Historic Preservation Services
Community Development & Neighborhood Services
281 North College Avenue
P.O. Box 580
Fort Collins, CO 80522.0580

970.224.6078
preservation@fcgov.com
fcgov.com/historicpreservation

REPORT OF ALTERATIONS TO DESIGNATED RESOURCE
Site Number/Address: 718 Remington St.
Laurel School National Register Historic District
ISSUED: April 24, 2024

Jordan Wiswell and Meghan King
718 Remington St.
Fort Collins, CO 80524

Dear Property Owners:

This report is to inform you of the results of this office's review of proposed alterations to the Hahn House at 718 Remington St., pursuant to Fort Collins Municipal Code, Chapter 14, Article IV. A copy of this report may be forwarded to the Colorado Office of Archaeology and Historic Preservation as well.

The alterations reviewed include:

- Detached pergola with solar panel system at property rear

Our staff review of the proposed work finds the alterations meet the SOI Standards for Rehabilitation and the project appears to be routine in nature with minimal effects to the historic resource, meeting the requirements of Article IV cited above.

Notice of the approved application has been provided to building and zoning staff to facilitate the processing of any permits that are needed for the work.

Please note that work beyond that indicated in your permit application/correspondence requires additional approval.

If you have any questions regarding this report, or if I may be of any assistance, please do not hesitate to contact me. I can be reached at yjones@fcgov.com or at 970-224-6045.

Sincerely,

Yani Jones
Historic Preservation Planner

City of Fort Collins

BUILDING PERMIT APPLICATION: **Solar PV**

All information on the application must be filled out (as applicable).

Scope of work *(check one)*

New system installation ☑ | Alterations to an existing system ☐ (new equipment or expansion) | Reinstallation of an existing system ☐ (same equipment and same location)

USE / TYPE OF BUILDING *(check the correct uses below):*

Residential ☑ Commercial ☐

Single family detached ☑ Duplex/Two-Family ☐ Single Family Attached (Townhome) ☐ Multi-Family (Apartment/Condo) ☐

Garage ☐ Bank ☐ Bar ☐ Church ☐ Hotel/Motel ☐ Medical Office ☐ Retail ☐ Other ☑: Pergola

JOB SITE ADDRESS: 718 Remington, Fort Collins, CO 80524 **UNIT#:** ______

PROPERTY OWNER INFO: (All owner information is required – NOT optional)

Last Name Wiswell First Name Jordan Middle ______

Street Address 718 Remington St City Fort Collins State CO Zip 80524

Phone # 970-692-4059 Email jordan.wiswell@gmail.com

CONTRACTOR INFO:

Company Name ______

License Holder Name ______ LIC # ______ CERT # ______

CONSTRUCTON INFO *(check any that apply)*:

PV (photovoltaic) ☑ Thermal Hydronic System ☐ Battery Storage ☐

Mounting: Ground ☑ Roof ☐

UTILITES INFO:

Electric Service Upgrade? Yes ☐ No ☑ Existing Amps 200 New Amps ______

Electric Meter Relocation? Yes ☐ No ☑

Meter change out? Yes ☐ No ☑

Panel change out? Yes ☐ No ☑

VALUE OF CONSTRUCTION (*materials and labor*): $ 15,000

DESCRIPTION OF WORK *(Include KWh and number of solar panels):*

Ground mount solar pergola with 14 solar panels, not batteries.

JOBSITE SUPERVISOR CONTACT INFO: Name ______ Phone ______

SUBCONTRACTOR INFO:

Electrical Kinect Electric Plumbing ______

Applicant: I hereby acknowledge that I have read this application and state that the above information is correct and agree to comply with all requirements contained herein and City of Fort Collins ordinances and state laws regulating building construction.

Applicant Signature [signature] Type or Print Name Jordan Wiswell

Phone # 970-692-4059 Email jordan.wiswell@gmail.com

THIS APPLICATION EXPIRES 180 DAYS FROM APPLICATION DATE

City of Fort Collins

Building Services
PO Box 580
281 N College Ave
Fort Collins, CO 80524
970-416-2740 phone 970-224-6134 fax

HOMEOWNER AFFIDAVIT

I, Jordan Wiswell, as owner of record of the property located at: 718 Remington St., Fort Collins, Colorado, hereby declare and attest to the following: (*please check only the one that applies*):

OPTION 1: CONSTRUCTION OF NEW HOME

☐ I am acting on my behalf for the purpose of obtaining a building permit and personally constructing my home. The home to be constructed is on the above property and **will** be my primary residence. I have not personally constructed any other new homes in the Fort Collins city limits within the past **24-month** period.

OPTION 2: PERMITTED WORK ON DETACHED SINGLE FAMILY HOME

☑ I am acting on my behalf for the purpose of obtaining a building permit and personally constructing an alteration or addition to my house, acting as my own general contractor. The house to be altered is on the above property and **is** my personal **primary** residence.

OPTION 3: PERMITED WORK ON ATTACHED SINGLE FAMILY DWELLING UNIT.

☐ I am acting on my behalf for the purpose of obtaining a building permit and personally constructing a non-structural alteration to my **attached single family dwelling unit**. The house to be altered is my personal **primary** residence. I am aware that I **cannot complete or supervise** any structural, electrical, plumbing or mechanical work and ***must*** *hire contractors/subcontractors* who are currently licensed and insured with the City of Fort Collins*.

I am personally performing all of the work or hiring City of Fort Collins licensed trades people, or will be continuously supervising unpaid volunteers (see Option 3 for attached dwellings). The work is directly related to the construction of the above referenced home.

I understand that any person(s) or agent(s) contracted to perform **structural** wood-framing, plumbing, HVAC, electrical or roofing work, MUST BE licensed contractors in accordance with the regulation of the City of Fort Collins.

I understand that failure to comply with any of the above conditions may result in revocation of any permits associated with the above Permit Application number, forfeiture of any fees that have been collected, a Stop Work Order and potentially a court summons.

Sign in the presence of Notary Public

[signature]
Owner

JULIANA GARCIA
Notary Public
State of Colorado
Notary ID # 20224043827
My Commission Expires 11-16-2026

The foregoing Affidavit was acknowledged before me on this 22nd day of April, 2024 (month, year) by Jordan Wiswell.

Witness my hand and official seal
My commission expires:

Juliana Garcia
Notary Public

nonstructural construction, alterations, and/or repairs of less than $2000 are exempt from this requirement.

Revised 12/14/2022

Building Services
281 N. College Ave.
P.O. Box 580
Fort Collins, CO 80524
Voice: 970.416.2740 FAX: 970.224.6134

City of Fort Collins

HOMEOWNER AFFIDAVIT

Homeowners of a **DETACHED** single-family home may personally perform and /or act as their own general contractor for any work on their **PRIMARY** residence. Permit requirements are applicable. If said homeowner hires and pays anyone for work that requires a City licensed contractor, the City licensed contractor needs to be listed on the building permit application, and will need to be current on City license and insurance requirements before the building permit can be issued.

Homeowners of an **ATTACHED** single-family home (townhouse, condominium or duplex), may perform **LIMITED "MINOR ALTERATIONS AND REPAIRS"** by City Code as follows:

> *"A building owner and any unpaid volunteers or paid workers employed by said owner who perform only minor alterations and repairs to such building, provided that all such work is under the continuous personal supervision of said owner, and further provided that no building owner, or unpaid volunteer or paid worker employed by said owner, may engage in the following types of work without obtaining the appropriate contractor license."*

Furthermore, the work must be limited to minor alterations and repairs, which, **DO NOT** include:

1. Any alterations/installations involving, fire-resistive assemblies, alterations to primary and secondary framework; electrical, plumbing, or mechanical systems; and replacement of more than 100 sq. ft. of roofing; **OR**
1. Any nonstructural construction, alterations, or repairs when the total value of the work exceeds $2000.

PAID WORKERS

Regardless of ownership status, **paid** non-owner worker(s) or contractors performing overall project supervision **MUST BE A CITY LICENSED GENERAL CONTRACTOR**. Any paid specialized trades that perform any one of the following: structural wood framing, roofing, electrical, plumbing, or HVAC, **MUST BE SUB-CONTRACTORS** licensed by the City.

APPLICATIONS & PENALTIES

A homeowner acting as their own "general contractor" for work on their own primary residence, must submit a notarized City Homeowner Affidavit form to Building Services before a building permit can be issued. Failure to comply with the above conditions can result in a "Stop Work" order on the project, permit revocation, forfeiture of fees, and a court summons.

EXEMPTIONS

(1) Any homeowner of an attached dwelling and any unpaid volunteers or paid workers employed by said owner who perform only minor alterations and repairs to such building, provided that all such work is under the continuous personal supervision of said owner, and further provided that **NO homeowner of an attached dwelling, or unpaid volunteer or paid worker employed by said owner, may engage in the following types of work without obtaining an appropriately licensed City contractor:**

(a) Alterations to the primary or secondary structural frame work (except for the repair and replacement of existing window and doors, provided that such repair or replacement does not create larger openings or greater spans for such headers);

(b) Alterations to fire-resistive assemblies as defined in the building code,

(c) Alterations to or the installation of electrical, plumbing or mechanical systems, (except for electrical/plumbing fixture replacement in the same location as original).

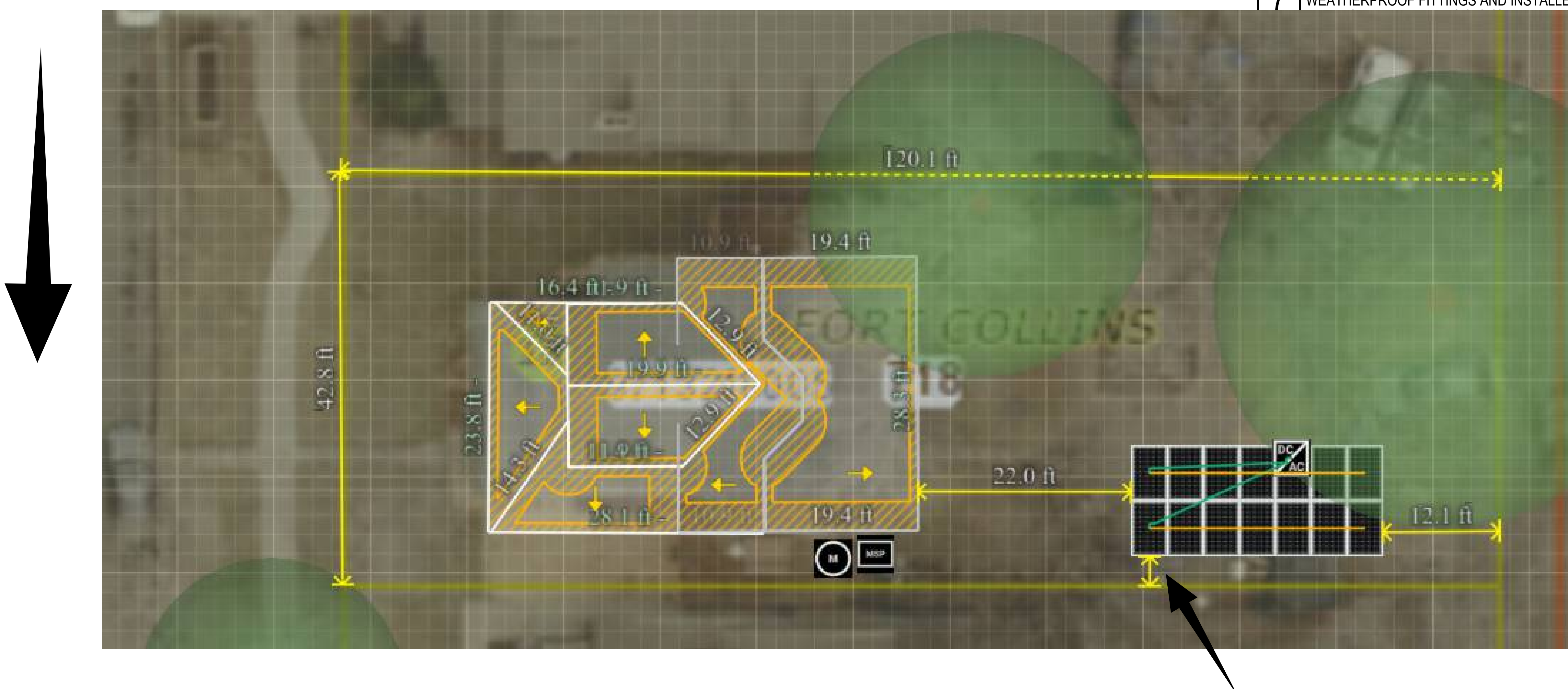
(d) Replacement/installation of more than a total of one (1) square (100 square feet) of roofing.

(e) Nonstructural construction, alterations, or repairs to a building performed by the building owner, or by his or her unpaid volunteer or paid workers, when the total construction value of all work (including the related work done on the project by licensed specialized trade contractors) exceeds twoo thousand dollars ($2000).

