAME 2:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k-ft	-0.21 k-ft	
		BACK	0.00 k-ft	1.52 k-ft	-2.02 k-ft	
	OVERTURN AT A =	19.89 k-ft		**OVERTURN RESISTANCE AT A =**		38.07 k-ft
	OVERTURN AT B =	1.26 k-ft		**OVERTURN RESISTANCE AT B =**		38.07 k-ft
	SAFETY FACTOR FOR OT AT A =	1.91	OK			
	SAFETY FACTOR FOR OT AT B =	30.22	OK			
FRAME 3:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k-ft	-0.19 k-ft	
		BACK	0.00 k-ft	1.45 k-ft	-1.90 k-ft	
	OVERTURN AT A =	18.76 k-ft		**OVERTURN RESISTANCE AT A =**		36.35 k-ft
	OVERTURN AT B =	1.09 k-ft		**OVERTURN RESISTANCE AT B =**		36.35 k-ft
	SAFETY FACTOR FOR OT AT A =	1.94	OK			
	SAFETY FACTOR FOR OT AT B =	33.27	OK			

BEARING CHECK: APPLIED BEARING ≤ MAX ALLOWABLE BEARING

FRAME 1:	**GOVERNING LOAD COMBINATION =**		1*Dead+0.6*Wnodal+					
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.62 ft	
		FRONT	6.98 k-ft	0.00 k	0.29 k	L/6 =	1.58 ft	
		BACK	6.98 k-ft	0.00 k	0.29 k	L/2 =	4.75 ft	
	MAX APPLIED BEARING PRESSURE =		0.49 ksf	≤	1.00 ksf	OK		
FRAME 2:	**GOVERNING LOAD COMBINATION =**		1*Dead+0.6*Wnodal+					
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.62 ft	
		FRONT	7.05 k-ft	0.00 k	0.35 k	L/6 =	1.58 ft	
		BACK	7.05 k-ft	0.00 k	0.35 k	L/2 =	4.75 ft	
	MAX APPLIED BEARING PRESSURE =		0.49 ksf	≤	1.00 ksf	OK		
FRAME 3:	**GOVERNING LOAD COMBINATION =**		1*Dead+0.6*Wnodal+					
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.56 ft	
		FRONT	6.52 k-ft	0.00 k	0.35 k	L/6 =	1.58 ft	
		BACK	6.52 k-ft	0.00 k	0.35 k	L/2 =	4.75 ft	
	MAX APPLIED BEARING PRESSURE =		0.49 ksf	≤	1.00 ksf	OK		

REINFORCEMENT:

BLOCKS 1+2

Length=	9.50 ft	min steel (shrinkage), longitudinal direction=	1.46 in^2
Width=	3.75 ft	min steel (shrinkage), transverse direction=	3.69 in^2
Depth=	1.50 ft	minimum bar spacing=	18 in
rows of bars=	2	As (#4 bar)= 0.20 in^2	As (#5 bar)= 0.31 in^2
longitudinal bars per row by max spacing (18 in)=	4	transverse bars per row by max spacing (18 in)=	7
longitudinal #4 bars/row, min steel=	4	transverse #4 bars/row, min steel=	10
longitudinal #5 bars/row, min steel=	3	transverse #5 bars/row, min steel=	7

Reinforcement (#4 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#4 bars)=	10	transverse bars Top and Bottom
Reinforcement (#5 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#5 bars)=	7	transverse bars Top and Bottom

BLOCKS 3+

Length=	9.50 ft	min steel (shrinkage), longitudinal direction=	1.39 in^2
Width=	3.58 ft	min steel (shrinkage), transverse direction=	3.69 in^2
Depth=	1.50 ft	minimum bar spacing=	18 in
rows of bars=	2	As (#4 bar)= 0.20 in^2	As (#5 bar)= 0.31 in^2
longitudinal bars/row, min spacing=	4	transverse bars/row, min spacing=	7
longitudinal #4 bars/row, min steel=	4	transverse #4 bars/row, min steel=	10
longitudinal #5 bars/row, min steel=	3	transverse #5 bars/row, min steel=	7

Reinforcement (#4 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#4 bars)=	10	transverse bars Top and Bottom
Reinforcement (#5 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#5 bars)=	7	transverse bars Top and Bottom

Alternatively, reinforcement may be fiber mesh for shrinkage and cracking requirments. A minimum of 5 lbs per 1 yd^3 BASF MasterFiber MAC 2200 CB Fiber or approved equal required.

DESIGN CRITERIA

Interior

Design Criteria:

Code:	**2020 New York State Building Code (IBC 2018)**
Dead Load:	4.0 psf
Roof Live Load:	0.0 psf
Ground Snow:	50.0 psf
Wind Speed:	110 mph (Exposure C Assumed)
Module Tilt:	30.0 deg
Purlin Trib Width:	3.27 ft (Horizontal Projection)

Snow Load Calculation: $p_f = 0.7C_sC_eC_tI_sp_g$

C_e =	0.9
C_t =	1.2
I_s =	1.0
C_s =	0.73
p_s=	**27.6 psf**

Wind Load Calculation: $q = 0.00256K_zK_dK_{zt}V^2$

K_z =	0.85
K_d =	0.85
K_{zt} =	1.0
q =	**22.4 psf**

Mean Roof Height = 6.8 ft (Per RWDI Wind Tunnel Analysis)

WIND TUNNEL COEFFICIENTS (RWDI)			TILT 30.0 deg	
PURLIN				
ZONE	**GCp Up**	**GCp Down**	**PSF Up**	**PSF Down**
Cantilever	-2.223	1.980	-49.75	44.31
Edge Span	-1.832	1.340	-40.99	29.98
North Row Center Span	-1.247	0.927	-27.90	20.75
South Row Center Span	-1.617	1.232	-36.18	27.57
Interior Center Span	-1.322	0.789	-29.58	17.67
TOP CHORD				
ZONE	**GCp Up**	**GCp Down**	**PSF Up**	**PSF Down**
Cantilever	-1.617	1.675	-36.20	37.49
Edge Span	-1.381	1.008	-30.91	22.56
North Row Center Span	-1.117	0.830	-25.01	18.57
South Row Center Span	-1.245	0.959	-27.87	21.46
Interior Row Center Span	-0.991	0.712	-22.18	15.93
BASE MOMENT				
ZONE	**GCmy (+)**	**GCmy (-)**	**q*GCmy (+)**	**q*GCmy (-)**
Cantilever	0.551	-0.237	12.32	-5.30
Edge Span	0.437	-0.174	9.79	-3.90
North Row Center Span	0.260	-0.169	5.82	-3.79
South Row Center Span	0.376	-0.101	8.41	-2.27
Interior Row Center Span	0.324	-0.162	7.25	-3.63

Note: See Figures 1 & 2 for clarity on zones

APPLIED LOADING		
DEAD LOAD:	5psf*Purlin Spacing/1000	0.01511 klf
LIVE LOAD:	N/A	0.000 klf
SNOW:	P_s*Purlin Trib. Width/1000:	0.09032 klf

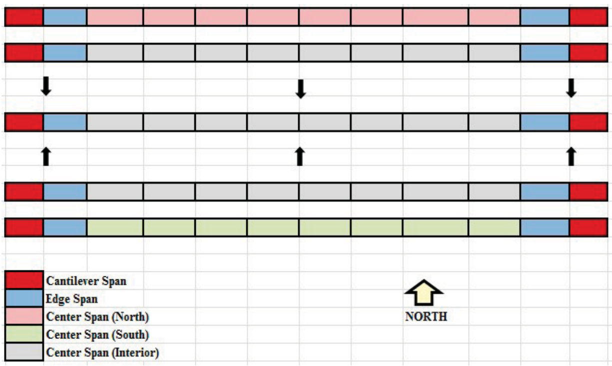


FIGURE 1

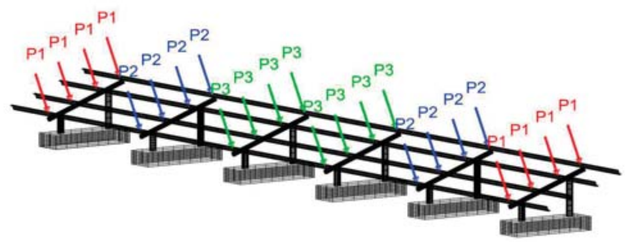


FIGURE 2

WIND: (Top Chord Pressures)	Interior
$P1_{up} = \frac{Upslope\ Length*q}{4}\left[Cantilever\ Width * GCp_{(cantilever)} + \frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)}\right]$	-1.183 kips
$P1_{down} = \frac{Upslope\ Length*q}{4}\left[Cantilever\ Width * GCp_{(cantilever)} + \frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)}\right]$	1.022 kips
$P2_{up} = \frac{Upslope\ Length*q}{4}\left[\frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)} + \frac{Center\ Span\ Width}{2} * GCp_{(center\ span)}\right]$	-1.141 kips
$P2_{down} = \frac{Upslope\ Length*q}{4}\left[\frac{Edge\ Span\ Width}{2} * GCp_{(edge\ span)} + \frac{Center\ Span\ Width}{2} * GCp_{(center\ span)}\right]$	0.827 kips
$P3_{up} = \frac{Upslope\ Length*q}{4}\left[Center\ Span\ Width * GCp_{(center\ span)}\right]$	-0.953 kips
$P3_{down} = \frac{Upslope\ Length*q}{4}\left[Center\ Span\ Width * GCp_{(center\ span)}\right]$	0.685 kips