P-9F5B1E

GENERAL NOTES	
1	EQUIPMENT LIKELY TO BE WORKED UPON WHILE ENERGIZED SHALL BE INSTALLED IN LOCATIONS THAT SATISFY MIN. WORKING CLEARANCES PER NEC 110.26.
2	24/7 UNESCORTED KEYLESS ACCESS SHALL BE PROVIDED TO ALL CITY OF FORT COLLINS - (CO) EQUIPMENT.
3	CONTRACTOR SHALL USE ONLY COMPONENTS LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY FOR THE INTENDED USE.
4	CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL EQUIPMENT, CABLES, ADDITIONAL CONDUITS, RACEWAYS, AND OTHER ACCESSORIES NECESSARY FOR A COMPLETE AND OPERATIONAL PV SYSTEM.
5	ALL EXPOSED PV ROOFTOP CONDUCTORS NOT UNDER THE ARRAY SHALL BE PROTECTED BY A RACEWAY WITH A LISTED JUNCTION BOX AT BOTH ENDS AND COMPLY WITH NEC 690.31(A).
6	WHERE DC PV SOURCE OR DC PV OUTPUT CIRCUITS ARE RUN INSIDE THE BUILDING, THEY SHALL BE CONTAINED IN METAL RACEWAYS, TYPE MC METAL-CLAD CABLE, OR METAL ENCLOSURES FROM THE POINT OF PENETRATION INTO THE BUILDING TO THE FIRST READILY ACCESSIBLE DISCONNECTING MEANS, PER NEC 690.31(D).
7	ALL EMT CONDUIT FITTINGS SHALL BE LISTED AS WEATHERPROOF FITTINGS AND INSTALLED TO ENSURE A

REMMINGTON ST



3' SETBACK FROM PROPERTY LINE

GRID-TIED PV SYSTEM

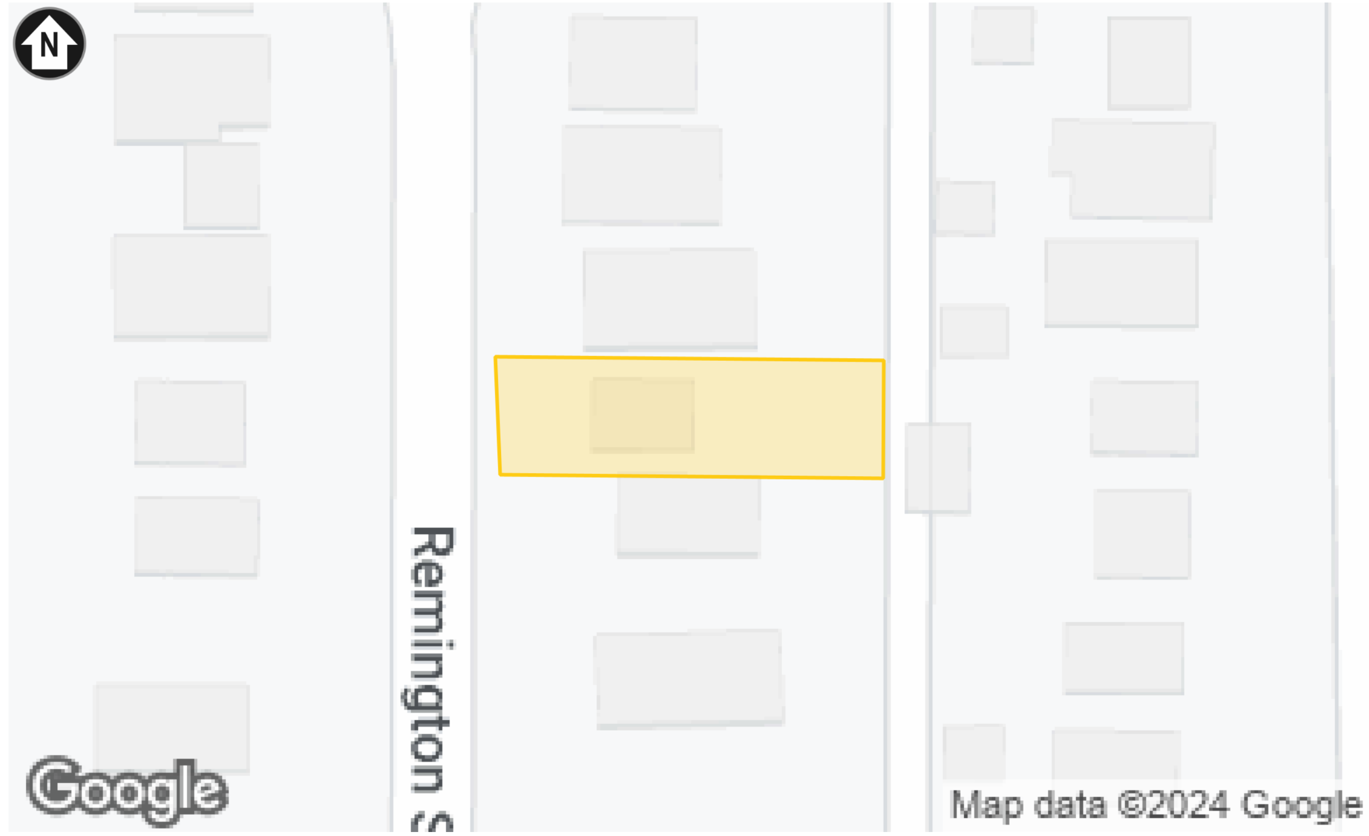
WISWELL RESIDENCE
718 REMINGTON ST
FORT COLLINS, CO 80524

SITE PLAN

PV-2

DIRECTORY OF PAGES	
PV-1	PROJECT SUMMARY
PV-2	SITE PLAN
PV-3	ELECTRICAL PLAN
PV-4	PV SAFETY LABELS
PV-5	ATTACHMENT PLAN
PV-6	ATTACHMENT DETAILS
PV-7	CUSTOM CONTENT
APPENDIX	ANCHOR DATASHEET
	DISCONNECT DATASHEET
	INVERTER DATASHEET
	MODULE DATASHEET
	MOUNTING SYSTEM DATASHEET
	MOUNTING SYSTEM ENGINEERING LETTER
	PV HAZARD CONTROL DEVICE DATASHEET
	UL 2703 CLASS A FIRE CERTIFICATION
	UL 2703 GROUNDING AND BONDING CERTIFICATION

PROJECT DETAILS	
PROPERTY OWNER	JORDAN WISWELL
PROPERTY ADDRESS	718 REMINGTON ST, FORT COLLINS, CO 80524
APN	0055468
ZONING	RESIDENTIAL
USE AND OCCUPANCY CLASSIFICATION	ONE- OR TWO-FAMILY DWELLING GROUP (GROUP R3)
AHJ	CITY OF FORT COLLINS
UTILITY COMPANY	CITY OF FORT COLLINS - (CO)
ELECTRICAL CODE	2023 NEC (NFPA 70)
FIRE CODE	2021 IFC
OTHER BUILDING CODES	IBC 2021



1 PV-1 PARCEL
SCALE: NTS

2 PV-1 LOCALE
SCALE: NTS

SCOPE OF WORK

THIS PROJECT INVOLVES THE INSTALLATION OF A GRID-INTERACTIVE PV SYSTEM. PV MODULES WILL BE MOUNTED USING A PREENGINEERED MOUNTING SYSTEM. THE MODULES WILL BE ELECTRICALLY CONNECTED WITH DC TO AC POWER INVERTERS AND INTERCONNECTED TO THE LOCAL UTILITY USING MEANS AND METHODS CONSISTENT WITH THE RULES ENFORCED BY THE LOCAL UTILITY AND PERMITTING JURISDICTION.

THIS DOCUMENT HAS BEEN PREPARED TO DESCRIBE THE DESIGN OF A PROPOSED PV SYSTEM WITH ENOUGH DETAIL TO DEMONSTRATE COMPLIANCE WITH APPLICABLE CODES AND REGULATIONS. THE DOCUMENT SHALL NOT BE RELIED UPON AS A SUBSTITUTE FOR FOLLOWING MANUFACTURER INSTALLATION INSTRUCTIONS. THE SYSTEM SHALL COMPLY WITH ALL MANUFACTURERS INSTALLATION INSTRUCTIONS, AS WELL AS ALL APPLICABLE CODES. NOTHING IN THIS DOCUMENT SHALL BE INTERPRETED IN A WAY THAT OVERRIDES THEM. CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF ALL DETAILS IN THIS DOCUMENT.

PV SYSTEM	
DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH NO ENERGY STORAGE
PV SYSTEM DC RATING	5.81KW
PV SYSTEM AC RATINGS	7.60KW, 32.0A
DERATED AC POWER	5.358KW
INVERTER(S)	1 X TESLA 1538000-XX-Y (7.6 KW)
PV MODULE(S)	14 X TRINA SOLAR TSM-415NE09RC.05
PV ARRAY WIRING	(1) STRING OF 7 (MPPT #1) (1) STRING OF 7 (MPPT #2)

INTERCONNECTION DETAILS	
POINT OF INTERCONNECTION	NEW LOAD-SIDE AC CONNECTION PER NEC 705.12(B)(2) AT MSP
UTILITY SERVICE	120/240V 1Φ
ELECTRICAL PANEL	MAIN SERVICE PANEL W/ TOP-FED 200A BUSBAR 200A MCB

SITE DESIGN PARAMETERS	
DRY BULB EXTREME LOW	-23°C (-9°F)
DRY BULB 2% HIGH	32°C (90°F)
DATA SOURCE	ASHRAE DATASET FORT COLLINS DOWNTOWN
WIND (ASCE 7-16)	140 MPH, EXPOSURE CATEGORY B, RISK CATEGORY II
GROUND SNOW LOAD	35 PSF

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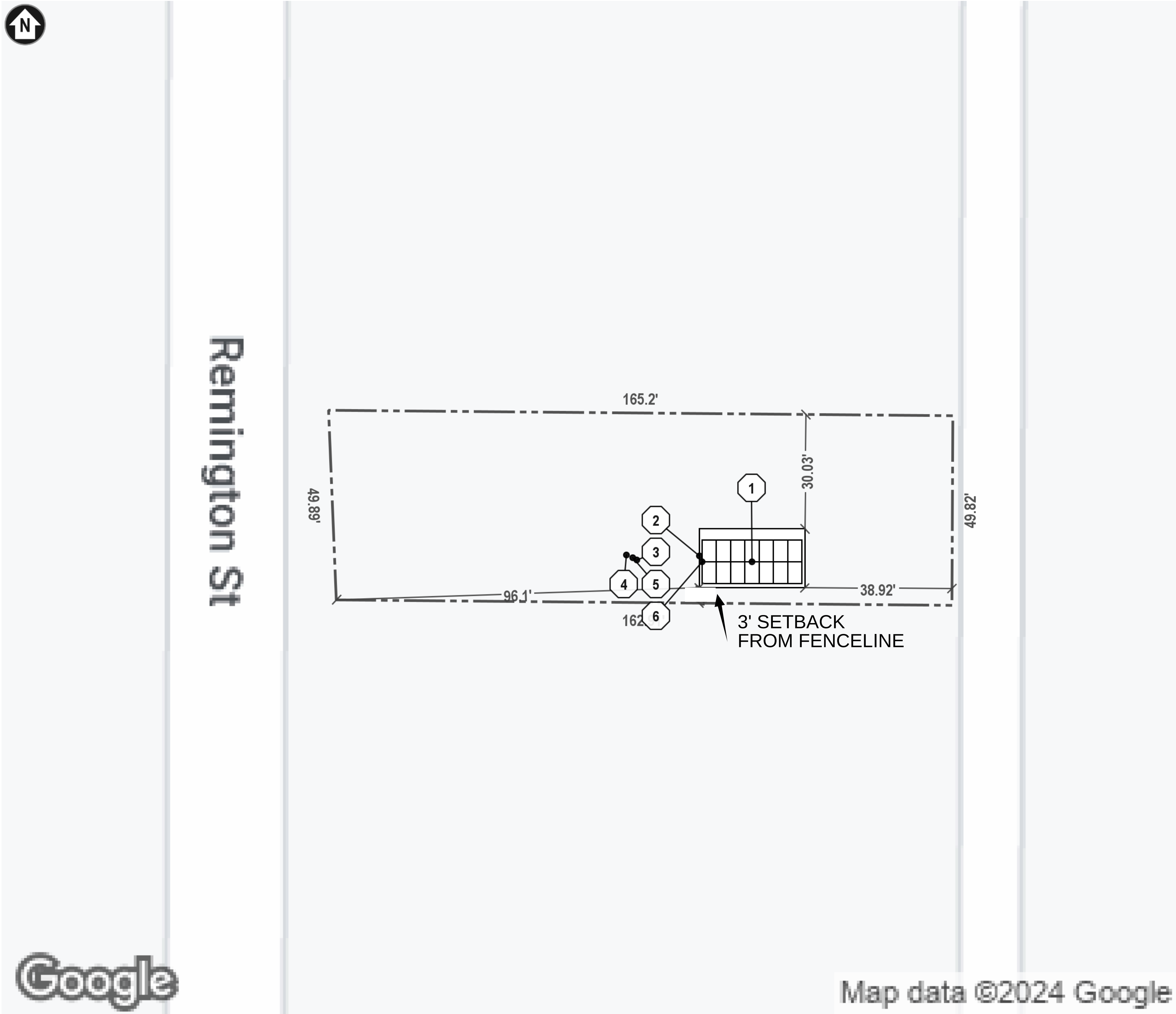
GRID-TIED PV SYSTEM

WISWELL RESIDENCE
718 REMINGTON ST
FORT COLLINS, CO 80524

PROJECT SUMMARY

PV-1



1 SITE PLAN
PV-2 SCALE: 1" = 30'

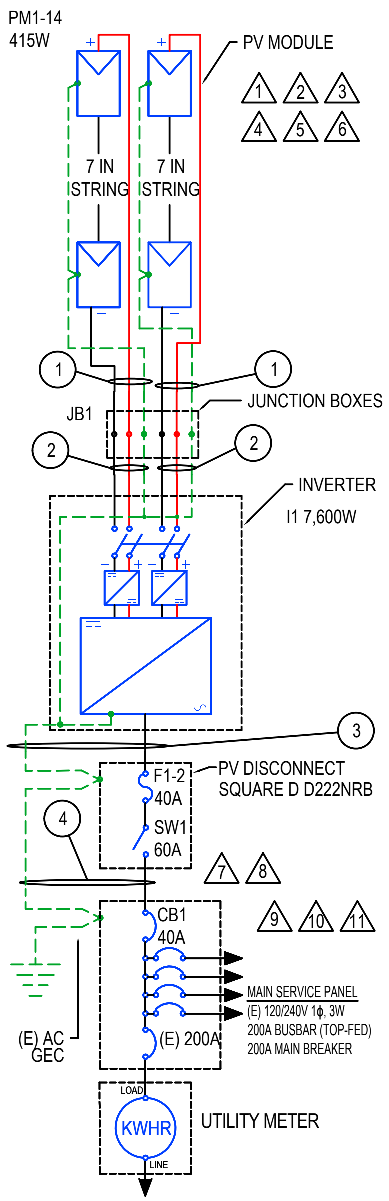
GENERAL NOTES	
1	EQUIPMENT LIKELY TO BE WORKED UPON WHILE ENERGIZED SHALL BE INSTALLED IN LOCATIONS THAT SATISFY MIN. WORKING CLEARANCES PER NEC 110.26.
2	24/7 UNESCORTED KEYLESS ACCESS SHALL BE PROVIDED TO ALL CITY OF FORT COLLINS - (CO) EQUIPMENT.
3	CONTRACTOR SHALL USE ONLY COMPONENTS LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY FOR THE INTENDED USE.
4	CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL EQUIPMENT, CABLES, ADDITIONAL CONDUITS, RACEWAYS, AND OTHER ACCESSORIES NECESSARY FOR A COMPLETE AND OPERATIONAL PV SYSTEM.
5	ALL EXPOSED PV ROOFTOP CONDUCTORS NOT UNDER THE ARRAY SHALL BE PROTECTED BY A RACEWAY WITH A LISTED JUNCTION BOX AT BOTH ENDS AND COMPLY WITH NEC 690.31(A).
6	WHERE DC PV SOURCE OR DC PV OUTPUT CIRCUITS ARE RUN INSIDE THE BUILDING, THEY SHALL BE CONTAINED IN METAL RACEWAYS, TYPE MC METAL-CLAD CABLE, OR METAL ENCLOSURES FROM THE POINT OF PENETRATION INTO THE BUILDING TO THE FIRST READILY ACCESSIBLE DISCONNECTING MEANS, PER NEC 690.31(D).
7	ALL EMT CONDUIT FITTINGS SHALL BE LISTED AS WEATHERPROOF FITTINGS AND INSTALLED TO ENSURE A RAINTIGHT FIT, PER NEC 358.42.

1	(N) PROPOSED ROOF-MOUNTED PV ARRAY. 2/12 (9.5°) SLOPED ROOF, (14) TRINA SOLAR TSM-415NE09RC.05 MODULES (BLACK FRAME, CLEAR BACKSHEET), 180° AZIMUTH
2	(N) TESLA 1538000-XX-Y (7.6 KW) INVERTER (I1), INDOOR
3	(N) VISIBLE-OPEN TYPE, LOCKABLE, READILY ACCESSIBLE, LABELED PV SYSTEM DISCONNECT LOCATED WITHIN 10 FT OF UTILITY METER (SW1), OUTDOOR
4	(E) MAIN SERVICE PANEL (MSP), OUTDOOR
5	(E) UTILITY METER, OUTDOOR
6	(N) TRANSITION BOX, OUTDOOR, OUTPUT CIRCUIT CONDUCTORS SHALL BE RUN IN EMT CONDUIT OVER ROOF NO CLOSER THAN 3/4" ABOVE ROOF SURFACE

GRID-TIED PV SYSTEM

WISWELL RESIDENCE
718 REMINGTON ST
FORT COLLINS, CO 80524

SITE PLAN



MODULES

REF.	QTY.	MAKE AND MODEL	PMAX	PTC	ISC	IMP	VOC	VMP	TEMP. COEFF. OF VOC	FUSE RATING
PM1-14	14	TRINA SOLAR TSM-415NE09RC.05	415W	390W	10.50A	9.85A	50.1V	42.1V	-0.1242V/°C (-0.25%/°C)	20A

INVERTERS

REF.	QTY.	MAKE AND MODEL	AC VOLTAGE	GROUND	RATED POWER	MAX OUTPUT CURRENT	MAX INPUT CURRENT	MAX INPUT VOLTAGE	CEC WEIGHTED EFFICIENCY
I1	1	TESLA 1538000-XX-Y (7.6 KW)	240V	NOT SOLIDLY GROUNDED	7,600W	32.0A	68.0A	600V	98.0%

DISCONNECTS

REF.	QTY.	MAKE AND MODEL	RATED CURRENT	MAX RATED VOLTAGE
SW1	1	SQUARE D D222NRB OR EQUIV.	60A	240VAC

OCPDS

REF.	QTY.	RATED CURRENT	MAX VOLTAGE
F1-2	2	40A	240VAC
CB1	1	40A	240VAC

PASS-THRU BOXES AND COMBINERS

REF.	QTY.	MAKE AND MODEL	RATED CURRENT	MAX RATED VOLTAGE
JB1	1	TRANSITION BOX FOR 2 CIRCUITS	30A	240VAC / 600VDC

SYSTEM SUMMARY

	MPPT 1	MPPT 2
MODULES IN SERIES	7	7
ARRAY VMP	294.7V	294.7V
ARRAY IMP	9.8A	9.8A
ARRAY MAX VOC	392.1V	392.1V
ARRAY ISC	10.5A	10.5A
ARRAY STC POWER	5,810W	
ARRAY PTC POWER	5,467W	
MAX AC CURRENT	32A	
MAX AC POWER OUTPUT	7,600W	
DERATED AC POWER OUTPUT	5,358W	

1. RAPID SHUTDOWN DEVICES COMPLIANT WITH REQUIREMENTS AS PER NEC 690.12(B)(2). PV CIRCUIT CONDUCTORS LOCATED OUTSIDE THE ARRAY BOUNDARY (DEFINED AS 3 FEET FROM THE POINT OF PENETRATION INTO A BUILDING OR MORE THAN 3 FEET FROM AN ARRAY) SHALL BE LIMITED TO NOT MORE THAN 30V WITHIN 30 SECONDS OF RAPID SHUTDOWN INITIATION. CONDUCTORS LOCATED INSIDE OF THE ARRAY BOUNDARY SHALL BE LIMITED TO NOT MORE THAN 80 VOLTS WITHIN 30 SECONDS OF SHUTDOWN.
2. THE SYSTEM SHALL BE INSTALLED WITH TESLA MCI-2 INLINE PV HAZARD CONTROL SYSTEM DEVICES. WHEN INSTALLED WITH THESE DEVICES, THE TESLA INVERTER MEETS REQUIREMENTS FOR PV HAZARD CONTROL SYSTEM AS DEFINED IN NEC 690.12(B)(2)
3. MATING CONNECTORS SHALL COMPLY WITH NEC 690.33.
4. DC PV CONDUCTORS ARE NOT SOLIDLY-GROUNDED. NO DC PV CONDUCTOR SHALL BE WHITE- OR GRAY-COLORED
5. ALL METAL ENCLOSURES, RACEWAYS, CABLES AND EXPOSED NONCURRENT-CARRYING METAL PARTS OF EQUIPMENT SHALL BE GROUNDED TO EARTH AS REQUIRED BY NEC 250.4(B) AND PART III OF ARTICLE 250 AND DC EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45. THE GROUNDING ELECTRODE SYSTEM SHALL ADHERE TO NEC 690.47(A) AND NEC 250.169 AND INSTALLED IN COMPLIANCE WITH NEC 250.64.
6. MAX DC VOLTAGE OF ARRAY IS EXPECTED TO BE 392.1V AT -23°C ((-22.6°C - 25°C) X -0.124V/C + 50.1V) X 7 MODULES = 392.1V).
7. PV SYSTEM DISCONNECT SHALL BE A VISIBLE KNIFE-BLADE TYPE DISCONNECT THAT IS ACCESSIBLE AND LOCKABLE BY THE UTILITY IN ACCORDANCE WITH NEC 690.13(E). THE DISCONNECT SHALL BE LOCATED WITHIN 10 FT OF UTILITY METER AND INSTALLED IN COMPLIANCE WITH NEC 705.20 AND GROUPED AS REQUIRED BY NEC 230.72.
8. PV SYSTEM DISCONNECT MEETS NEC 690.12(C) REQUIREMENT FOR A RAPID SHUTDOWN INITIATION DEVICE
9. PV BACKFEED OCPDS SHALL HAVE AN AMPERE INTERRUPTING CAPACITY THAT COMPLIES WITH THE REQUIREMENTS OF NEC 110.9 AND NEC 240.86(B)
10. POINT-OF-CONNECTION IS ON LOAD SIDE OF SERVICE DISCONNECT, IN COMPLIANCE WITH NEC 705.12(B)(2). OUTPUT IS BACKFED THROUGH BREAKER IN MAIN PANEL. THE SUM OF 125% OF POWER SOURCE(S) OUTPUT CURRENT (32A X 1.25 = 40A) AND THE MAIN BREAKER (200A) DOES NOT EXCEED 120% OF BUSBAR RATING (200A X 1.20 = 240A). 40A + 200A <= 240A
11. THE PV BREAKER SHALL BE LOCATED AT THE OPPOSITE END OF THE BUSBAR FROM THE MAIN BREAKER. IT SHALL NOT BE MARKED FOR "LINE" AND "LOAD".

CONDUCTOR AND CONDUIT SCHEDULE W/ELECTRICAL CALCULATIONS

ID	TYP	CONDUCTOR	CONDUIT / CABLE	CURRENT-CARRYING CONDUCTORS IN CONDUIT/CABLE.	OCPD	EGC	TEMP. CORR. FACTOR	FILL FACTOR	CONT. CURRENT	MAX. CURRENT (125%)	BASE AMP.	DERATED AMP.	TERM. TEMP. RATING	AMP. @ TERM. TEMP. RATING	LEN.	V.D.
1	2	10 AWG PV WIRE, COPPER	FREE AIR	N/A	N/A	6 AWG BARE, COPPER	0.96 (33°C)	1.0	13.13A	16.41A	55A	53A	90 °C	40A	91.9FT	0.41%
2	1	10 AWG THWN-2, COPPER	0.75" DIA. EMT	4	N/A	10 AWG THWN-2, COPPER	0.96 (33°C)	0.8	13.13A	16.41A	40A	31A	75 °C	35A	16.8FT	0.07%
3	1	8 AWG THWN-2, COPPER	1.0" DIA. PVC-80	2	40A	10 AWG THWN-2, COPPER	0.96 (33°C)	1.0	32A	40A	55A	53A	60 °C	40A	17.5FT	0.36%
4	1	8 AWG THWN-2, COPPER	0.75" DIA. EMT	2	40A	10 AWG THWN-2, COPPER	0.96 (33°C)	1.0	32A	40A	55A	53A	75 °C	50A	48IN	0.08%

GENERAL ELECTRICAL NOTES

1	UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
2	CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.10 (D).
3	CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).

GROUNDING NOTES

1	ALL EQUIPMENT SHALL BE PROPERLY GROUNDED PER THE REQUIREMENTS OF NEC ARTICLES 250 & 690
2	PV MODULES SHALL BE GROUNDED USING MODULE LUGS OR RACKING INTEGRATED GROUNDING CLAMPS AS ALLOWED BY LOCAL JURISDICTION. ALL OTHER EXPOSED METAL PARTS SHALL BE GROUNDED USING UL-LISTED LAY-IN LUGS.
3	INSTALLER SHALL CONFIRM THAT MOUNTING SYSTEM HAS BEEN EVALUATED FOR COMPLIANCE WITH UL 2703 "GROUNDING AND BONDING" WHEN USED WITH PROPOSED PV MODULE.
4	IF THE EXISTING MAIN SERVICE PANEL DOES NOT HAVE A VERIFIABLE GROUNDING ELECTRODE, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE.
5	AC SYSTEM GROUNDING ELECTRODE CONDUCTOR (GEC) SHALL BE A MINIMUM SIZE #8AWG WHEN INSULATED, #6AWG IF BARE WIRE.
6	EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC ARTICLE 690.45, AND BE A MINIMUM OF #10AWG WHEN NOT EXPOSED TO DAMAGE, AND #6AWG SHALL BE USED WHEN EXPOSED TO DAMAGE
7	GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLOR CODED GREEN, OR MARKED GREEN IF #4AWG OR LARGER

1 / PV-3 SINGLE-LINE DIAGRAM
SCALE: NTS

P-9F5B1E

GRID-TIED PV SYSTEM

WISWELL RESIDENCE
718 REMINGTON ST
FORT COLLINS, CO 80524

SINGLE-LINE DIAGRAM

PV-3

DC RACEWAYS
3

JB1 - TRANSITION BOX (MODEL NOT SPECIFIED)
4

SW1 - DISCONNECT (SQUARE D D222NRB)
4, 5, 6

I1 - INVERTER (TESLA 1538000-XX-Y (7.6 KW))
4, 7

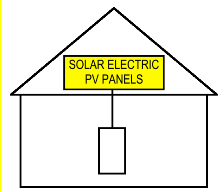
CB1 IN MAIN SERVICE PANEL
4, 5, 8

MAIN SERVICE PANEL
1, 2, 9, 10, 11

1 SEE NOTE NO. 4 (MSP)

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE 'OFF' POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY.

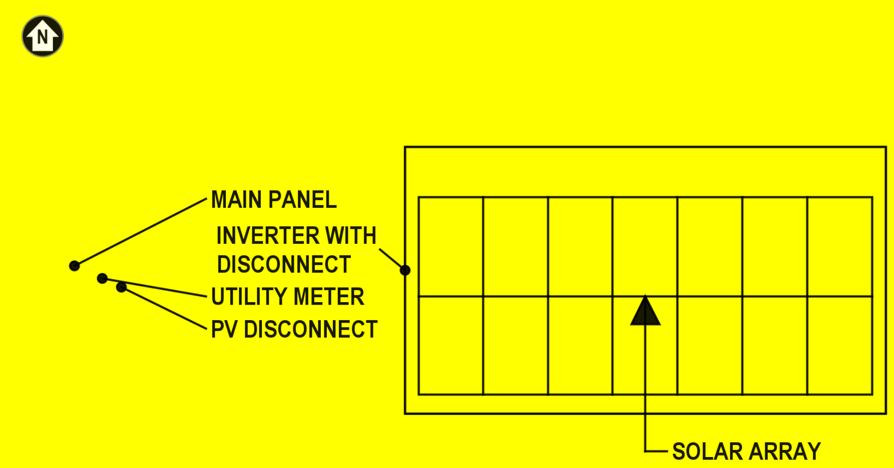


NEC 690.12(D) AND IFC 1205.4.1

2 POINT-OF-INTERCONNECTION OR AT MAIN SERVICE DISCONNECT (MSP)

! CAUTION: MULTIPLE SOURCES OF POWER !