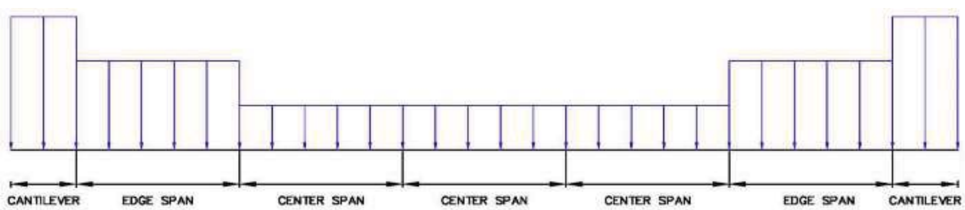


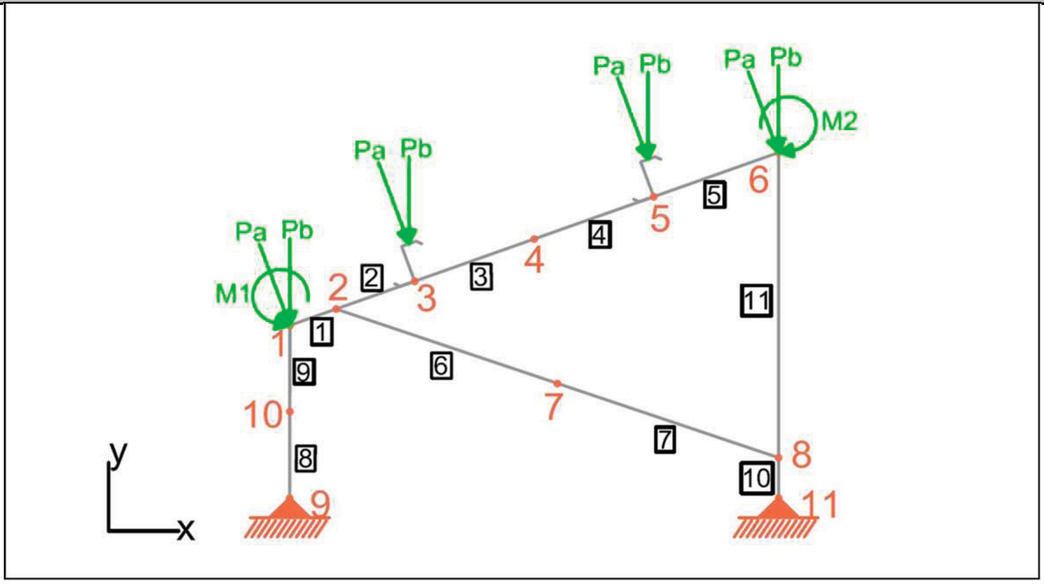
FIGURE 3

WIND: (Base Moments)

GC_{My}*q*A*Upslope Length

Interior		
POSITIVE		
Post 1	Post 2	Post 3
23.27 k-ft	22.02 k-ft	18.74 k-ft
NEGATIVE		
Post 1	Post 2	Post 3
-9.60 k-ft	-9.73 k-ft	-9.37 k-ft

Interior Frame Analysis



DIRECT STIFFNESS METHOD BEAM, NODE, AND RELEASE DEFINITIONS											
Member	Member Beginning	Member Ending Node	Node B Release	Node E Release	A	E	I	Length, L	θ	cos(θ)	sin(θ)
1	1	2	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	6.00 in	30.0 °	0.87	0.50
2	2	3	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	29.92 in	30.0 °	0.87	0.50
3	3	4	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	17.78 in	30.0 °	0.87	0.50
4	4	5	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	17.78 in	30.0 °	0.87	0.50
5	5	6	FIXED	FIXED	1.77 in^2	29000 ksi	4.40 in^4	35.92 in	30.0 °	0.87	0.50
6	2	7	PINNED	FIXED	0.84 in^2	29000 ksi	0.49 in^4	45.68 in	-16.0 °	0.96	-0.28
7	8	7	PINNED	FIXED	0.84 in^2	29000 ksi	0.49 in^4	45.68 in	164.0 °	-0.96	0.28
8	9	10	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	14.22 in	90.0 °	0.00	1.00
9	1	10	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	14.22 in	-90.0 °	0.00	-1.00
10	11	8	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	6.25 in	90.0 °	0.00	1.00
11	6	8	PINNED	FIXED	2.68 in^2	29000 ksi	16.40 in^4	75.90 in	-90.0 °	0.00	-1.00

STIFFNESS, k DETERMINATION VARIABLES					
Member	ka	kΔΔ	kΔθ	kθθ	kϕθ
1	8555.00	7088.89	21266.67	85066.67	42533.33
2	1715.68	57.18	855.33	17059.90	8529.95
3	2886.39	272.26	2420.86	28700.82	14350.41
4	2886.39	272.26	2420.86	28700.82	14350.41
5	1429.08	33.04	593.44	14210.10	7105.05
6	533.27	0.45	20.43	933.22	622.15
7	533.27	0.45	20.43	933.22	622.15
8	5464.10	495.82	7052.36	100311.09	66874.06
9	5464.10	495.82	7052.36	100311.09	66874.06
10	12435.20	5844.17	36526.08	228288.00	152192.00
11	1023.99	3.26	247.68	18798.65	12532.43

	FIXED-FIXED	PINNED-FIXED
ka=	(EA/L)	(EA/L)
kΔΔ=	$(12EI)/(L^3)$	$(3EI)/(L^3)$
kΔθ=	$(6EI)/(L^2)$	$(3EI)/(L^2)$
kθθ=	(4EI)/(L)	(3EI)/(L)
kϕθ=	(2EI)/(L)	(2EI)/(L)

c=cos(θ) s=sin(θ)

ELEMENT GLOBAL STIFFNESS MATRIX EQUATIONS

PINNED-FIXED

0	0	0	0	0	0
0	c^2k_a $+s^2k_{\Delta\Delta}$	csk_a $-csk_{\Delta\Delta}$	$-sk_{\Delta\theta}$	$-c^2k_a$ $-s^2k_{\Delta\Delta}$	$-csk_a$ $+csk_{\Delta\Delta}$
0		s^2k_a $+c^2k_{\Delta\Delta}$	$ck_{\Delta\theta}$	$-csk_a$ $+csk_{\Delta\Delta}$	$-s^2k_a$ $-c^2k_{\Delta\Delta}$
0			$k_{\theta\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
0	symmetrical			c^2k_a $+s^2k_{\Delta\Delta}$	csk_a $-csk_{\Delta\Delta}$
0					s^2k_a $+c^2k_{\Delta\Delta}$

FIXED-FIXED

$k_{\theta\theta}$	$-sk_{\Delta\theta}$	$ck_{\Delta\theta}$	$k_{\Phi\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
	c^2k_a $+s^2k_{\Delta\Delta}$	csk_a $-csk_{\Delta\Delta}$	$-sk_{\Delta\theta}$	$-c^2k_a$ $-s^2k_{\Delta\Delta}$	$-csk_a$ $+csk_{\Delta\Delta}$
		s^2k_a $+c^2k_{\Delta\Delta}$	$ck_{\Delta\theta}$	$-csk_a$ $+csk_{\Delta\Delta}$	$-c^2k_a$ $-s^2k_{\Delta\Delta}$
			$k_{\theta\theta}$	$sk_{\Delta\theta}$	$-ck_{\Delta\theta}$
symmetrical				c^2k_a $+s^2k_{\Delta\Delta}$	csk_a $-csk_{\Delta\Delta}$
					s^2k_a $+c^2k_{\Delta\Delta}$

Equilibrium: $\{P_e\}_G = [T]\{P_e\}_L$

Compatibility: $\{\Delta_e\}_L = \{T\}^T\{\Delta_e\}_G$

Force Displacement: $\{P_e\}_L = [k_e]_L\{\Delta_e\}_L$

$[T]\{P_e\}_L = [T][k_e]_L[T]^T\{\Delta_e\}_G$

$\{P_e\}_G = [k_e]_G\{\Delta_e\}_G$

$[k_e]_G = [T][k_e]_L[T]^T$

$$\begin{Bmatrix} P \\ R \end{Bmatrix} = \begin{bmatrix} K_{PP} & K_{PR} \\ K_{RP} & K_{RR} \end{bmatrix} \begin{Bmatrix} \Delta_P \\ \Delta_R \end{Bmatrix}$$

Structural Stiffness Method General Form

P=external load Δ=displacement

T=transformation matrix

T^T=inverse transfromation matrix

e=element G=global

L=local k=element stiffness matrix

{}=vector K=structure global stiffness matrix

[]=matrix R=structural global reaction

Beam End Forces (Global Coordinate System)

TOP CHORD		BEAM 1					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	14.23 k-in	0.31 k	-0.06 k	-15.45 k-in	-0.31 k	0.06 k
	1*Dead+1*Snow	18.93 k-in	0.00 k	1.14 k	-13.01 k-in	0.00 k	-1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	23.67 k-in	0.23 k	0.74 k	-20.52 k-in	-0.23 k	-0.74 k
	1*Dead	2.40 k-in	0.00 k	0.14 k	-1.65 k-in	0.00 k	-0.14 k
	0.6*Dead+0.6*Wup	-12.27 k-in	-0.36 k	0.32 k	14.99 k-in	0.36 k	-0.32 k
FRAME 2	1*Dead+0.6*Wdown	12.46 k-in	0.25 k	0.01 k	-13.14 k-in	-0.25 k	-0.01 k
	1*Dead+1*Snow	22.71 k-in	0.00 k	1.37 k	-15.62 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	24.94 k-in	0.19 k	0.95 k	-20.58 k-in	-0.19 k	-0.95 k
	1*Dead	2.88 k-in	0.00 k	0.17 k	-1.98 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-11.49 k-in	-0.34 k	0.33 k	14.22 k-in	0.34 k	-0.33 k
FRAME 3	1*Dead+0.6*Wdown	10.81 k-in	0.21 k	0.04 k	-11.22 k-in	-0.21 k	-0.04 k
	1*Dead+1*Snow	22.71 k-in	0.00 k	1.37 k	-15.62 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	23.70 k-in	0.15 k	0.97 k	-19.14 k-in	-0.15 k	-0.97 k
	1*Dead	2.88 k-in	0.00 k	0.17 k	-1.98 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-9.32 k-in	-0.29 k	0.29 k	11.69 k-in	0.29 k	-0.29 k