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM A ROOF-MOUNTED SOLAR ARRAY WITH SAFETY DISCONNECTS AS SHOWN



NEC 690.56 AND NEC 705.10

3 SEE NOTE NO. 5 (DC RACEWAYS)

WARNING
PHOTOVOLTAIC POWER SOURCE

NEC 690.31(D)(2)

4 EACH DISCONNECTING MEANS FOR PHOTOVOLTAIC EQUIPMENT (JB1, SW1, I1, CB1 IN MSP)

! WARNING !
ELECTRIC SHOCK HAZARD. TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

NEC 690.13(B)

5 AC DISCONNECT (SW1, CB1 IN MSP)

MAXIMUM AC OPERATING CURRENT: 32.0A
MAXIMUM AC OPERATING VOLTAGE: 240V

6 SEE NOTE NO. 6 (SW1)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

NEC 690.12(D)(2) AND IFC 1205.4.3

7 DC DISCONNECT (MPPT CHANNEL A OF I1, MPPT CHANNEL B OF I1)

DIRECT-CURRENT PHOTOVOLTAIC POWER SOURCE
MAXIMUM VOLTAGE: 392V
MAX CIRCUIT-CURRENT: 16.4A

NEC 690.7

8 SOLAR BACKFEED BREAKER AS MAIN PV SYSTEM DISCONNECT (CB1 IN MSP)

PV SYSTEM DISCONNECT

NEC 690.13(B)

10 ANY AC ELECTRICAL PANEL THAT IS FED BY BOTH THE UTILITY AND THE PHOTOVOLTAIC SYSTEM (MSP)

! CAUTION !
MULTIPLE SOURCES OF POWER

NEC 705.10

11 SOLAR BREAKER (MSP)

! WARNING !
POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE.

NEC 705.12(B)(2)

LABELING NOTES	
1	ALL PLAQUES AND SIGNAGE REQUIRED BY 2023 NEC AND 2021 IFC WILL BE INSTALLED AS REQUIRED.
2	LABELS, WARNING(S) AND MARKING SHALL COMPLY WITH ANSI Z535.4, WHICH REQUIRES THAT DANGER, WARNING, AND CAUTION SIGNS USED THE STANDARD HEADER COLORS, HEADER TEXT, AND SAFETY ALERT SYMBOL ON EACH LABEL. THE ANSI STANDARD REQUIRES A HEADING THAT IS AT LEAST 50% TALLER THAN THE BODY TEXT, IN ACCORDANCE WITH NEC 110.21(B).
3	A PERMANENT PLAQUE OR DIRECTORY SHALL BE INSTALLED PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS IF NOT IN THE SAME LOCATION IN ACCORDANCE WITH NEC 690.56.
4	LABEL(S) WITH MARKING, "TURN RAPID SHUTDOWN SWITCH TO THE 'OFF' POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY," SHALL BE LOCATED WITHIN 3 FT OF SERVICE DISCONNECTING MEANS. THE TITLE SHALL UTILIZE CAPITALIZED LETTERS WITH A MINIMUM HEIGHT OF 3/8". ALL TEXT SHALL BE LEGIBLE AND CONTRAST THE BACKGROUND. .
5	LABEL(S) WITH MARKING, "WARNING PHOTOVOLTAIC POWER SOURCE," SHALL BE LOCATED AT EVERY 10 FT OF EACH DC RACEWAY AND WITHIN 1 FT OF EVERY TURN OR BEND AND WITHIN 1 FT ABOVE AND BELOW ALL PENETRATIONS OF ROOF/CEILING ASSEMBLIES, WALLS AND BARRIERS. THE LABEL SHALL HAVE 3/8" TALL LETTERS IN WHITE ON A RED BACKGROUND .
6	LABEL(S) WITH MARKING, "RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM," SHALL BE LOCATED WITHIN 3 FT OF RAPID SHUTDOWN SWITCH. THE LABEL SHALL HAVE 3/8" TALL LETTERS AND BE REFLECTIVE WITH WHITE TEXT ON A RED BACKGROUND.

P-9F5B1E

GRID-TIED PV SYSTEM

WISWELL RESIDENCE
718 REMINGTON ST
FORT COLLINS, CO 80524

SAFETY LABELS

PV-4

STRUCTURAL DESIGN PARAMETERS	
ELEVATION	4993 FT
SEISMIC	0.207 S_{DS}
WIND (ASCE 7-16)	140 MPH, EXPOSURE CATEGORY B, RISK CATEGORY II
GROUND SNOW LOAD	35 PSF

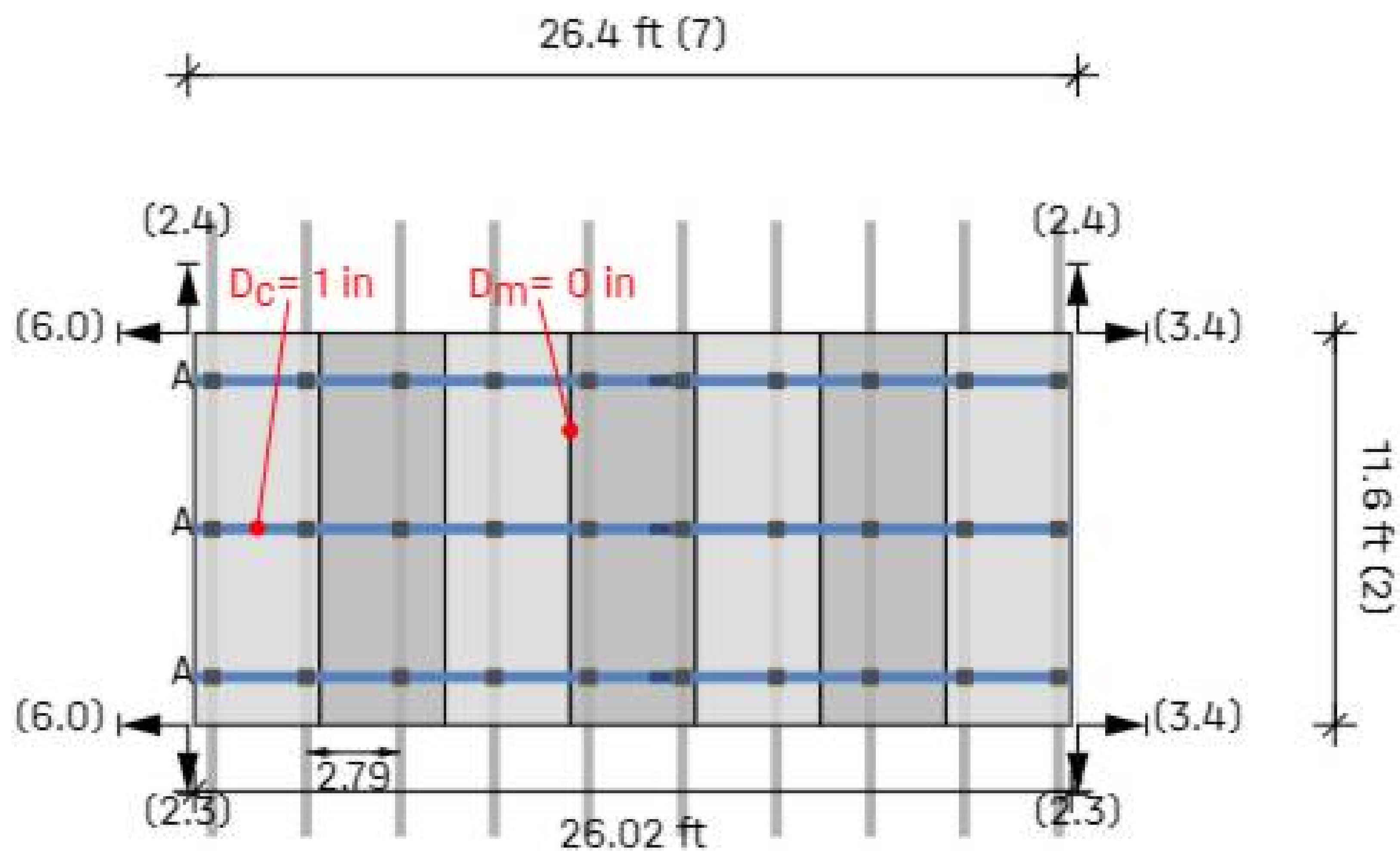
ROOF PROPERTIES	
ROOF MATERIAL	NONE, OPEN TRUSS
SLOPE	2/12 (9.5°)
MEAN ROOF HEIGHT	11.3FT
ROOF DECKING	NONE
CONSTRUCTION	2x12 TRUSSES

MODULE MECHANICAL PROPERTIES	
MODEL	TRINA SOLAR TSM-415NE09RC.05
DIMENSIONS (AREA)	69.4IN X 44.6IN X 1.2IN (21.5 SQ FT)
WEIGHT	48.1 LBS

MOUNTING SYSTEM PROPERTIES	
RAIL MODEL	K2 CROSSRAIL 44-X
ANCHOR MODEL	K2 , 2.5IN AIR GAP
FASTENING METHOD	2.5 INCH EMBEDMENT INTO TRUSSES WITH (1) 5/16IN DIA. FASTENER
GROUNDING AND BONDING	INTEGRAL GROUNDING CERTIFIED TO UL 2703 REQUIREMENTS

DEAD LOAD CALCULATIONS			
LOAD	QTY	LBS	TOTAL LBS
MODULES	14	48.1	672.9
LINEAR FEET OF RAIL	107 FT	0.5	50.1
ANCHORS	40	1.2	50.0
MISC. HARDWARE		5.7	5.7
TOTAL ARRAY WEIGHT			782.0 LBS
AREA NAME	QTY	SQFT	TOTAL SQFT
MODULES	14	21.5	301.0
POINT LOAD (782.0 LBS / 40 ATTACHMENTS)			19.6 LBS
DIST. LOAD (782.0 LBS / 301.0 SQFT)			2.6 PSF

NOTES	
1	TRUSS LOCATIONS ARE APPROXIMATE. CONTRACTOR MAY NEED TO MAKE MINOR ADJUSTMENTS TO ANCHOR LOCATIONS. IN NO CASE SHALL THE ANCHOR SPACING EXCEED "MAX. ANCHOR SPACING"



ANCHOR PLACEMENT PARAMETERS (ASCE 7-16)				
WIND PRESSURE ZONE	MODULE WIND EXPOSURE	MAX. ALLOWABLE RAIL SPAN	MAX. ANCHOR SPACING	MAX. ALLOWABLE CANTILEVER
ZONES 1, 2E, 2N, 2R, 3E	NORMAL	52.0IN	33.0IN	17.3IN
ZONE 3R	NORMAL	51.0IN	33.0IN	17.0IN

DISTANCE α IS EQUAL TO 10% OF THE BUILDING'S LEAST HORIZONTAL DIMENSION ("LHD") OR 40% OF THE EAVE HEIGHT, WHICHEVER IS SMALLER, BUT NOT LESS THAN 4% OF THE LHD OR 3 FT. THESE SETBACKS ARE APPLIED TO THE BUILDING FOOTPRINT AND PROJECTED TO THE ROOF PLANES IN ACCORDANCE WITH GUIDANCE PROVIDED BY ASCE 7-16 FIGURES 30.3-2B–I.

α = MAX(MIN(0.4 * EAVE HEIGHT, 0.1 * LHD), 0.04 * LHD, 3 FT)

3.0 FT = MAX(MIN(0.4 * 10.0 FT, 0.1 * 15.6 FT), 0.04 * 15.6 FT, 3 FT)

1 / PV-5 ATTACHMENT PLAN (ORTHOGONAL PROJECTION)
SCALE: 1/4" = 1'

P-9F5B1E

GRID-TIED PV SYSTEM

WISWELL RESIDENCE
718 REMINGTON ST
FORT COLLINS, CO 80524

PV-5

Conductor, Conduit, and OCPD Sizing Validation

1. Maximum System DC Voltage Test

1.1. Tesla inverter w/14 Trina Solar TSM-415NE09RC.05 (415W)s

Array Properties

Array Type	String Inverter Array
System Description	Tesla inverter w/14 Trina Solar TSM-415NE09RC.05 (415W)s
Module	TSM-415NE09RC.05 (415W)
Highest number of modules in series in a PV Source Circuit	7
Design Low Temp.	-22.6°C
Module voc	50.1V
Temp. Coefficient voc	-0.124V/C

NEC Code Calculations

A. Maximum Voltage of PV Source Circuit 392.1V
see NEC 690.7(A)

NEC 690.7(A) requires that if the PV module manufacturer provides a temperature coefficient of open-circuit voltage, it must be used to calculate the PV array's maximum system voltage. It includes an information note recommending the use of the ASHRAE 'Extreme Annual Mean Minimum Design Dry Bulb Temperature' as the design low temperature. Using these values, the module Voc (50.1V) will increase to 56.01V at the design low temperature (-22.6°C).

(-22.6°C - 25°C) X -0.124V/C + 50.1V = 56.01V
The string Voc at the design low temperature is 392.1V.