TOP CHORD		BEAM 2					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	15.45 k-in	-1.03 k	0.33 k	8.40 k-in	1.03 k	-0.33 k
	1*Dead+1*Snow	13.01 k-in	0.00 k	1.14 k	16.48 k-in	0.00 k	-1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	20.52 k-in	-0.77 k	1.03 k	17.62 k-in	0.77 k	-1.03 k
	1*Dead	1.65 k-in	0.00 k	0.14 k	2.09 k-in	0.00 k	-0.14 k
	0.6*Dead+0.6*Wup	-14.99 k-in	1.19 k	-0.13 k	-6.06 k-in	-1.19 k	0.13 k
FRAME 2	1*Dead+0.6*Wdown	13.14 k-in	-0.83 k	0.32 k	7.62 k-in	0.83 k	-0.32 k
	1*Dead+1*Snow	15.62 k-in	0.00 k	1.37 k	19.78 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	20.58 k-in	-0.62 k	1.18 k	19.29 k-in	0.62 k	-1.18 k
	1*Dead	1.98 k-in	0.00 k	0.17 k	2.50 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-14.22 k-in	1.15 k	-0.10 k	-5.55 k-in	-1.15 k	0.10 k
FRAME 3	1*Dead+0.6*Wdown	11.22 k-in	-0.69 k	0.30 k	6.74 k-in	0.69 k	-0.30 k
	1*Dead+1*Snow	15.62 k-in	0.00 k	1.37 k	19.78 k-in	0.00 k	-1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	19.14 k-in	-0.52 k	1.16 k	18.63 k-in	0.52 k	-1.16 k
	1*Dead	1.98 k-in	0.00 k	0.17 k	2.50 k-in	0.00 k	-0.17 k
	0.6*Dead+0.6*Wup	-11.69 k-in	0.96 k	-0.07 k	-4.39 k-in	-0.96 k	0.07 k

TOP CHORD		BEAM 3					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-8.40 k-in	-0.72 k	-0.35 k	9.40 k-in	0.72 k	0.35 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	0.00 k	16.48 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-17.62 k-in	-0.54 k	-0.26 k	18.37 k-in	0.54 k	0.26 k
	1*Dead	-2.09 k-in	0.00 k	0.00 k	2.09 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	6.06 k-in	0.83 k	0.41 k	-7.21 k-in	-0.83 k	-0.41 k
FRAME 2	1*Dead+0.6*Wdown	-7.62 k-in	-0.58 k	-0.28 k	8.42 k-in	0.58 k	0.28 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.29 k-in	-0.44 k	-0.21 k	19.90 k-in	0.44 k	0.21 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	5.55 k-in	0.80 k	0.39 k	-6.66 k-in	-0.80 k	-0.39 k
FRAME 3	1*Dead+0.6*Wdown	-6.74 k-in	-0.48 k	-0.23 k	7.40 k-in	0.48 k	0.23 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-18.63 k-in	-0.36 k	-0.18 k	19.13 k-in	0.36 k	0.18 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	4.39 k-in	0.67 k	0.33 k	-5.32 k-in	-0.67 k	-0.33 k

TOP CHORD		BEAM 4					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-9.40 k-in	-0.72 k	-0.35 k	10.39 k-in	0.72 k	0.35 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	0.00 k	16.48 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-18.37 k-in	-0.54 k	-0.26 k	19.11 k-in	0.54 k	0.26 k
	1*Dead	-2.09 k-in	0.00 k	0.00 k	2.09 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	7.21 k-in	0.83 k	0.41 k	-8.36 k-in	-0.83 k	-0.41 k
FRAME 2	1*Dead+0.6*Wdown	-8.42 k-in	-0.58 k	-0.28 k	9.22 k-in	0.58 k	0.28 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.90 k-in	-0.44 k	-0.21 k	20.50 k-in	0.44 k	0.21 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	6.66 k-in	0.80 k	0.39 k	-7.77 k-in	-0.80 k	-0.39 k
FRAME 3	1*Dead+0.6*Wdown	-7.40 k-in	-0.48 k	-0.23 k	8.07 k-in	0.48 k	0.23 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	0.00 k	19.78 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.13 k-in	-0.36 k	-0.18 k	19.63 k-in	0.36 k	0.18 k
	1*Dead	-2.50 k-in	0.00 k	0.00 k	2.50 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	5.32 k-in	0.67 k	0.33 k	-6.24 k-in	-0.67 k	-0.33 k

TOP CHORD		BEAM 5					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	-10.39 k-in	-0.41 k	-1.03 k	-14.23 k-in	0.41 k	1.03 k
	1*Dead+1*Snow	-16.48 k-in	0.00 k	-1.14 k	-18.93 k-in	0.00 k	1.14 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.11 k-in	-0.31 k	-1.55 k	-23.67 k-in	0.31 k	1.55 k
	1*Dead	-2.09 k-in	0.00 k	-0.14 k	-2.40 k-in	0.00 k	0.14 k
	0.6*Dead+0.6*Wup	8.36 k-in	0.47 k	0.94 k	12.27 k-in	-0.47 k	-0.94 k
FRAME 2	1*Dead+0.6*Wdown	-9.22 k-in	-0.33 k	-0.89 k	-12.46 k-in	0.33 k	0.89 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	-1.37 k	-22.71 k-in	0.00 k	1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	-20.50 k-in	-0.25 k	-1.60 k	-24.94 k-in	0.25 k	1.60 k
	1*Dead	-2.50 k-in	0.00 k	-0.17 k	-2.88 k-in	0.00 k	0.17 k
	0.6*Dead+0.6*Wup	7.77 k-in	0.46 k	0.88 k	11.49 k-in	-0.46 k	-0.88 k
FRAME 3	1*Dead+0.6*Wdown	-8.07 k-in	-0.27 k	-0.77 k	-10.81 k-in	0.27 k	0.77 k
	1*Dead+1*Snow	-19.78 k-in	0.00 k	-1.37 k	-22.71 k-in	0.00 k	1.37 k
	1*Dead+0.75*Snow+0.45*Wdown	-19.63 k-in	-0.21 k	-1.51 k	-23.70 k-in	0.21 k	1.51 k
	1*Dead	-2.50 k-in	0.00 k	-0.17 k	-2.88 k-in	0.00 k	0.17 k
	0.6*Dead+0.6*Wup	6.24 k-in	0.38 k	0.72 k	9.32 k-in	-0.38 k	-0.72 k

KNEE BRACE		BEAM 6					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	1.33 k	-0.38 k	0.00 k-in	-1.33 k	0.38 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	1.00 k	-0.29 k	0.00 k-in	-1.00 k	0.29 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.55 k	0.44 k	0.00 k-in	1.55 k	-0.44 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	1.08 k	-0.31 k	0.00 k-in	-1.08 k	0.31 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.81 k	-0.23 k	0.00 k-in	-0.81 k	0.23 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.49 k	0.43 k	0.00 k-in	1.49 k	-0.43 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	0.89 k	-0.26 k	0.00 k-in	-0.89 k	0.26 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.67 k	-0.19 k	0.00 k-in	-0.67 k	0.19 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	-1.25 k	0.36 k	0.00 k-in	1.25 k	-0.36 k

KNEE BRACE		BEAM 7					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-1.33 k	0.38 k	0.00 k-in	1.33 k	-0.38 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-1.00 k	0.29 k	0.00 k-in	1.00 k	-0.29 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.55 k	-0.44 k	0.00 k-in	-1.55 k	0.44 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-1.08 k	0.31 k	0.00 k-in	1.08 k	-0.31 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.81 k	0.23 k	0.00 k-in	0.81 k	-0.23 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.49 k	-0.43 k	0.00 k-in	-1.49 k	0.43 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-0.89 k	0.26 k	0.00 k-in	0.89 k	-0.26 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.67 k	0.19 k	0.00 k-in	0.67 k	-0.19 k
	1*Dead	0.00 k-in	0.00 k	0.00 k	0.00 k-in	0.00 k	0.00 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.25 k	-0.36 k	0.00 k-in	-1.25 k	0.36 k

FRONT POST		BEAM 8					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.62 k	0.00 k-in	0.00 k	-0.62 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.28 k	0.00 k-in	0.00 k	-2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.03 k	0.00 k-in	0.00 k	-2.03 k
	1*Dead	0.00 k-in	0.00 k	0.29 k	0.00 k-in	0.00 k	-0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.21 k	0.00 k-in	0.00 k	0.21 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.62 k	0.00 k-in	0.00 k	-0.62 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.34 k	0.00 k-in	0.00 k	-2.34 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.17 k	0.00 k-in	0.00 k	0.17 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	0.57 k	0.00 k-in	0.00 k	-0.57 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	2.30 k	0.00 k-in	0.00 k	-2.30 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	-0.10 k	0.00 k-in	0.00 k	0.10 k

FRONT POST		BEAM 9					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.62 k	0.00 k-in	0.00 k	0.62 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.28 k	0.00 k-in	0.00 k	2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.03 k	0.00 k-in	0.00 k	2.03 k
	1*Dead	0.00 k-in	0.00 k	-0.29 k	0.00 k-in	0.00 k	0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.21 k	0.00 k-in	0.00 k	-0.21 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.62 k	0.00 k-in	0.00 k	0.62 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.34 k	0.00 k-in	0.00 k	2.34 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.17 k	0.00 k-in	0.00 k	-0.17 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	0.00 k	-0.57 k	0.00 k-in	0.00 k	0.57 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	0.00 k	-2.30 k	0.00 k-in	0.00 k	2.30 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.00 k	0.10 k	0.00 k-in	0.00 k	-0.10 k

BACK POST		BEAM 10					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-1.23 k	2.09 k	7.71 k-in	1.23 k	-2.09 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.28 k	0.00 k-in	0.00 k	-2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.92 k	3.13 k	5.78 k-in	0.92 k	-3.13 k
	1*Dead	0.00 k-in	0.00 k	0.29 k	0.00 k-in	0.00 k	-0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.43 k	-1.91 k	-8.92 k-in	-1.43 k	1.91 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-1.00 k	1.80 k	6.24 k-in	1.00 k	-1.80 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.75 k	3.23 k	4.68 k-in	0.75 k	-3.23 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.38 k	-1.80 k	-8.61 k-in	-1.38 k	1.80 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-0.83 k	1.55 k	5.16 k-in	0.83 k	-1.55 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	2.73 k	0.00 k-in	0.00 k	-2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.62 k	3.04 k	3.87 k-in	0.62 k	-3.04 k
	1*Dead	0.00 k-in	0.00 k	0.35 k	0.00 k-in	0.00 k	-0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	1.15 k	-1.47 k	-7.19 k-in	-1.15 k	1.47 k

BACK POST		BEAM 11					
		START			END		
		M	FX	FY	M	FX	FY
FRAME 1	1*Dead+0.6*Wdown	0.00 k-in	-0.10 k	-1.71 k	-7.71 k-in	0.10 k	1.71 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.28 k	0.00 k-in	0.00 k	2.28 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.08 k	-2.84 k	-5.78 k-in	0.08 k	2.84 k
	1*Dead	0.00 k-in	0.00 k	-0.29 k	0.00 k-in	0.00 k	0.29 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.12 k	1.47 k	8.92 k-in	-0.12 k	-1.47 k
FRAME 2	1*Dead+0.6*Wdown	0.00 k-in	-0.08 k	-1.49 k	-6.24 k-in	0.08 k	1.49 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.06 k	-3.00 k	-4.68 k-in	0.06 k	3.00 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.11 k	1.38 k	8.61 k-in	-0.11 k	-1.38 k
FRAME 3	1*Dead+0.6*Wdown	0.00 k-in	-0.07 k	-1.30 k	-5.16 k-in	0.07 k	1.30 k
	1*Dead+1*Snow	0.00 k-in	0.00 k	-2.73 k	0.00 k-in	0.00 k	2.73 k
	1*Dead+0.75*Snow+0.45*Wdown	0.00 k-in	-0.05 k	-2.85 k	-3.87 k-in	0.05 k	2.85 k
	1*Dead	0.00 k-in	0.00 k	-0.35 k	0.00 k-in	0.00 k	0.35 k
	0.6*Dead+0.6*Wup	0.00 k-in	0.09 k	1.12 k	7.19 k-in	-0.09 k	-1.12 k

PURLIN ANALYSIS

Purlin Selected=	6 z 16 ga (1)
Zone:	Interior
Purlin Spacing =	3.78 ft
Dead Load=	3.06 psf
Snow Load=	27.6 psf

(module wt + purlin self wt)

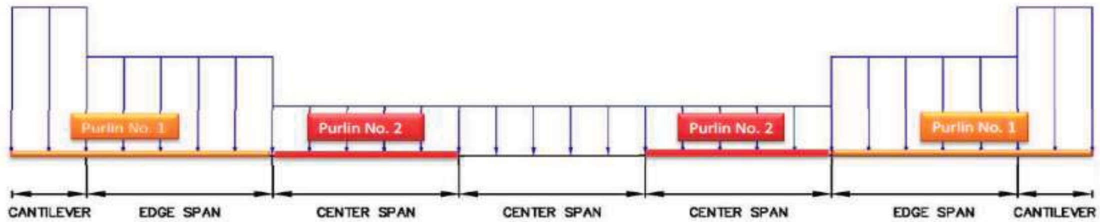


FIGURE 1

Strong Axis Applied Distributed Pressures						
ASD Load Combos:	Cantilever		Edge Span		Center Span	
	positive, ↓	negative, ↑	positive, ↓	negative, ↑	positive, ↓	negative, ↑
D+0.6W=	29.24 psf	-	20.64 psf	-	13.25 psf	-
D+S=	23.35 psf	-	23.35 psf	-	23.35 psf	-
D+0.75(0.6W+S)=	38.12 psf	-	31.67 psf	-	26.13 psf	-
0.6D+0.6W=	-	-28.26 psf	-	-23.00 psf	-	-16.16 psf
Weak Axis Applied Distributed Pressures						
ASD Load Combos:	Cantilever		Edge Span		Center Span	
	positive, ↓	negative, ↑	positive, ↓	negative, ↑	positive, ↓	negative, ↑
D+0.6W=	1.53 psf	-	1.53 psf	-	1.53 psf	-
D+S=	13.48 psf	-	13.48 psf	-	13.48 psf	-
D+0.75(0.6W+S)=	10.49 psf	-	10.49 psf	-	10.49 psf	-
0.6D+0.6W=	-	0.92 psf	-	0.92 psf	-	0.92 psf

Lengths	
Cant. Length	3.81 ft
Edge Span Length	11.44 ft
Center Span Length	11.44 ft

Purlin Properties			
D=	6.00 in	Ix=	3.54 in^4
B1=	2.00 in	Iy=	0.60 in^4
B2=	2.00 in	Sx=	1.18 in^3
d=	0.55 in	Sy=	0.25 in^3
t=	0.06 in	C_R=	0.70
R=	0.13 in	Ωb =	1.67
Area=	0.65 in^2	Cm=	1
Wt per foot=	2.20 lb/ft	Sy(group)=	16.65 in^3
Fy=	55 ksi	E=	29000 ksi
ALL PRE-GALVANIZED PURLIN COIL MATERIAL IS PER ASTM A653 GRADE 55		Lu=	11.25 ft
		Per AISI F2.1, Mne = Sf * Fn Fcre > 2.78 * Fy, Fn = Fy lateral torsional buckling does not control	

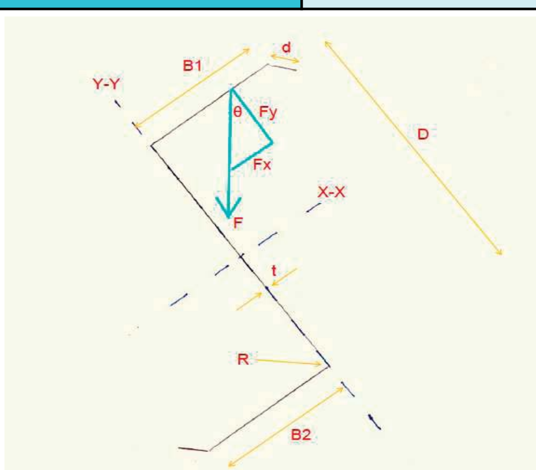
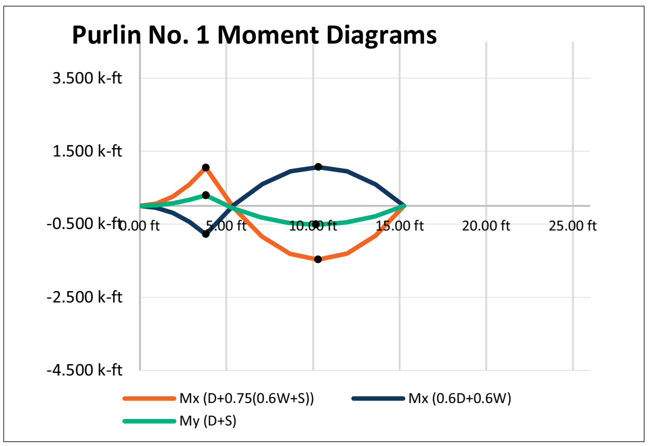


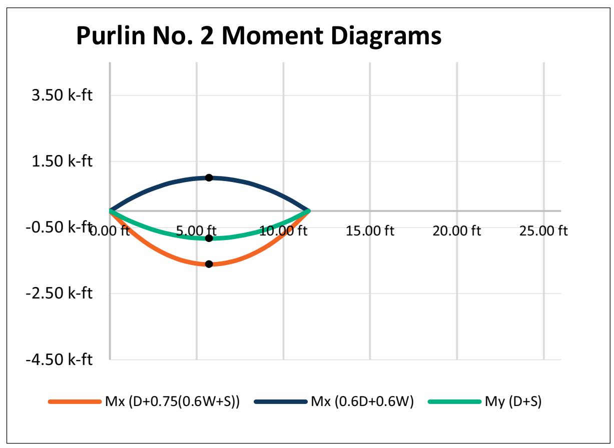
FIGURE 2

Stress Ratio Maximums

Interior Zone	Purlin Stress Ratios: Positive Shear, ↓				
	Mx	My	Governing Load Combo	S.R. = (Mx/Max)+(My/May) ≤ 1.0	
Cantilever	1.05 k-ft	0.29 k-ft	D+0.75(0.6W+S)=	0.47	OK
Edge Span	1.47 k-ft	0.51 k-ft	D+0.75(0.6W+S)=	0.47	OK
Center Span	1.62 k-ft	0.65 k-ft	D+0.75(0.6W+S)=	0.52	OK

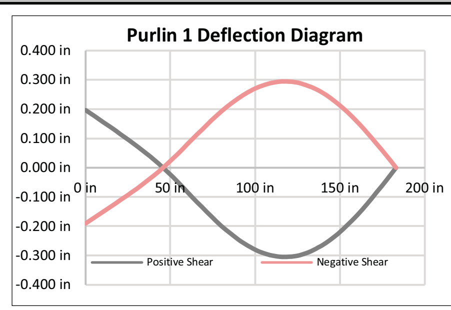
Interior Zone	Purlin Stress Ratios: Positive Shear, ↑				
	Mx	My	Governing Load Combo	S.R. = (Mx/Max)+(My/May) ≤ 1.0	
Cantilever	-0.78 k-ft	0.03 k-ft	0.6D+0.6W=	0.24	OK
Edge Span	-1.06 k-ft	0.04 k-ft	0.6D+0.6W=	0.47	OK
Center Span	-1.00 k-ft	0.06 k-ft	0.6D+0.6W=	0.44	OK