56.01V X 7 = 392.1V

NEC Code Validation Tests

1.	PV Source Circuit maximum Voc must not exceed 600V 392.1V < 600V = true	PASS

2. Wire, Conduit, and OCPD Code Compliance Validation

2.1. #1: PV Source Circuit: PV Source to Transition Box

Circuit Section Properties

Conductor	10 AWG PV Wire, Copper
Equipment Ground Conductor (EGC)	6 AWG Bare, Copper
OCPD(s)	N/A
Raceway/Cable	Free Air
Lowest Terminal Temperature Rating	90 °C
Maximum Wire Temperature	33 °C
Power Source Description	String of 7 TSM-415NE09RC.05 (415W) PV modules
Power Source Current	10.5A
Voltage	294V - 350V
Module Series Fuse Rating	20A
Total Number of Series Strings	1

NEC Code Calculations

A. Continuous Current 13.13A
see NEC 690.8(A)(1)(a)(1)

The continuous current for this PV source circuit is equal to the short circuit current of the PV module (10.5A) multiplied by 1.25

10.5A X 1.25 = 13.13A

B. Ampacity of Conductor 55A
see NEC Table 310.17

Ampacity (30°C) for a copper conductor with 90°C insulation in free air is 55A.

C. Derated Ampacity of Conductor 53A
see NEC 310.15(B)(2), NEC Table 310.15(C)(1), and NEC Article 100

The temperature factor for 90°C insulation at 33°C is 0.96.
The fill factor for conductors in free air is 1.
The ampacity derated for Conditions of Use is the product of the conductor ampacity (55A) multiplied by the temperature factor (0.96) and by the fill factor (1).

55A X 0.96 X 1 = 52.8A rounded to 53A

D. Max Current for Terminal Temp. Rating 40A
see NEC 110.14(C)

The lowest temperature rating for this conductor at any termination is 90°C.
Using the method specified in NEC 110.14(C), the maximum current permitted to ensure that the device terminal temperature does not exceed its 90°C rating would be the amount referenced in the 90°C column in NEC Table 310.16, which is 40A.

E. Minimum Required EGC Size 12 AWG
see NEC 690.45 and NEC Table 250.122

No OCPD is used in circuit and an assumed rating of 16A has been calculated in accordance with NEC 690.45
The smallest EGC size allowed is 12 AWG for OCPD rating 16A according to Table 250.122.
According to NEC 690.45, it is not necessary to increase the size of the PV array's EGC when conductors are oversized for voltage drop considerations.

NEC Code Validation Tests

1.	System must meet requirements for not having series fuse (NEC 690.9(A))	PASS
2.	Derated Ampacity must be greater than or equal to the Continuous Current (NEC Article 100) 53A >= 13.13A = true	PASS
3.	Conductor Ampacity must be at least 125% of Continuous Current (NEC 215.2(A)(1)) 55A >= 13.13A x 1.25 = true	PASS
4.	Max current for terminal must be at least 125% of the Continuous Current. (NEC 110.14(C)) 40A >= 13.13A X 1.25 = true	PASS
5.	EGC must meet code requirements for minimum size (NEC Table 250.122) 6 AWG >= 12 AWG = true	PASS
6.	EGC must meet code requirements for physical protection (NEC 250.120(C)) 6 AWG >= 6 AWG = true	PASS

2.2. #2: PV Source Circuit: Transition Box to Inverter

Circuit Section Properties

Conductor	10 AWG THWN-2, Copper
Equipment Ground Conductor (EGC)	10 AWG THWN-2, Copper
OCPD(s)	N/A
Raceway/Cable	0.75" dia. EMT
Lowest Terminal Temperature Rating	75 °C
Maximum Wire Temperature	33 °C
Power Source Description	String of 7 TSM-415NE09RC.05 (415W) PV modules
Power Source Current	10.5A
Voltage	294V - 350V
Module Series Fuse Rating	20A
Total Number of Series Strings	1

NEC Code Calculations

A. Continuous Current — 13.13A
see NEC 690.8(A)(1)(a)(1)

The continuous current for this PV source circuit is equal to the short circuit current of the PV module (10.5A) multiplied by 1.25

10.5A X 1.25 = 13.13A

B. Ampacity of Conductor — 40A
see NEC Table 310.16

Ampacity (30°C) for a copper conductor with 90°C insulation in conduit/cable is 40A.

C. Derated Ampacity of Conductor — 31A
see NEC 310.15(B)(2), NEC Table 310.15(C)(1), and NEC Article 100

The temperature factor for 90°C insulation at 33°C is 0.96.
The fill factor for a conduit/cable that has 4 wires is 0.8.
The ampacity derated for Conditions of Use is the product of the conductor ampacity (40A) multiplied by the temperature factor (0.96) and by the fill factor (0.8).

40A X 0.96 X 0.8 = 30.72A rounded to 31A

D. Max Current for Terminal Temp. Rating — 35A
see NEC 110.14(C)

The lowest temperature rating for this conductor at any termination is 75°C.
Using the method specified in NEC 110.14(C), the maximum current permitted to ensure that the device terminal temperature does not exceed its 75°C rating would be the amount referenced in the 75°C column in NEC Table 310.16, which is 35A.

E. Minimum Required EGC Size — 12 AWG
see NEC 690.45 and NEC Table 250.122

No OCPD is used in circuit and an assumed rating of 16A has been calculated in accordance with NEC 690.45
The smallest EGC size allowed is 12 AWG for OCPD rating 16A according to Table 250.122.
According to NEC 690.45, it is not necessary to increase the size of the PV array's EGC when conductors are oversized for voltage drop considerations.

F. Minimum Recommended Conduit Size — 0.5" dia.
see NEC 300.17

The total area of all conductors is 0.1055in². With a maximum fill rate of 0.4, the recommended conduit diameter is 0.5.

Qty	Description	Size	Type	Area	Total Area
4	Conductor	10 AWG	THWN-2	0.0211in²	0.0844in²
1	Equipment Ground	10 AWG	THWN-2	0.0211in²	0.0211in²
5					0.1055in²

0.1055in² / 0.4 = 0.2638in² (Corresponding to a diameter of 0.5")

NEC Code Validation Tests

1.	System must meet requirements for not having series fuse (NEC 690.9(A))	PASS
2.	Derated Ampacity must be greater than or equal to the Continuous Current (NEC Article 100) 31A >= 13.13A = true	PASS
3.	Conductor Ampacity must be at least 125% of Continuous Current (NEC 215.2(A)(1)) 40A >= 13.13A x 1.25 = true	PASS
4.	Max current for terminal must be at least 125% of the Continuous Current. (NEC 110.14(C)) 35A >= 13.13A X 1.25 = true	PASS
5.	EGC must meet code requirements for minimum size (NEC Table 250.122) 10 AWG >= 12 AWG = true	PASS
6.	Conduit must meet code recommendation for minimum size (NEC 300.17) 0.75in. >= 0.5in. = true	PASS

2.3. #3: Inverter Output: Inverter to Utility Disconnect

Circuit Section Properties

Conductor	8 AWG THWN-2, Copper
Equipment Ground Conductor (EGC)	10 AWG THWN-2, Copper
OCPD(s)	40A
Raceway/Cable	1.0" dia. PVC-80
Lowest Terminal Temperature Rating	60 °C
Maximum Wire Temperature	33 °C
Power Source Description	7600W Inverter
Power Source Current	32A
Voltage	240V
Inverter Max OCPD rating	40A

NEC Code Calculations

A. Continuous Current — 32A
see NEC Article 100

Equipment maximum rated output current is 2 X 10.5A = 32A

B. Ampacity of Conductor — 55A
see NEC Table 310.16

Ampacity (30°C) for a copper conductor with 90°C insulation in conduit/cable is 55A.

C. Derated Ampacity of Conductor — 53A
see NEC 310.15(B)(2), NEC Table 310.15(C)(1), and NEC Article 100

The temperature factor for 90°C insulation at 33°C is 0.96.
The fill factor for a conduit/cable that has 2 wires is 1.
The ampacity derated for Conditions of Use is the product of the conductor ampacity (55A) multiplied by the temperature factor (0.96) and by the fill factor (1).

55A X 0.96 X 1 = 52.8A rounded to 53A

D. Max Current for Terminal Temp. Rating — 40A
see NEC 110.14(C)

The lowest temperature rating for this conductor at any termination is 60°C.
Using the method specified in NEC 110.14(C), the maximum current permitted to ensure that the device terminal temperature does not exceed its 60°C rating would be the amount referenced in the 60°C column in NEC Table 310.16, which is 40A.

E. Minimum Allowed OCPD Rating — 40A
see NEC 240.4

NEC 690.9(B)(1) requires OCPD be rated for no less than 1.25 times Continuous Current of the circuit.

32A X 1.25 = 40A

F. Minimum Required EGC Size — 10 AWG
see NEC Table 250.122

The smallest EGC size allowed is 10 AWG for OCPD rating 40A according to Table 250.122.

G. Minimum Recommended Conduit Size — 0.75" dia.
see NEC 300.17

The total area of all conductors is 0.1309in². With a maximum fill rate of 0.4, the recommended conduit diameter is 0.75.

Qty	Description	Size	Type	Area	Total Area
2	Conductor	8 AWG	THWN-2	0.0366in²	0.0732in²
1	Neutral	8 AWG	THWN-2	0.0366in²	0.0366in²
1	Equipment Ground	10 AWG	THWN-2	0.0211in²	0.0211in²
4					0.1309in²

0.1309in² / 0.4 = 0.3273in² (Corresponding to a diameter of 0.75")

NEC Code Validation Tests

1.	OCPD rating must be at least 125% of Continuous Current (NEC 240.4) 40A >= 32A X 1.25 = true	PASS
2.	Derated ampacity must exceed OCPD rating, or rating of next smaller OCPD (NEC 240.4) 53A >= 40A (OCPD Rating) = true	PASS
3.	Derated Ampacity must be greater than or equal to the Continuous Current (NEC Article 100) 53A >= 32A = true	PASS
4.	Conductor Ampacity must be at least 125% of Continuous Current (NEC 215.2(A)(1)) 55A >= 32A x 1.25 = true	PASS
5.	Max current for terminal must be at least 125% of the Continuous Current. (NEC 110.14(C)) 40A >= 32A X 1.25 = true	PASS
6.	EGC must meet code requirements for minimum size (NEC Table 250.122) 10 AWG >= 10 AWG = true	PASS
7.	Conduit must meet code recommendation for minimum size (NEC 300.17) 1.0in. >= 0.75in. = true	PASS

2.4. #4: Utility Disconnect Output: Utility Disconnect to Main Service Panel

Circuit Section Properties

Conductor	8 AWG THWN-2, Copper
Equipment Ground Conductor (EGC)	10 AWG THWN-2, Copper
OCPD(s)	40A
Raceway/Cable	0.75" dia. EMT
Lowest Terminal Temperature Rating	75 °C
Maximum Wire Temperature	33 °C
Power Source Description	7600W Inverter
Power Source Current	32A
Voltage	240V

NEC Code Calculations

A. Continuous Current — 32A
see NEC Article 100

Equipment maximum rated output current is 2 X 10.5A = 32A

B. Ampacity of Conductor — 55A
see NEC Table 310.16

Ampacity (30°C) for a copper conductor with 90°C insulation in conduit/cable is 55A.

C. Derated Ampacity of Conductor — 53A
see NEC 310.15(B)(2), NEC Table 310.15(C)(1), and NEC Article 100

The temperature factor for 90°C insulation at 33°C is 0.96.
The fill factor for a conduit/cable that has 2 wires is 1.
The ampacity derated for Conditions of Use is the product of the conductor ampacity (55A) multiplied by the temperature factor (0.96) and by the fill factor (1).

55A X 0.96 X 1 = 52.8A rounded to 53A

D. Max Current for Terminal Temp. Rating — 50A
see NEC 110.14(C)

The lowest temperature rating for this conductor at any termination is 75°C.
Using the method specified in NEC 110.14(C), the maximum current permitted to ensure that the device terminal temperature does not exceed its 75°C rating would be the amount referenced in the 75°C column in NEC Table 310.16, which is 50A.

E. Minimum Allowed OCPD Rating — 40A
see NEC 240.4

NEC 690.9(B)(1) requires OCPD be rated for no less than 1.25 times Continuous Current of the circuit.

32A X 1.25 = 40A

F. Minimum Required EGC Size — 10 AWG
see NEC Table 250.122

The smallest EGC size allowed is 10 AWG for OCPD rating 40A according to Table 250.122.

G. Minimum Recommended Conduit Size — 0.75" dia.
see NEC 300.17

The total area of all conductors is 0.1309in². With a maximum fill rate of 0.4, the recommended conduit diameter is 0.75.