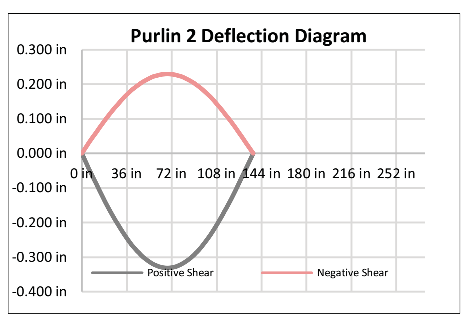


Deflection Checks

Purlin No. 1			
Allowable Deflection =	L/120		
Maximum Cantilever Deflection =	0.20 in	L/466	OK
Maximum Span Deflection =	0.30 in	L/451	OK



Purlin No. 2			
Allowable Deflection =	L/120		
Maximum Positive Deflection =	0.33 in	L/415	OK
Maximum Negative Deflection =	0.23 in	L/599	OK



ROLL-FORMED TOP CHORD ANALYSIS

TOP CHORD SECTION:	C4"x4.75"x0.88"x14ga

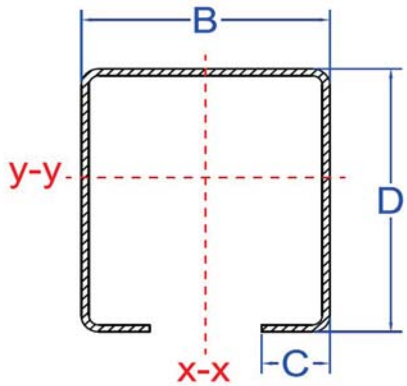


FIGURE 1

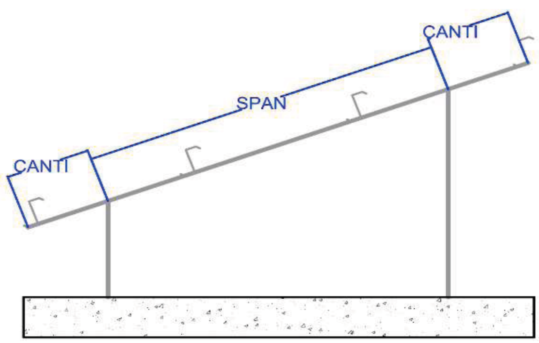


FIGURE 2

SECTION PROPERTIES					
	CANTI	SPAN		CANTI	SPAN
Lx=	19.20 in	35.92 in	J=	0.0021 in^4	0.0021 in^4
Ly=	19.20 in	139.80 in	Cw=	13.90 in^6	13.90 in^6
Lt=	19.20 in	35.92 in	ry=	1.73 in	1.73 in
Kx=	1.20	1.20 in	rx=	1.73 in	1.73 in
Ky=	2.10	1.20 in	ro=	5.10 in	5.10 in
Kt=	1.20	1.20 in	u=	0.20 in	0.20 in
B=	4.00 in	4.00 in	a=	3.68 in	3.68 in
D=	4.75 in	4.75 in	ā=	3.93 in	3.93 in
C=	0.88 in	0.88 in	b=	4.43 in	4.43 in
r=	0.13 in	0.13 in	b̄=	4.68 in	4.68 in
t=	0.075 in	0.075 in	c=	0.71 in	0.71 in
E=	29500 ksi	29500 ksi	ć=	0.84 in	0.84 in
G=	11300.0 ksi	11300.0 ksi	A=	1.105 in^2	1.105 in^2
Fy=	55 ksi	55 ksi	$\ddot{x}_c$=	1.98 in	1.98 in
Fu=	70 ksi	70 ksi	m=	2.49 in	2.49 in
Sx=	1.66 in^3	1.66 in^3	x_o=	-4.47 in	-4.47 in
c'=	2.73 in	2.73 in	β_w=	-3.04	-3.04
c''=	2.02 in	2.02 in	β_f=	2.36	2.36
Sy+=	1.21 in^3	1.21 in^3	β_l=	3.28	3.28
Sy-=	1.64 in^3	1.64 in^3	B'=	3.93 in	3.93 in
Iy=	3.315 in^4	3.315 in^4	D'=	4.68 in	4.68 in
Ix=	3.304 in^4	3.304 in^4	C'=	0.84 in	0.84 in

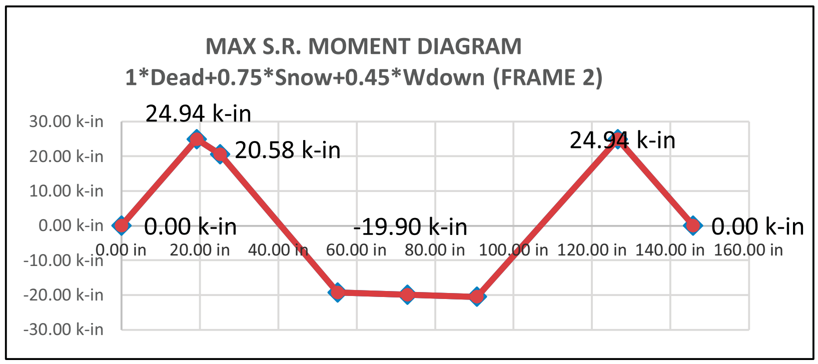
SHEAR		
	CANTI	SPAN
h=	4.35 in	4.35 in
h/t=	58	58
Aw=	0.65 in^2	0.65 in^2
k_v=	5.34	5.34
F_{cr}=	42.3 ksi	42.3 ksi
V_{cr}=	27.62 k	27.62 k
V_y=	21.53 k	21.53 k
λ_v=	0.88	0.88
V_{n1}=	21.53 k	21.53 k
V_{n2}=	19.87 k	19.87 k
V_{n3}=	13.81 k	13.81 k
V_n=	19.87 k	19.87 k
Ω_v=	1.60	1.60
V_a=	12.42 k	12.42 k

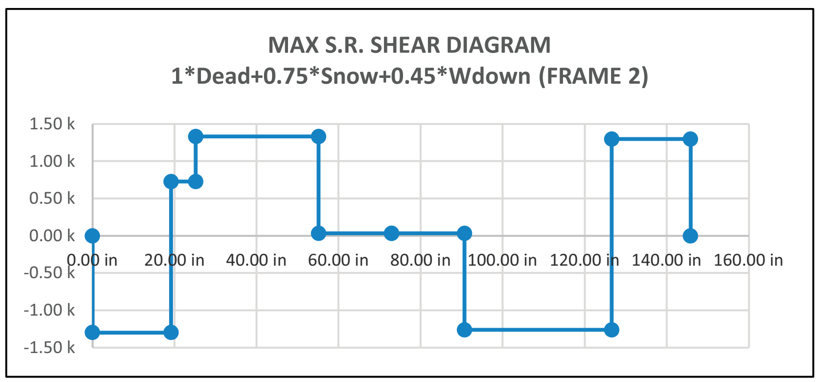
TENSION		
	CANTI	SPAN
A_g=	1.11 in^2	1.11 in^2
$T_{n(yield)}$=	60.78 k	60.78 k
Ω_y=	1.67	1.67
$T_{a(yield)}$=	36.40 k	36.40 k
A_n=	1.11 in^2	1.11 in^2
$T_{n(rupture)}$=	77.36 k	77.36 k
Ω_r=	2.00	2.00
$T_{a(rupture)}$=	38.68 k	38.68 k
T_a=	36.40 k	36.40 k

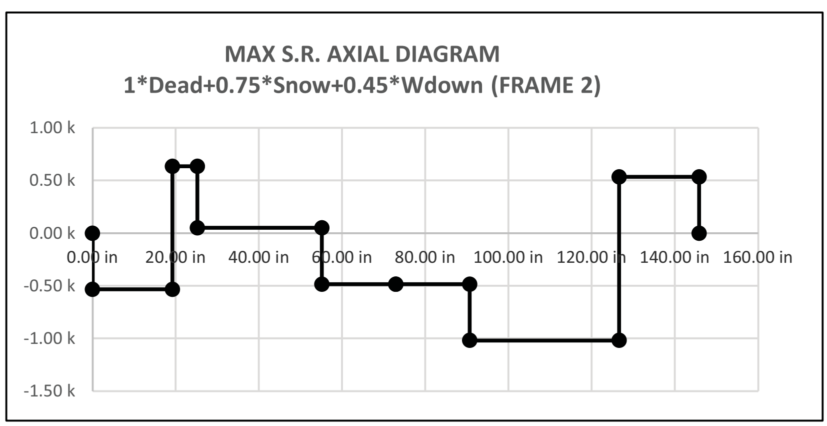
FLEXURE		
	CANTI	SPAN
My+=	66.5 k-in	66.5 k-in
My-=	90.0 k-in	90.0 k-in
Sfy+=	1.21 in^3	1.21 in^3
Sfy-=	1.64 in^3	1.64 in^3
C_S=	-1.00	-1.00
σ_{ex}=	1639.7	468.5
σ_{ey}=	537.2	31.0
C_{TF}=	1.00	1.00
σ_t=	266.14	76.63
j=	4.87 in	4.87 in
ro=	5.10 in	5.10 in
Fcre+=	622.76 ksi	179.26 ksi
Fcre-=	11236.84 ksi	3211.81 ksi
2.78*Fy=	152.9	152.9
.56*Fy=	30.8	30.8
Fn1=	55.0 ksi	55.0 ksi
Fn2+=	59.6 ksi	55.9 ksi
Fn2-=	61.0 ksi	60.8 ksi
Fn3+=	622.8 ksi	179.3 ksi
Fn3-=	11236.8 ksi	3211.8 ksi
Fn+=	55.0 ksi	55.0 ksi
Fn-=	55.0 ksi	55.0 ksi
Yield and LTB, Mne+=	66.5 k-in	66.5 k-in
Yield and LTB, Mne-=	90.0 k-in	90.0 k-in
Fcrllip=	141.5 ksi	141.5 ksi
Fcrlweb=	46.3 ksi	46.3 ksi
Fcrlflange=	31.7 ksi	31.7 ksi
Elastic Local Buckling, Mcrl+=	171.2 k-in	171.2 k-in
Elastic Local Buckling, Mcrl-=	62.0 k-in	62.0 k-in
λ_{l+}=	0.62	0.62
λ_{l-}=	1.20	1.20
Mnl1+=	66.52 k-in	66.52 k-in
Mnl2+=	75.83 k-in	75.83 k-in
Mnl1-=	90.05 k-in	90.05 k-in
Mnl2-=	67.55 k-in	67.55 k-in
Local Buckling, Mnl+=	66.52 k-in	66.52 k-in
Local Buckling, Mnl-=	67.55 k-in	67.55 k-in
Ωb=	1.67	1.67
Ma+=	39.8 k-in	39.8 k-in
Ma-=	40.5 k-in	40.5 k-in
Ma=	39.8 k-in	39.8 k-in