Qty	Description	Size	Type	Area	Total Area
2	Conductor	8 AWG	THWN-2	0.0366in²	0.0732in²
1	Neutral	8 AWG	THWN-2	0.0366in²	0.0366in²
1	Equipment Ground	10 AWG	THWN-2	0.0211in²	0.0211in²
4					0.1309in²

0.1309in² / 0.4 = 0.3273in² (Corresponding to a diameter of 0.75")

NEC Code Validation Tests

1.	OCPD rating must be at least 125% of Continuous Current (NEC 240.4) 40A >= 32A X 1.25 = true	PASS
2.	Derated ampacity must exceed OCPD rating, or rating of next smaller OCPD (NEC 240.4) 53A >= 40A (OCPD Rating) = true	PASS
3.	Derated Ampacity must be greater than or equal to the Continuous Current (NEC Article 100) 53A >= 32A = true	PASS
4.	Conductor Ampacity must be at least 125% of Continuous Current (NEC 215.2(A)(1)) 55A >= 32A x 1.25 = true	PASS
5.	Max current for terminal must be at least 125% of the Continuous Current. (NEC 110.14(C)) 50A >= 32A X 1.25 = true	PASS
6.	EGC must meet code requirements for minimum size (NEC Table 250.122) 10 AWG >= 10 AWG = true	PASS
7.	Conduit must meet code recommendation for minimum size (NEC 300.17) 0.75in. >= 0.75in. = true	PASS

Vertex S+

N-TYPE MODULE

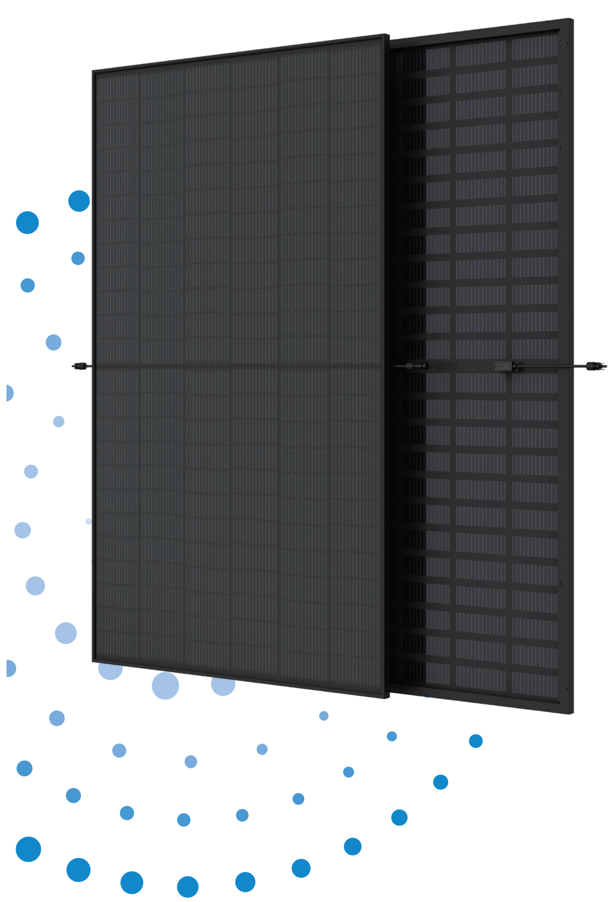
PRODUCT: TSM-NE09RC.05

PRODUCT RANGE: 410-435W

435W MAXIMUM POWER OUTPUT

0~+5W POSITIVE POWER TOLERANCE

21.8% MAXIMUM EFFICIENCY



Smaller panel, Bigger power generation

- Up to 435W, 21.8% module efficiency.
- Reduce installation cost with higher module power on the roof.
- Boost performance in warm weather with lower temperature coefficiency

High Reliability

- Innovative non-destructive cell cutting technology for improved mechanical resistance and strength

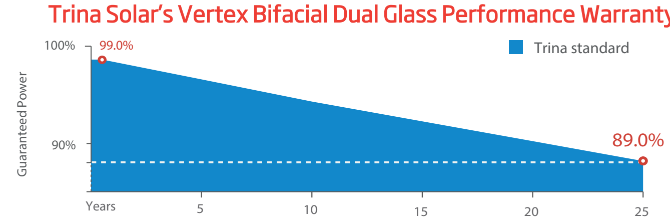
Lower Degradation, longer warranty, higher output

- First-year degradation 1% and annual degradation at 0.4%
- Up to 25 years product warranty and 25 years power warranty

Universal solution for residential and C&I rooftops

- Easy for integration, designed for compatibility with existing mainstream inverters and diverse mounting systems
- Perfect size and low weight for handling and installation
- Most valuable solution on low load capacity rooftops
- Mechanical performance up to 6000 Pa positive load and 4000 Pa negative load

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty

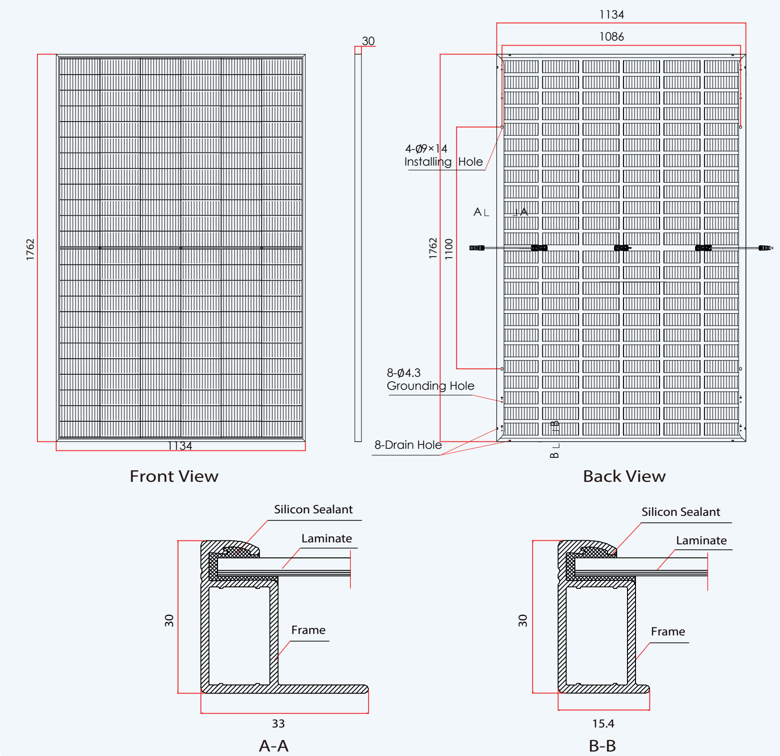


Comprehensive Products and System Certificates

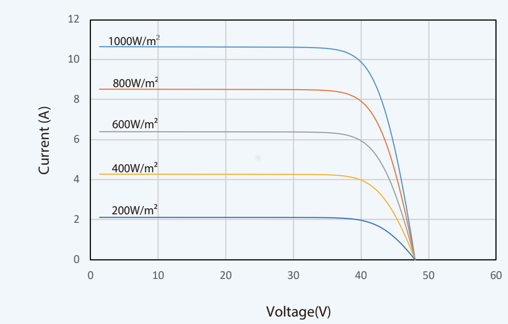
IEC61215/IEC61730/IEC61701/IEC62716/UL61730
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
ISO45001: Occupational Health and Safety Management System

Trinasolar

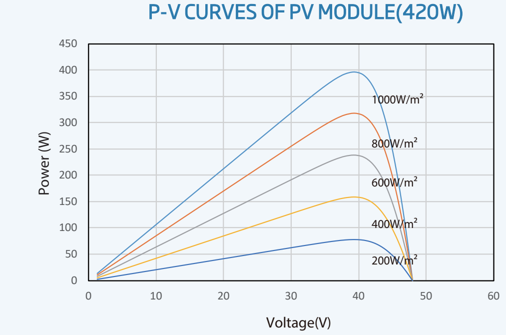
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(420 W)



P-V CURVES OF PV MODULE(420W)



ELECTRICAL DATA (STC)

Peak Power Watts-P_{MAX} (Wp)*	410	415	420	425	430	435
Power Tolerance-PMAX (W)	0 ~ +5					
Maximum Power Voltage-V_{MPP} (V)	41.8	42.1	42.5	42.8	43.2	43.6
Maximum Power Current-I_{MPP} (A)	9.81	9.85	9.89	9.92	9.95	9.99
Open Circuit Voltage-V_{OC} (V)	49.7	50.1	50.5	50.9	51.4	51.8
Short Circuit Current-I_{SC} (A)	10.46	10.50	10.54	10.57	10.60	10.65
Module Efficiency η m (%)	20.5	20.8	21.0	21.3	21.5	21.8

STC: Irrdiance 1000W/m2, Cell Temperature 25ºC, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power -P_{MAX} (Wp)	437	442	447	453	458	463
Maximum Power Voltage-V_{MPP} (V)	41.8	42.1	42.5		43.2	43.6
Maximum Power Current-I_{MPP} (A)	10.45	10.49	10.53	10.56	10.60	10.64
Open Circuit Voltage-V_{OC} (V)	49.7	50.1	50.5	50.9	51.4	51.8
Short Circuit Current-I_{SC} (A)	11.14	11.18	11.22	11.26	11.29	11.34
Irradiance ratio (rear/front)	10%					

Power Bifaciality:65±10%.

ELECTRICAL DATA (NOCT)

Maximum Power-P_{MAX} (Wp)	312	316	320	323	327	332
Maximum Power Voltage-V_{MPP} (V)	47.1	47.5	47.9	48.2	48.7	49.1
Maximum Power Current-I_{MPP} (A)	8.43	8.46	8.49	8.52	8.54	8.58
Open Circuit Voltage-V_{OC} (V)	39.0	39.3	39.6	39.9	40.3	40.6
Short Circuit Current-I_{SC} (A)	8.01	8.04	8.07	8.09	8.12	8.16

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Topcon Bifacial
No. of cells	144cells
Module Dimensions	1762×1134×30 mm (69.37×44.65×1.18 inches)
Weight	21.8kg (48.06 lb)
Front Glass	3.2 mm (0.12inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
BackSheet	Black Grid Transparent Backsheet
Frame	30mm (1.18 inches) Anodized Aluminium Alloy, Black
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), Landscape: N 1100 mm /P 1100 mm (43.31/43.31 inches)
Connector	MC4 EVo2
Fire Type	Type 1 or Type 2

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P_{MAX}	- 0.30%/°C
Temperature Coefficient of V_{OC}	- 0.25%/°C
Temperature Coefficient of I_{SC}	0.04%/°C

MAXIMUMRATINGS

Operational Temperature	-40~+85ºC
Maximum System Voltage	1500V DC (IEC)
Max Series Fuse Rating	20A

WARRANTY

25 year Product Workmanship Warranty

25 year Power Warranty

1% first year degradation

0.4% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGUREATION

Modules per box: 36 pieces

Modules per 40' container: 828 pieces

Trinasolar

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

Version number: TSM_NA_2023_A

www.trinasolar.com

Tesla Solar Inverter
with Site Controller

Tesla Solar Inverter completes the Tesla home solar system, converting DC power from solar to AC power for home consumption. Tesla's renowned expertise in power electronics has been combined with robust safety features and a simple installation process to produce an outstanding solar inverter that is compatible with both Solar Roof and traditional solar panels. Once installed, homeowners use the Tesla mobile app to manage their solar system and monitor energy consumption, resulting in a truly unique ecosystem experience.

KEY FEATURES

- Built on Powerwall technology for exceptional efficiency and reliability
- Wi-Fi, Ethernet, and cellular connectivity with easy over-the-air updates
- Designed to integrate with Tesla Powerwall and Tesla App
- 0.5% revenue-grade metering for Solar Renewable Energy Credit (SREC) programs included

May 12, 2023

Tesla Solar Inverter Technical Specifications

Electrical Specifications: Output (AC)

Model Number	1538000-xx-y			
Output (AC)[1]	3.8 kW	5 kW	5.7 kW	7.6 kW
Nominal Power	3,800 W	5,000 W	5,700 W	7,600 W
Maximum Apparent Power	3,840 VA	5,040 VA	6,000 VA	7,680 VA
Maximum Continuous Current	16 A	21 A	24 A	32 A
Breaker (Overcurrent Protection)	20 A	30 A	30 A	40 A
Nominal Power Factor	1 - 0.9 (leading / lagging			
THD (at Nominal Power)	<5%			

Electrical Specifications: Input (DC)

MPPT	4
Input Connectors per MPPT	1-2-1-2
Maximum Input Voltage	600 VDC
DC Input Voltage Range	60 - 550 VDC
DC MPPT Voltage Range	60 - 480 VDC[1]
Maximum Current per MPPT (I_{MP})	13 A[2]
Maximum Short Circuit Current per MPPT (I_{SC})	17 A[2]

[1]Maximum current.
[2]Where the DC input current exceeds an MPPT rating, jumpers can be used to allow a single MPPT to intake additional DC current up to 26 A I_{MP} / 34 A I_{SC}.

Performance Specifications

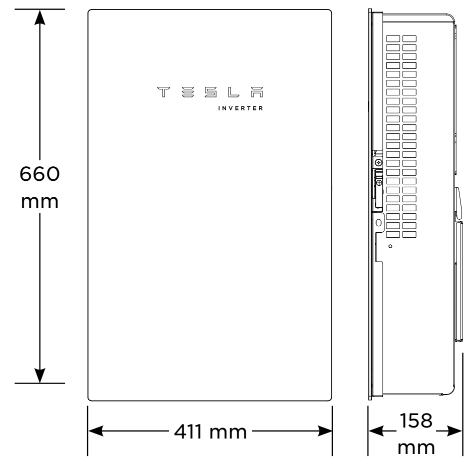
Peak Efficiency	98.6% at 240 V
CEC Efficiency	98.0% at 240 V
Allowable DC/AC Ratio	1.7
Customer Interface	Tesla Mobile App
Internet Connectivity	Wi-Fi (2.4 GHz, 802.11 b/g/n), Ethernet, Cellular (LTE/4G)[3]
Revenue Grade Meter	Revenue Accurate (+/- 0.5%)
AC Remote Metering Support	Wi-Fi (2.4 GHz, 802.11 b/g/n), RS-485
Protections	Integrated arc fault circuit interrupter (AFCI), Rapid Shutdown
Supported Grid Types	60 Hz, 240 V Split Phase
Warranty	12.5 years

[3]Cellular connectivity subject to network operator service coverage and signal strength.

Tesla Solar Inverter Technical Specifications

Mechanical Specifications

Dimensions	660 mm x 411 mm x 158 mm (26 in x 16 in x 6 in)



Weight	52 lb[4]
Mounting Options	Wall mount (bracket)

[4]Door and bracket can be removed for a mounting weight of 37 lb.

Environmental Specifications

Operating Temperature	–30°C to 45°C (–22°F to 113°F)[5]
Operating Humidity (RH)	Up to 100%, condensing
Storage Temperature	–30°C to 70°C (–22°F to 158°F)
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Rating	Type 3R
Ingress Rating	IP55 (Wiring compartment)
Pollution Rating	PD2 for power electronics and terminal wiring compartment, PD3 for all other components
Operating Noise @ 1 m	< 40 db(A) nominal, < 50 db(A) maximum

[5]Performance may be de-rated to 6.2 kW at 240 V when operating at temperatures greater than 45°C.