COMPRESSION		
	CANTI	SPAN
P_y=	60.78 k	60.78 k
σt=	266.1	76.6
σ_{ex}=	1639.7	468.5
σ_{ey}=	537.2	31.0
β=	0.23	0.23
F_{cre}=	235.69 ksi	67.80 ksi
λ_c=	0.48	0.90
Fn1=	49.88 ksi	39.17 ksi
Fn2=	206.7 ksi	59.5 ksi
Fn=	49.9 ksi	39.2 ksi
GLOBAL BUCKLING, P_{ne}=	55.13 k	43.28 k
klip=	0.43	0.43
μlip=	0.3	0.3
wlip=	0.68 in	0.68 in
kweb=	4	4
μweb=	0.3	0.3
wweb=	3.60 in	3.60 in
kflange=	4	4
μflange=	0.3	0.3
wflange=	4.35 in	4.35 in
Fcrllip=	141.5 ksi	141.5 ksi
Fcrlweb=	46.3 ksi	46.3 ksi
Fcrlflange=	31.7 ksi	31.7 ksi
F_{crl}=	31.7 ksi	31.7 ksi
Pcrl=	35.04 k	35.04 k
λ_l=	1.25	1.11
Pnl1=	55.13 k	43.28 k
Pnl2=	40.23	34.29
LOCAL BUCKLING, P_{crl}=	40.23 k	34.29 k
$k_{\phi fe}$=	4.973	0.651
$k_{\phi we}$=	0.570	0.570
k_{ϕ}=	0	0
$k_{\phi fg}$=	0.10667	0.03699
$k_{\phi wg}$=	0.00214	0.00074
L_m=	19.20 in	35.92 in
x_{of}=	1.98 in	1.98 in
h_{xf}=	-2.69	-2.69
h_o=	4.00 in	4.00 in
μ=	0.300	0.300
I_{xf}=	0.013	0.013
C_{wf}=	0	0
I_{xyf}=	0.052	0.052
I_{yf}=	0.930	0.930
L_{crd}=	32.60 in	32.60 in
L=	19.20 in	32.60 in
J_f=	0.00078	0.00078
A_f=	0.41 in^2	0.41 in^2
y_{of}=	-0.064	-0.064
F_{crd}=	50.9 ksi	32.4 ksi
P_{crd}=	56.29 k	35.76 k
λd=	1.039	1.304
P_{nd1}=	60.8 ksi	60.8 ksi
P_{nd2}=	44.2 ksi	36.2 ksi
DISTORTIONAL BUCKLING	44.19 k	36.17 k
Ω_c=	1.8	1.8
Pa=	22.35 k	19.05 k

MAX LOADING - BEAM STRESS RATIO SUMMARY			
S.R.	LOAD COMBO	S.R. FORMULA	BEAM
64.1%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	cantilever 1
NOT APPLIED		(P/Pa)+(M/Ma)	cantilever 1
63.5%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	cantilever 1
NOT APPLIED		(T/Ta)+(M/Ma)	cantilever 2
65.0%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(P/Pa)+(M/Ma)	cantilever 2
63.5%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	cantilever 2
31.2%	0.6*Dead+0.6*Wup (FRAME 1)	(T/Ta)+(M/Ma)	beam 1
66.0%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(P/Pa)+(M/Ma)	beam 1
62.9%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 1
51.9%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 1)	(T/Ta)+(M/Ma)	beam 2
51.9%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(P/Pa)+(M/Ma)	beam 2
52.8%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 2
49.8%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 3
20.1%	0.6*Dead+0.6*Wup (FRAME 1)	(P/Pa)+(M/Ma)	beam 3
49.7%	1*Dead+1*Snow (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 3
51.3%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 4
49.7%	1*Dead+1*Snow (FRAME 2)	(P/Pa)+(M/Ma)	beam 4
50.0%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 4
54.3%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	(T/Ta)+(M/Ma)	beam 5
25.6%	0.6*Dead+0.6*Wup (FRAME 1)	(P/Pa)+(M/Ma)	beam 5
52.5%	1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)	((V/Va)^2+(M/Ma)^2)^0.5	beam 5
66.0%	**1*Dead+0.75*Snow+0.45*Wdown (FRAME 2)**	**(P/Pa)+(M/Ma)**	**beam 1**







ROLL-FORMED POST ANALYSIS

terrasmart™

POST SECTION:	C8"x3"x0.80"x10ga

COMPRESSION		
	FRONT	BACK
P_y=	109.44 k	109.44 k
σt=	233.7	31.9
σ_{ex}=	784.6	94.1
σ_{ey}=	91.8	11.0
β=	0.71	0.71
F_{cre}=	91.76 ksi	11.00 ksi
λ_c=	0.77	2.24
Fn1=	42.80 ksi	6.79 ksi
Fn2=	80.5 ksi	9.6 ksi
Fn=	42.8 ksi	9.6 ksi
GLOBAL BUCKLING, P_{ne}=	85.16 k	19.20 k
klip=	0.43	0.43
μlip=	0.3	0.3
wlip=	0.54 in	0.54 in
kweb=	4	4
μweb=	0.3	0.3
wweb=	7.48 in	7.48 in
kflange=	4	4
μflange=	0.3	0.3
wflange=	2.48 in	2.48 in
Fcrllip=	703.4 ksi	703.4 ksi
Fcrlweb=	34.2 ksi	34.2 ksi
Fcrlflange=	310.9 ksi	310.9 ksi
F_{crl}=	34.2 ksi	34.2 ksi
Pcrl=	68.07 k	68.07 k
λ_l=	1.12	0.53
Pnl1=	85.16 k	19.20 k
Pnl2=	67.18	23.93
LOCAL BUCKLING, P_{crl}=	67.18 k	19.20 k
$k_{\phi fe}$=	2.413	2.413
$k_{\phi we}$=	1.625	1.625
k_{ϕ}=	0	0
$k_{\phi fg}$=	0.04671	0.04671
$k_{\phi wg}$=	0.02762	0.02762
L_m=	28.45 in	82.15 in
x_{of}=	1.14 in	1.14 in
h_{xf}=	-1.72	-1.72
h_o=	8.00 in	8.00 in
μ=	0.300	0.300
I_{xf}=	0.015	0.015
C_{wf}=	0	0
I_{xyf}=	0.041	0.041
I_{yf}=	0.423	0.423
L_{crd}=	20.21 in	20.21 in
L=	20.21 in	20.21 in
J_f=	0.003 in^4	0.003 in^4
A_f=	0.48 in^2	0.48 in^2
y_{of}=	-0.075	-0.075
F_{crd}=	54.3 ksi	54.3 ksi
P_{crd}=	108.09 k	108.09 k
λd=	1.006	1.006
P_{nd1}=	109.4 ksi	109.4 ksi
P_{nd2}=	81.7 ksi	81.7 ksi
DISTORTIONAL BUCKLING, P	81.67 k	81.67 k
Ω_c=	1.8	1.8
Pa=	37.32 k	10.67 k

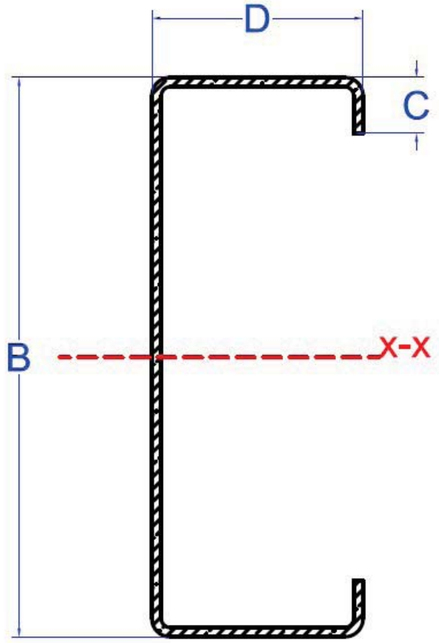


FIGURE 1

SECTION PROPERTIES					
	FRONT	BACK		FRONT	BACK
Lx=	28.45 in	82.15 in	J=	0.01 in^4	0.01 in^4
Ly=	28.45 in	82.15 in	Cw=	27.73 in^6	27.73 in^6
Lt=	28.45 in	82.15 in	ry=	1.06 in	1.06 in
Kx=	2.10	2.10 in	rx=	3.10 in	3.10 in
Ky=	2.10	2.10 in	ro=	3.90 in	3.90 in
Kt=	1.20	1.20 in	u=	0.20 in	0.20 in
B=	8.00 in	8.00 in	a=	7.62 in	7.62 in
D=	3.00 in	3.00 in	ā=	7.87 in	7.87 in
C=	0.80 in	0.80 in	b=	2.62 in	2.62 in
r=	0.13 in	0.13 in	б=	2.87 in	2.87 in
t=	0.134 in	0.134 in	c=	0.61 in	0.61 in
E=	29500 ksi	29500 ksi	ć=	0.73 in	0.73 in
G=	11300 ksi	11300 ksi	A=	1.99 in^2	1.99 in^2
Fy=	55 ksi	55 ksi	$\ddot{x}_c$=	0.82 in	0.82 in
Fu=	70 ksi	70 ksi	m=	1.29 in	1.29 in
Sx=	4.78 in^3	4.78 in^3	x_o=	-2.11 in	-2.11 in
c'=	2.12 in	2.12 in	β_w=	-5.00	-5.00
c''=	0.88 in	0.88 in	β_f=	8.49	8.49
Sy+=	1.06 in^3	1.06 in^3	β_l=	6.84	6.84
Sy-=	2.54 in^3	2.54 in^3	B'=	7.87 in	7.87 in
Iy=	2.24 in^4	2.24 in^4	D'=	2.87 in	2.87 in
Ix=	19.14 in^4	19.14 in^4	C'=	0.73 in	0.73 in

FLEXURE		
	FRONT	BACK
Mxy=	263.1 k-in	263.1 k-in
Sfx=	4.78 in^3	4.78 in^3
Cb=	1.000	1.000
σ_{ey}=	91.76 ksi	11.00 ksi
σ_t=	233.67 ksi	31.94 ksi
Fcre=	237.34 ksi	30.39 ksi
2.78*Fy=	152.90 ksi	152.90 ksi
.56*Fy=	30.80 ksi	30.80 ksi
Fn1=	55.00 ksi	55.00 ksi
Fn2=	57.18 ksi	30.39 ksi
Fn3=	237.34 ksi	30.39 ksi
Fn=	55.00 ksi	30.39 ksi
Yield and LTB, Mne=	263.13 k-in	145.38 k-in
Fcrllip=	703.4 ksi	703.4 ksi
Fcrlweb=	34.2 ksi	34.2 ksi
Fcrlflange=	310.9 ksi	310.9 ksi
Elastic Local Buckling, Mcrl=	1487.2 k-in	1487.2 k-in
λ_l=	0.42	0.31
Mnl1=	263.13 k-in	145.38 k-in
Mnl2=	368.32 k-in	228.39 k-in
Local Buckling, Mnl=	263.1 ksi	145.4 ksi
Ωb=	1.67	1.67
Ma=	157.6 k-in	87.1 k-in

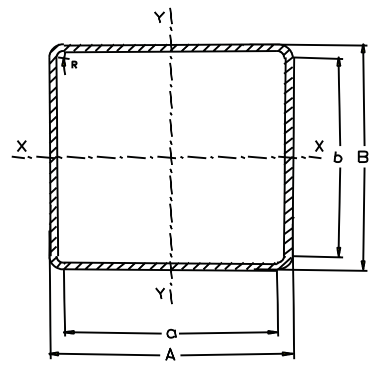
SHEAR		
	FRONT	BACK
h=	7.48 in	7.48 in
h/t=	55.84	55.84
Aw=	1.00 in^2	1.00 in^2
k_v=	5.34	5.34
F_{cr}=	45.7 ksi	45.7 ksi
V_{cr}=	45.79 k	45.79 k
V_y=	33.09 k	33.09 k
λ_v=	0.85	0.85
V_{n1}=	33.09 k	33.09 k
V_{n2}=	31.72 k	31.72 k
V_{n3}=	45.80 k	45.80 k
V_n=	31.72 k	31.72 k
Ω_v=	1.60	1.60
V_a=	19.83 k	19.83 k

TENSION		
	FRONT	BACK
A_g=	1.99 in^2	1.99 in^2
$T_{n(yield)}$=	109.44 k	109.44 k
Ω_y=	1.67	1.67
$T_{a(yield)}$=	65.53 k	65.53 k
A_n=	1.99 in^2	1.99 in^2
$T_{n(rupture)}$=	139.29 k	139.29 k
Ω_r=	2.00	2.00
$T_{a(rupture)}$=	69.64 k	69.64 k
T_a=	65.53 k	65.53 k

	GOVERNING LOAD COMBO	Local Coordinates						
		BEAM	Mx	Fy	Fx	(T/Ta)+(M/Ma)	(P/Pa)+(M/Ma)	((V/Va)^2+(M/Ma)^2)^.5
FRONT:	1*Dead+1*Snow	8	0.00 k-in	0.00 k	2.73 k	NO TENSION	7.32%	0.00%
BACK:	*Dead+0.75*Snow+0.45*Wdown	11	-4.68 k-in	0.06 k	3.00 k	NO TENSION	33.46%	5.38%

Knee Brace Design - Compression Member

Input Data			KNEE BRACE
Member Section	**2x2x15ga**		
A = Tube Width	2	in	
B = Tube Length	2	in	
R = Corner Inner Radius	0.09375	in	
t = Thickness	0.072	in	
KL_x= Buckling around x-x	7.61	ft	
KL_y= Buckling around y-y	7.61	ft	
E = Modulus of Elasticity	29500	ksi	
F_y = Yield Stress	50	ksi	
G = Shear Modulus	11300	ksi	



Calculated Parameter		
1- Properties of 90° corner		
r = R + t/2, Centerline of Dimension	0.130	in
u = π. r/2, Arc Length	0.204	in
c=0.637.r Distance of c.g. from center	0.083	in
2- Flat widths of flanges and webs		
Flat width of Dim. a= A - (2.r + t)	1.6685	in
Flat width of Dim. b= B - (2.r + t)	1.6685	in

Applied Forces		
M	**0.000**	kip.ft
P	**1.33**	kips
BEAMS 6 & 7		

Calculation of I_x

Element	L, Length (in)		Y, Distance to the center (in)		$L \times Y^2$	I_x'
Flanges	2.a	3.337	B/2 - t/2	0.964	3.101	0.000
Web	2.b	3.337	0	0.000	0.000	0.774
Corners	4.u	0.815	b/2 + c	0.917	0.685	0.000
Sum	7.489		1.881		3.786	0.774

Calculation of I_y

Element	L, Length (in)		X, Distance to the center (in)		$L \times X^2$	I_y'
Flanges	2.a	3.337	0	0.000	0.000	0.774
Web	2.b	3.337	A/2 - t/2	0.964	3.101	0.000
Corners	4.u	0.815	a/2 + c	0.917	0.685	0.000
Sum	7.489		1.881		3.786	0.774

Section Properties

A	L x t	0.5392	in^2
I_X	$t \times (L \times Y^2 + I_x')$	0.3284	in^4
I_Y	$t \times (L \times X^2 + I_y')$	0.3284	in^4
S_x	$I_X /(B/2)$	0.3284	in^3
S_Y	$I_Y /(A/2)$	0.3284	in^3
r_x	$(I_x /A)^{0.5}$	0.7804	in
r_Y	$(I_Y /A)^{0.5}$	0.7804	in

Nominal Buckling Stress			
KL_x/r_x		117.08	
KL_y/r_y		117.08	
KL/r		117.08	
F_e	$\pi^2 . E/(KL/r)^2$	21.24	ksi
λ_c	$(Fy/Fe)^{0.5}$	1.53	
F_n		18.63	ksi

Effective Area			
effective width of compression flange			
w/t = a/t		23.17	
λ	$1.052/(k)^{0.5}$ x (w/t) x $(F_n/E)^{0.5}$	0.31	
ρ	$(1-0.22 / \lambda) / \lambda$	0.92	
a_e		1.67	in
effective width of web element			
w/t = b/t		23.17	
λ	$1.052/(k)^{0.5}$ x (w/t) x $(F_n/E)^{0.5}$	0.31	
ρ	$(1-0.22 / \lambda) / \lambda$	0.92	
b_e		1.67	in

Allowable Axial Load			
A_e	$A_e = A - 2 \times t \times [(a-a_e) + (b-b_e)]$	0.54	in^2
P_n	$P_n = A_e \times F_n$	10.05	kips
Ω_c		1.80	
$P_a = P_n / \Omega_c$		5.58	kips

Check Compression Stresses				
			Loads from Wind?	
C_{b1}	$Cb1=(P / P_a)$	0.24	NO	
			Allowable Stress Unity	1
		0.24	**Section is OK**	

Computing of M_{nx}

By using the effective width of compression flange and assuming the web is fully effective, the neutral axis can be located as follow:

Element	L, Length (in)		y, Distance to top fiber (in)		L.y	$L.y^2$
C. Flanges	a_e	1.669	t/2	0.036	0.060	0.002
Web	2.b	3.337	B/2	1.000	3.337	3.337
C. Corners	2.u	0.408	c+t/2	0.119	0.048	0.006
T. Flanges	a_e	1.669	B-t/2	1.964	3.277	6.436
T.Corners	2.u	0.408	B-c-t/2	1.881	0.767	1.443
Sum	7.489		5.000		7.489	11.224

$y_{cg} =$ L.y/ L 1.000 Z=R+t 0.166 in

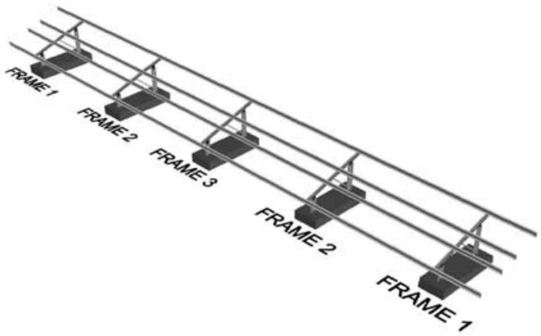
The max. stress of 50 ksi ocurs in the compression flange as assumed in the calculation