Compliance Information

Grid Certifications	UL 1741, UL 1741 SA, UL 1741 SB, UL 1741 PCS, IEEE 1547-2018, IEEE 1547.1
Safety Certifications	UL 1741 PVRSS, UL 1699B, UL 1998 (US), UL 3741
Emissions	EN 61000-6-3 (Residential), FCC 47CFR15.109 (a)

Product data sheet
Characteristics

D222NRB
SWITCH FUSIBLE GD 240V 60A 2P NEMA3R

Product availability: Stock - Normally stocked in distribution facility

Main

Product	Single Throw Safety Switch
Current Rating	60 A
Certifications	UL listed file E2875
Enclosure Rating	NEMA 3R
Disconnect Type	Fusible disconnect switch
Factory Installed Neutral	Neutral (factory installed)
Short Circuit Current Rating	100 kA maximum depending on fuse H, K or R
Mounting Type	Surface
Number of Poles	2
Electrical Connection	Lugs
Duty Rating	General duty
Voltage Rating	240 V AC
Wire Size	AWG 12...AWG 3 aluminium AWG 14...AWG 3 copper

Complementary

Width	189.23 mm (7.45 in)
Height	377.95 mm (14.88 in)
Depth	123.70 mm (4.87 in)
Tightening torque	3.95 N.M (35 lbf.in) 0.00…0.01 in² (2.08…5.26 mm²) AWG 14...AWG 10) 3.95 N.M (35 lbf.in) AWG 14...AWG 10) 5.08 N.M (45 lbf.in) 0.01 in² (8.37 mm²) AWG 8) 5.08 N.M (45 lbf.in) 0.02…0.03 in² (12.3…21.12 mm²) AWG 6...AWG 4) 5.65 N.m (50 lbf.in) 0.04 in² (26.67 mm²) AWG 3)

Ordering and shipping details

Category	00106 - D & DU SW,NEMA3R, 30-200A
Discount Schedule	DE1A
GTIN	00785901460640
Package weight(Lbs)	3.74 kg (8.25 lb(US))
Returnability	Yes
Country of origin	US

Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: Lead and lead compounds which is known to the State of California to cause Carcinogen & Reproductive harm. For more information go to www.p65warnings.ca.gov
REACh Regulation	REACh Declaration
REACh free of SVHC	Yes
EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS Declaration
Environmental Disclosure	Product Environmental Profile
Circularity Profile	No need of specific recycling operations

Contractual warranty

Warranty	18 months

July 21, 2021

Everest Solar Systems LCC
2835 La Mirada Dr, Suite A
Vista, CA 92081
TEL: (760) 301-5300

Attn.: Everest Solar - Engineering Department

Re: Report # 20-02753vHG.01 – Everest Solar CrossRail - 44-X Dual Rail System for Gable and Hip Roofs
Subject: Engineering Certification for the State of Colorado

PZSE, Inc. – Structural Engineers has provided engineering and span tables for the Everest Solar CrossRail, as presented in PZSE Report # 20-02753vHG.01, "Engineering Certification for the Everest Solar CrossRail - Dual Rail System for Gable and Hip Roofs". All information, data, and analysis therein are based on, and comply with, the following building codes and typical specifications:

Building Codes:

1. ASCE/SEI 7-16, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers
2. 2018 International Building Code, by International Code Council, Inc.
3. 2018 International Residential Code, by International Code Council, Inc.
4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES
5. Aluminum Design Manual 2015, by The Aluminum Association, Inc.
6. ANSI/AWC NDS-2018, National Design Specification for Wood Construction, by the American Wood Council

Design Criteria:

Risk Category II
Seismic Design Category = A - E
Exposure Category = B, C & D
Basic Wind Speed (ultimate) per ASCE 7-16 = 95 mph to 200 mph
Ground Snow Load = 0 to 100 (psf)

This letter certifies that the loading criteria and design basis for the Everest Solar CrossRail Span Tables are in compliance with the above codes.

DIGITALLY SEALED

COLORADO LICENSED PROFESSIONAL ENGINEER
PAUL KENNETH ZACHER
45677
EXP. 10/31/2021

If you have any questions on the above, do not hesitate to call.

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA

1478 Stone Point Drive, Suite 190, Roseville, CA 95661
T 916.961.3960 F 916.961.3965 W www.pzse.com
Experience | Integrity | Empowerment

October 7, 2021

K2 Systems
2835 La Mirada Dr, Suite A
Vista, CA 92081
TEL: (760) 301-5300

Attn.: K2 Systems - Engineering Department

Re: Report # 20-02753vMS.01 – K2 Systems CrossRail - 44-X Dual Rail System for Monoslope Roofs
Subject: Engineering Certification for the State of Colorado

PZSE, Inc. – Structural Engineers has provided engineering and span tables for the K2 Systems CrossRail, as presented in PZSE Report # 20-02753vMS.01, "Engineering Certification for the K2 Systems CrossRail - Dual Rail System for Monoslope Roofs". All information, data, and analysis therein are based on, and comply with, the following building codes and typical specifications:

Building Codes:

1. ASCE/SEI 7-16, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers
2. 2018 International Building Code, by International Code Council, Inc.
3. 2018 International Residential Code, by International Code Council, Inc.
4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES
5. Aluminum Design Manual 2015, by The Aluminum Association, Inc.
6. ANSI/AWC NDS-2018, National Design Specification for Wood Construction, by the American Wood Council

Design Criteria:

Risk Category II
Seismic Design Category = A - E
Exposure Category = B, C & D
Basic Wind Speed (ultimate) per ASCE 7-16 = 95 mph to 200 mph
Ground Snow Load = 0 to 100 (psf)

This letter certifies that the loading criteria and design basis for the K2 Systems CrossRail Span Tables are in compliance with the above codes.

DIGITALLY SIGNED

COLORADO LICENSED PROFESSIONAL ENGINEER
PAUL KENNETH ZACHER
45677
EXP. 10/31/2023

If you have any questions on the above, do not hesitate to call.

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA

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Fire Rating

The CrossRail System has undergone fire performance testing in accordance with UL 2703, Fire Performance. A System Class A fire rating is achieved when using CrossRail 44-X/48-X/48-XL under the following conditions:

- Roof slope of 2/12" rise per linear foot or greater
- Used in combination with a UL 1703 Listed module with a fire performance rating of Type 1, Type 2, or Type 3. Consult the module manufacturer for specific fire performance rating information.
- CrossRail may be mounted using any stand-off height to maintain the Class A fire rating. Always consult the module manufacturer's installation instructions to ensure your installation is in compliance with their UL 1703 Listing.
- The results of the racking system do not improve a roof covering Class rating.

All documentation can be found on UL's Online Database as well as K2 Systems' website.

Bonding and Grounding

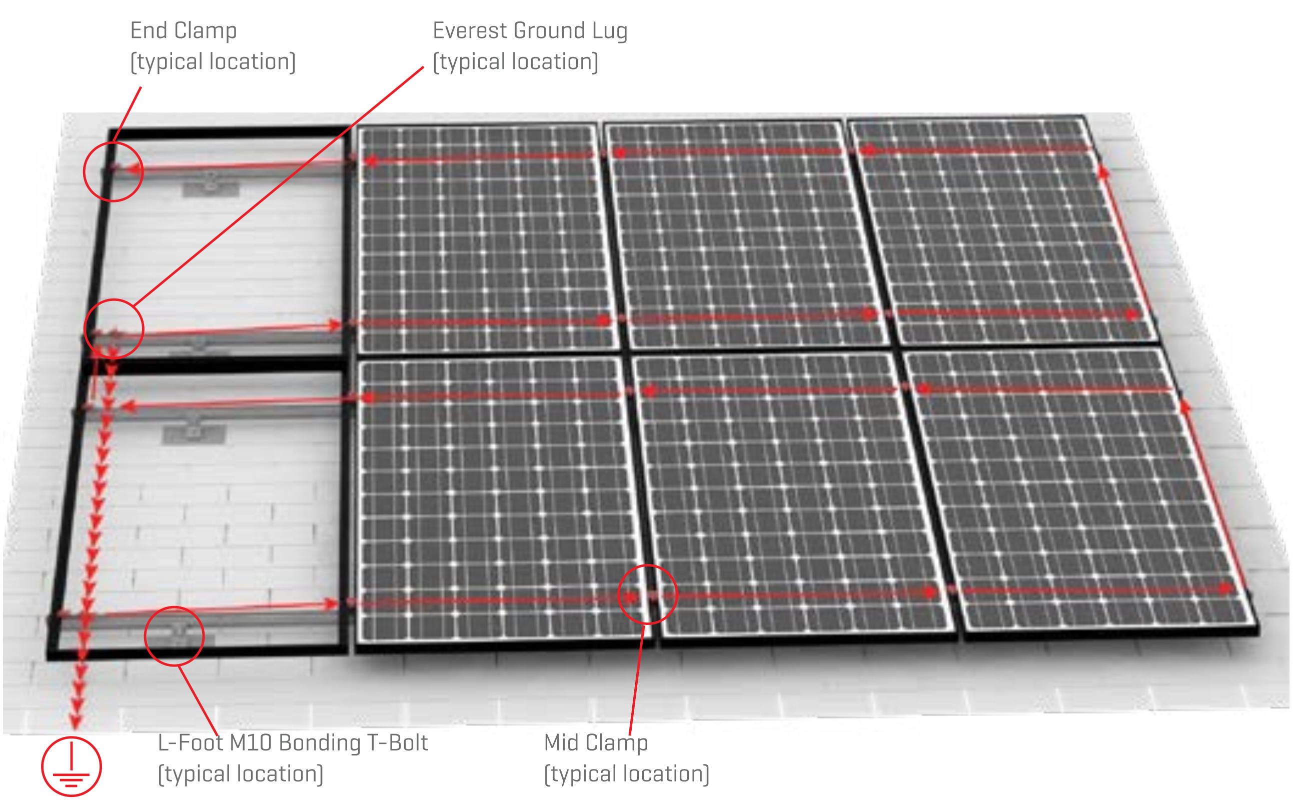
Appropriate means of bonding and grounding are required by regulation. The information provided in this manual shall always be verified with local and national building codes.

Everest Solar Systems has obtained a UL 2703 system listing from Underwriter's Laboratories (UL).

A sample bonding path diagram is shown in Figure 1 below. Your specific installation may vary, based upon site conditions and your AHJ's requirements.

Each electrical connection has been evaluated to a maximum fuse rating of 30A. At least one ground lug per row of modules must be used to ground all strings within each sub-array, although additional may be used for redundancy. When installed per these installation instructions, all connections meet the requirements of NEC 690.43.

This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.



Compatible Modules

K2's CrossRail System was tested with the following:

- UL/NRTL Listed Aptos Solar Modules:
  - DNA-120-MF26-XXXW
  - DNA-144-MF26-XXXW
  - DNA-120-BF23-XXXW
  - DNA-120-MF23-XXXW
  - DNA-144-BF23-XXXW
  - DNA-144-MF23-XXXW
- UL/NRTL Listed Axitec Modules:
  - AC-xxP/156-60S
  - AC-xxxM/156-60S
  - AC-xxxP/60V
  - AC-xxxP/60xV
  - AC-xxxP/60S
  - AC-xxxP/60x
  - AC-xxxMH/120S
  - AC-xxxM/60V
  - AC-xxxM/60xV
  - AC-xxxMH/120V
  - AC-xxxM/60S
  - AC-xxxM/60x
  - AC-xxxP/156-72S
  - AC-XXXP/72V
  - AC-XXXP/72XV
  - AC-XXXP/72S
  - AC-XXXP/72X
  - AC-XXXMH/144S
  - AC-XXXM/72V
  - AC-XXXM/72XV
  - AC-XXXMH/144V
  - AC-XXXM/72S
  - AC-XXXM/72X
- UL/NRTL Listed Boviet Modules:
  - BVM6612M 72-Cell Mono
- UL/NRTL Listed Canadian Solar Inc. Modules:
  - CS6U-xxx
  - CS6K-xxx
  - CS6X-xxx
  - CS6P-xxx
  - CS3K-xxxP
  - CS3K-xxxMS
  - CS3U-xxxP
  - CS3U-xxxMS
  - CS3W-xxxP
  - CS3U-xxxPB-AG
  - CS3U-xxxMB-AG
  - CS3W-xxxPB-AG
  - CS1H-xxxMS
- CONTINUED - Canadian Solar Inc Modules:
  - CS6K-xxxM
  - CS6K-P-FG DYMOND
- UL/NRTL Listed CertainTeed Modules:
  - CTXXXHC11-04
  - CTXXXHC00-04
  - CTxxxHC11-06
- UL/NRTL Listed ET Solar Modules:
  - ET-M660xxxBB
- UL/NRTL Listed Hansol Modules:
  - UB-AN1 Black 270-300
  - UBAN1 Silver 270-300
  - UD-AN1 330-360
- UL/NRTL Listed Hanwha Q Cells Modules:
  - Q.PEAK- G4.1/MAx xxx
  - Q.PEAK BLK G4.1 xxx
  - Q.PRO G4 xxx
  - Q.PLUS G4 xxx
  - Q.PEAK-G4.1/TAA xxx
  - Q.PEAK BLK G4.1/TAA xxx
  - Q.PLUS BFR G4.1/TAA xxx
  - Q.PLUS BFR G4.1/MAx xxx
  - B.LINE PLUS BFR G4.1 xxx
  - B.LINE PRO BFR G4.1 xxx
  - Q.PEAK DUO-G5 xxx
  - Q.PEAK DUO BLK-G5 xxx
  - Q.PEAK DUO-G8 xxx
  - Q.PEAK DUO BLK-G8 xxx
  - Q.PEAK DUO-G7 xxx
  - Q.PEAK DUO BLK-G7 xxx
  - Q.PEAK DUO G7.2 xxx
  - Q.PEAK DUO-G6 xxx
  - Q.PEAK DUO BLK-G6 xxx
  - Q.PEAK DUO BLK-G6+ xxx
  - Q.PEAK DUO-G6+ xxx
  - Q.PEAK DUO-G8+ xxx
  - Q.PEAK DUO BLK-G8+ xxx
  - Q.PEAK DUO L-G8.3 xxx
  - Q.PEAK DUO L-G8.2 xxx
  - Q.PEAK DUO L-G8.1 xxx
  - Q.PEAK DUO L-G8 xxx
  - Q.PEAK DUO L-G7.3 xxx
  - Q.PEAK DUO L-G7.2 xxx
  - Q.PEAK DUO L-G7.1 xxx
  - Q.PEAK DUO L-G7 xxx
  - Q.PEAK DUO L-G6 xxx
- CONTINUED - Hanwha Q Cells Modules:
  - Q.PEAK DUO L-G6.2 xxx
  - Q.PEAK DUO L-G6.3 xxx
  - Q.PLUS DUO L-G5 xxx
  - Q.PLUS DUO L-G5.1 xxx
  - Q.PLUS DUO L-G5.2 xxx
  - Q.PLUS DUO L-G5.3 xxx
  - Q.PEAK DUO L-G5.2 xxx
  - Q.PEAK DUO L-G5.3 xxx
  - Q.PEAK L-G4.2 xxx
  - Q.PEAK L-G4.1 xxx
  - Q.PLUS L-G4.2 xxx
  - Q.PLUS L-G4.1 xxx
  - Q.PLUS L-G4 xxx
  - Q.PEAK DUO BLK G6+/SC xxx
  - Q.PEAK DUO G5/SC xxx
  - Q.PEAK DUO BLK G5/SC xxx
  - Q.Plus BFR-G4.1xxx
  - Q.Pro BFR-G4.1xxx
  - Q.Pro-G4.1/SCxxx
  - Q.PLUS BFR G4.1 xxx
  - Q.PRO BFR G4 xxx
  - Q.PRO BFR G4.1 xxx
  - Q.PRO BFR G4.3 xxx
  - Q.PEAK-G4.1 xxx
  - Q. PEAK DUO BLK G6+/TS XXX
  - Q.PEAK DUO G5/TS-XXX
  - Q.PEAK DUO BLK G6/TS XXX
  - Q.PEAK DUO G6/TS-XXX
  - Q.PEAK DUO G6+/TS-XXX
  - Q.PEAK DUO ML-G9 XXX
  - Q.PEAK DUO ML-G9.2 XXX
  - Q.PEAK DUO ML BLK-G9 XXX
  - Q.PEAK DUO ML BLK-G9.2 XXX
  - Q.PEAK DUO XL-G9 XXX
  - Q.PEAK DUO XL-G9.2 XXX
  - Q.PEAK DUO XL BLK-G9 XXX
  - Q.PEAK DUO XL BLK-G9.2 XXX
  - Q.PEAK DUO XL BLK-G9.3 XXX
  - Q.PEAK DUO XL -G9.3 XXX
  - Q.PEAK DUO ML -G9.3 XXX
  - Q.PEAK DUO ML BLK -G9.3 XXX
  - Q.PEAK DUO ML -G9 XXX
  - Q.PEAK DUO ML -G9+ XXX
  - Q.PEAK DUO BLK ML -G9+ XXX
  - Q.PEAK DUO BLK ML -G9 XXX
- UL/NRTL Listed Hyundai Modules:
  - HiS-MxxxMG
  - HiS-MxxxMI