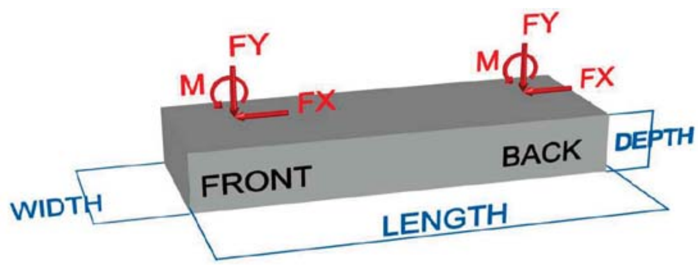
Check the effectiveness of the Web			
f_1	$(y_{cg} - Z)F_y/y_{cg}$	41.71	ksi
f_2	$-(B - y_{cg} - Z)F_y/y_{cg}$	-41.71	ksi
ψ	**f_2/f_1**	-1.00	
k	$4+2(1-\psi)^3+2(1-\psi)$	24.00	
h/t	b_e/t	23.17	
λ	$1.052/(k)^{0.5}$ x (h/t) x $(f1/E)^{0.5}$	0.19	
ρ	$(1-0.22 / \lambda) / \lambda$	-0.94	
b_e		1.67	in
b_1	$b_e/(3-\psi)$	0.42	in
b_2		0.83	in
	b_1+b_2	1.25	in
$2\ I'_{web}$	$2(1/12)(b)^3$	0.77	in^4
	$\Sigma(Ly^2)$	11.22	in^4
	$(-)(\Sigma L)(y_{cg})^2$	7.49	in^4
	I'_x	4.51	in^4
	I_x $=I'_x.t$	0.32	in^4
	S_{ex} $=I_x/y_{cg}$	0.32	in^3
C_b=1.0 for combined axial load and bending moment			
j	$2b^2d^2t/(b+d)$	0.33	in^4
S_f	fullS_x	0.33	in^4
L_u	$0.36C_b\pi.(E\ I.G.j)^{0.5}/(F_y.\ S_f)$	34.73	ft
F_e'	$C_b\pi.(E\ I.G.j)^{0.5}/(L.\ Sf)$	633.60	ksi
Allowable Bending Moment			
	M_{nx}	1.353	kip.ft
	Ω_b	1.670	
	M_a $= M_{nx} / \Omega_b$	0.810	kip.ft

Check Stresses				
C_{mx}	$0.6-0.4*M_1/M_2$	0.60	Loads from Wind?	
C_{b1}	$(P / P_a) + (C_{mx}\ M_x / M_a)$	0.24	NO	
C_{b2}	$(P / P_a) + (M_x / M_a)$	0.24	Allowable Stress Unity	1
C_b	If((P / P_a) <= 0.15,C_{b2},C_{b1})	0.24	**Section is OK**	

Interior Zones Ballast Analysis (ASD)

unit weight of concrete =	0.15 k/ft^3	depth below grade =	0.00 ft
sliding coeff of friction =	0.40	allowable bearing pressure=	1.00 ksf





BALLAST INPUTS:

		LENGTH		WIDTH		DEPTH
BLOCKS 1+2:	**DIMENSIONS =**	**9.50 ft**	**x**	**3.58 ft**	**x**	**1.50 ft**
	VOLUME =	51.02 ft^3				
	WEIGHT =	7.65 k		EDGE DISTANCE =	0.87 ft	
		LENGTH		WIDTH		DEPTH
BLOCKS 3+:	**DIMENSIONS =**	**9.50 ft**	**x**	**2.83 ft**	**x**	**1.50 ft**
	VOLUME =	40.33 ft^3				
	WEIGHT =	6.05 k		EDGE DISTANCE =	0.87 ft	

SLIDING CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**			0.6*Dead+0.6*Wup		
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.21 k	
		BACK	0.00 k-ft	1.43 k	-1.91 k	OK
	RESISTANCE TO SLIDING =		2.21 k		**SAFETY FACTOR =**	1.55
FRAME 2:	**GOVERNING LOAD COMBINATION =**			0.6*Dead+0.6*Wup		
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.17 k	
		BACK	0.00 k-ft	1.45 k	-1.91 k	OK
	RESISTANCE TO SLIDING =		2.23 k		**SAFETY FACTOR =**	1.54
FRAME 3:	**GOVERNING LOAD COMBINATION =**			0.6*Dead+0.6*Wup		
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.10 k	
		BACK	0.00 k-ft	1.15 k	-1.47 k	OK
	RESISTANCE TO SLIDING =		1.79 k		**SAFETY FACTOR =**	1.55

UPLIFT CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.21 k	
		BACK	0.00 k-ft	1.43 k	-1.91 k	OK
	RESISTANCE TO UPLIFT =	7.65 k		**SAFETY FACTOR =**		3.60
FRAME 2:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.17 k	
		BACK	0.00 k-ft	1.45 k	-1.91 k	OK
	RESISTANCE TO UPLIFT =	7.65 k		**SAFETY FACTOR =**		3.68
FRAME 3:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k	-0.10 k	
		BACK	0.00 k-ft	1.15 k	-1.47 k	OK
	RESISTANCE TO UPLIFT =	6.05 k		**SAFETY FACTOR =**		3.83

OVERTURNING CHECK: Ω ≥ 1.5

FRAME 1:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k-ft	-0.21 k-ft	
		BACK	0.00 k-ft	1.43 k-ft	-1.91 k-ft	
	OVERTURN AT A =	18.82 k-ft	**OVERTURN RESISTANCE AT A =**			36.35 k-ft
	OVERTURN AT B =	1.38 k-ft	**OVERTURN RESISTANCE AT B =**			36.35 k-ft
	SAFETY FACTOR FOR OT AT A =	1.93	OK			
	SAFETY FACTOR FOR OT AT B =	26.29	OK			
FRAME 2:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k-ft	-0.17 k-ft	
		BACK	0.00 k-ft	1.45 k-ft	-1.91 k-ft	
	OVERTURN AT A =	18.80 k-ft	**OVERTURN RESISTANCE AT A =**			36.35 k-ft
	OVERTURN AT B =	0.93 k-ft	**OVERTURN RESISTANCE AT B =**			36.35 k-ft
	SAFETY FACTOR FOR OT AT A =	1.93	OK			
	SAFETY FACTOR FOR OT AT B =	39.06	OK			
FRAME 3:	**GOVERNING LOAD COMBINATION =**	0.6*Dead+0.6*Wup				
	LOADING:	**POST**	**M**	**FX**	**FY**	
		FRONT	0.00 k-ft	0.00 k-ft	-0.10 k-ft	
		BACK	0.00 k-ft	1.15 k-ft	-1.47 k-ft	
	OVERTURN AT A =	14.52 k-ft	**OVERTURN RESISTANCE AT A =**			28.73 k-ft
	OVERTURN AT B =	0.47 k-ft	**OVERTURN RESISTANCE AT B =**			28.73 k-ft
	SAFETY FACTOR FOR OT AT A =	1.98	OK			
	SAFETY FACTOR FOR OT AT B =	61.57	OK			

BEARING CHECK: APPLIED BEARING ≤ MAX ALLOWABLE BEARING

FRAME 1:	**GOVERNING LOAD COMBINATION =**				1*Dead+0.6*Wnodal+				
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.70 ft		
		FRONT	6.98 k-ft	0.00 k	0.29 k	L/6 =	1.58 ft		
		BACK	6.98 k-ft	0.00 k	0.29 k	L/2 =	4.75 ft		
	MAX APPLIED BEARING PRESSURE =				0.50 ksf	≤	1.00 ksf	OK	
FRAME 2:	**GOVERNING LOAD COMBINATION =**				1*Dead+0.6*Wnodal+				
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.58 ft		
		FRONT	6.61 k-ft	0.00 k	0.35 k	L/6 =	1.58 ft		
		BACK	6.61 k-ft	0.00 k	0.35 k	L/2 =	4.75 ft		
	MAX APPLIED BEARING PRESSURE =				0.49 ksf	≤	1.00 ksf	OK	
FRAME 3:	**GOVERNING LOAD COMBINATION =**				1*Dead+0.6*Wnodal+				
	LOADING:	**POST**	**M**	**FX**	**FY**	e =	1.67 ft		
		FRONT	5.62 k-ft	0.00 k	0.35 k	L/6 =	1.58 ft		
		BACK	5.62 k-ft	0.00 k	0.35 k	L/2 =	4.75 ft		
	MAX APPLIED BEARING PRESSURE =				0.52 ksf	≤	1.00 ksf	OK	

REINFORCEMENT:

BLOCKS 1+2

Length=	9.50 ft	min steel (shrinkage), longitudinal direction=			1.39 in^2
Width=	3.58 ft	min steel (shrinkage), transverse direction=			3.69 in^2
Depth=	1.50 ft	minimum bar spacing=			18 in
rows of bars=	2	As (#4 bar)=	0.20 in^2	As (#5 bar)=	0.31 in^2
longitudinal bars per row by max spacing (18 in)=	4	transverse bars per row by max spacing (18 in)=			7
longitudinal #4 bars/row, min steel=	4	transverse #4 bars/row, min steel=			10
longitudinal #5 bars/row, min steel=	3	transverse #5 bars/row, min steel=			7

Reinforcement (#4 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#4 bars)=	10	transverse bars Top and Bottom
Reinforcement (#5 bars)=	4	longitudinal bars Top and Bottom
Reinforcement (#5 bars)=	7	transverse bars Top and Bottom

BLOCKS 3+

Length=	9.50 ft	min steel (shrinkage), longitudinal direction=			1.10 in^2
Width=	2.83 ft	min steel (shrinkage), transverse direction=			3.69 in^2
Depth=	1.50 ft	minimum bar spacing=			18 in
rows of bars=	2	As (#4 bar)=	0.20 in^2	As (#5 bar)=	0.31 in^2
longitudinal bars/row, min spacing=	3	transverse bars/row, min spacing=			7
longitudinal #4 bars/row, min steel=	3	transverse #4 bars/row, min steel=			10
longitudinal #5 bars/row, min steel=	2	transverse #5 bars/row, min steel=			7

Reinforcement (#4 bars)=	3	longitudinal bars Top and Bottom
Reinforcement (#4 bars)=	10	transverse bars Top and Bottom
Reinforcement (#5 bars)=	3	longitudinal bars Top and Bottom
Reinforcement (#5 bars)=	7	transverse bars Top and Bottom

Alternatively, reinforcement may be fiber mesh for shrinkage and cracking requirments. A minimum of 5 lbs per 1 yd^3 BASF MasterFiber MAC 2200 CB Fiber or approved equal required.