- CONTINUED - Hyundai Modules:
  - HiS-MxxxTI
  - HiS-MxxxRI
  - HiS-SxxxRI
  - HiS-MxxxRG

- UL/NRTL Listed Itek Modules
  - IT-xxx-SE
  - Hipro TP672M-xxx

- UL/NRTL Listed JA Solar Modules:
  - JAP6(DG)
  - JAM6(K)-60-xxx/4BB

- UL/NRTL Listed Jinko Solar Modules::
  - JKMxxxPP-72-DV
  - JKMxxxPP-60-DV
  - JKMxxxM-60HBL
  - JKMxxxM-72HL-V
  - JKMxxxM-72HL-TV
  - JKMxxx-P-60
  - JKMxxxM-72HL4-TV

- UL/NRTL Listed Kyocera Modules:
  - KUxxxMCA

- UL/NRTL Listed LG Electronics Inc. Modules:
  - LGxxxS1C-G4
  - LGxxxN1C-G4
  - LGxxxS2WG4
  - LGxxxN1K-G4
  - LGxxxN2W-G4
  - LGxxxN1K-A5
  - LGxxxQ1C-V5
  - LGxxxQ1K-V5
  - LGxxxN2W-A5
  - LGxxxS2W-A5
  - LGxxxN2T-A5
  - LGxxxQ1C-A5
  - LGxxxQ1K-A5
  - LGxxxN2W-V5
  - LGxxxN1C-V5
  - LGxxxN1W-V5
  - LGxxxN1K-V5
  - LGXXXN2W-V5
  - LGXXXN1C-V5
  - LGXXXN1W-V5
  - LGXXXN1K-V5
  - LGXXXN2T-V5
  - LGXXXN1C-N5
  - LGXXXQ1C-N5

- CONTINUED - LG Electronics Inc. Modules:
  - LGXXXQ1K-N5
  - LGXXXN1K-L5
  - LGXXXN2W-L5
  - LGXXXN2T-L5
  - LGXXXN1W-L5
  - LGXXXN1T-L5
  - LGXXXA1C-V5
  - LGXXXA1K-V5
  - LGXXXM1C-N5
  - LGXXXM1K-L5
  - LGXXXQ1C-A6
  - LGXXXQ1K-A6
  - LGXXXQAC-A6
  - LGXXXQAK-A6
  - LGXXXN1C-A6
  - LGXXXN1K-A6
  - LGXXXN2W-E6
  - LGXXXN2W-E6.AW5
  - LGXXXN2T-E6
  - LGXXXN1K-B6
  - LGXXXQ1C-A6
  - LGXXXQ1K-A6
  - LGXXXQAC-A6
  - LGXXXQAK-A6
  - LGXXXN1C-A6
  - LGXXXN1K-A6
  - LGXXXN2W-E6
  - LGXXXN2W-E6.AW5
  - LGXXXN2T-E6
  - LGXXXN1K-B6
  - LGXXXA1C-A6
  - LGXXXM1C-A6
  - LGXXXM1K-A6

- UL/NRTL Listed Longi Modules:
  - LR6-72-xxxM (xxx=320-350)
  - LR6-72HV-xxxM (xxx=320-350)
  - LR6-72BK-xxxM (xxx=320-350)
  - LR6-72PE-xxxM (xxx=340-380)
  - LR6-72PH-xxxM (xxx=340-380)
  - LR6-72PB-xxxM (xxx=340-380)
  - LR6-72HPB-xxxM (xxx=360-385)
  - LR6-60-xxxM (xxx=270-300)
  - LR6-60HV-xxxM (xxx=270-300)
  - LR6-60BK-xxxM (xxx=270-300)
  - LR6-60PE-xxxM (xxx=280-320)
  - LR6-60PH-xxxM (xxx=280-320)
  - LR6-60PB-xxxM (xxx=280-320)
  - LR6-72BP-xxxM

- CONTINUED - Longi Modules:
  - LR6-60BP-xxxM
  - LR6-72HBD-xxxM
  - LR6-60-xxxM
  - LR6-60BK-xxxM
  - LR6-60PE-xxxM
  - LR6-60PB-xxxM
  - LR6-60PH-xxxM
  - LR6-60HPB/HIB-xxxM
  - LR6-60HPH/HIH-xxxM
  - LR6-72-xxxM
  - LR6-72BK-xxxM
  - LR6-72HV-xxxM
  - LR6-72PE-xxxM
  - LR6-72PB-xxxM
  - LR6-72PH-xxxM
  - LR6-72HPH/HIH-xxxM
  - LR6-72BP-xxxM
  - LR6-72HBD/HIBD-xxxM
  - LR6-60BP-xxxM
  - LR6-60HBD/HIBD-xxxM
  - LR4-60HPH/HIH-xxxM
  - LR4-60HPB/HIB-xxxM
  - LR4-72HPH/HIH-xxxM
  - LR4-72HBD/HIBD-xxxM
  - LR4-72HBD/HIBD-xxxM

- UL/NRTL Listed Lumos Modules:
  - LSxxxx-60M-B/C

- UL/NRTL Listed Luxor Solar Modules:
  - Lx-xxxP
  - Lx-xxxM

- UL/NRTL Listed Mission Solar Modules:
  - MSExxxSB1J
  - MSExxxSO5T
  - MSExxxSO4J
  - MSExxxSQ6S
  - MSExxxSO6J
  - MSExxxSQ4S
  - MSExxxSQ5T
  - MSExxxSQ5K
  - MSExxxSQ8T
  - MSExxxSQ8K
  - MSExxxSQ9J
  - MSExxxSQ9S
  - MSExxxSR8T
  - MSExxxSR8K
  - MSExxxSR9S

Compatible Modules continued

K2's CrossRail System was tested with the following:

- CONTINUED - Mission Solar Modules:
  - MSExxxSB1J
  - MSExxxSX5T
  - MSExxxSX5K
  - MSExxxSX6S
  - MSExxxSX6W

- UL/NRTL Listed Panasonic Modules:
  - VBHNxxxSA16
  - VBHNxxxKA01
  - VBHNxxxKA03
  - VBHNxxxKA04
  - VBHNxxxSA17
  - VBHNxxxSA18
  - VBHNxxxSA17E
  - EVPVxxx
  - EVPVxxxK

- UL/NRTL Listed Peimar Modules:
  - SGxxxP-(BF)
  - SGxxxP
  - SGxxxM-(BF)
  - SGxxxM

- UL/NRTL Listed Phono Solar Modules:
  - PSxxxMG-20/U
  - PSxxxPG-20/U
  - PSxxxM-20/U
  - PSxxxMH-20/U

- UL/NRTL Listed Prism Solar Modules:
  - Bi48 xxx Bifacial
  - Bi60 xxx Bifacial

- UL/NRTL Listed REC Modules:
  - RECxxxTP2 BLK2
  - RECxxxTPS 72
  - RECxxxTP2S 72 XV
  - RECxxxTP2SM 72 XV
  - RECxxxTP2SM 72
  - RECxxx NP
  - RECxxx NP Black
  - RECxxxAA
  - RECxxxAA Black

- UL/NRTL Listed Sanyo Electric Co Ltd of Panasonic Group Modules:
  - VBHNxxxSA16
  - VBHNxxxSA17
  - VBHNxxxSA18

- CONTINUED - Sanyo Electric Co Ltd of Panasonic Group Modules:
  - VBHNxxxSA16
  - VBHNxxxSA17
  - VBHNxxxSA18
  - VBHNxxxKA01
  - VBHNxxxKA03
  - VBHNxxxKA04
  - MSExxxSX6W

- UL/NRTL Listed Seraphim Modules:
  - SEG-XXX-6MA-HV
  - SEG-XXX-BMA-HV

- UL/NRTL Listed Silfab Modules:
  - SLAxxxM
  - SLG-M-xxx
  - SLA-x-xxx
  - SLG-x-xxx
  - SIL-xxx BL
  - SIL-xxx HL
  - SIL-xxx NL
  - SIL-xxx ML
  - SIL-xxx NT
  - SIL-xxx BK
  - SIL-xxx NU
  - SIL-xxx NX

- UL/NRTL Listed Sharp Modules:
  - NU-SCxxx
  - NU-SAxxx

- UL/NRTL Listed Solaria Modules:
  - PowerxT® -xxxR-PD
  - PowerxT® -xxxR-BD
  - PowerxT® XXXR-PM

- UL/NRTL Listed Solarworld Modules "Sunmodule":
  - Plus SW XXX Mono
  - Plus SW XXX Poly

- UL/NRTL Listed Soluxtec Modules:
  - FR xxx Wp
  - Power Slate 54 Mono Dark Series
  - Power Slate 54 Mono Series

- UL/NRTL Listed SunPower Modules:
  - SPR-E19-xxx
  - SPR-E20-xxx

- UL/NRTL Listed Sunpreme Modules:
  - GxB-xxx
  - GxB-xxxSM
  - GxB-xxxSL

- UL/NRTL Listed Sunspark Modules:
  - SST-275-300M
  - SMX-250-265P
  - SST-xxxM 60 cell
  - SST-xxxM 72 cell
  - SST-xxxMB 60 cell
  - SST-XXXM3B-60/72
  - SST-XXXM3-60/72
  - SST-XXXM3B-60/72

- UL/NRTL Listed S-Energy Modules:
  - SN15-60PAE/PCE-xxxV
  - SN10-60PAE/PBE/PCE-xxxV
  - SN15-60MAE/MCE-xxxV
  - SN10-60MAE/MCE-xxxV
  - SNxxxM-10T(SN60)
  - SN15-72PAE/PCE-xxxV
  - SN10-72PAE/PBE/PCE-xxxV
  - SN15-72MAE/MCE-xxxV
  - SN10-72MAE/MBE/MCE-xxxV
  - SN20-60MAE/MBE/MCE-xxxV
  - SN25-60MAE/MCE-xxxV
  - SC20-60MAE/MBE/MCE-xxxV
  - SC25-60MAE/MCE-xxxV
  - SN20-72MAE/MBE/MCE-xxxV
  - SN25-72MAE/MCE-xxxV
  - SC20-72MAE/MBE/MCE-xxxV
  - SC25-72MAE/MCE-xxxV
  - SD25-60BDE-xxxV
  - SD25-72BDE-xxxV

- UL/NRTL Listed Talesun Modules
  - Hipro TP660M-xxx
  - Hipro TP672M-xxx

- UL/NRTL Listed Trina Solar Modules:
  - TSM-xxxDE14A
  - TSM-xxxDD05A.08
  - DUOMAX SPECS 1. PEG14
  - DUOMAX SPECS 2. PEG5
  - DUOMAX SPECS 3. PEG5.07
  - DUOMAX SPECS 4. PDG5
  - TSM-DE15H(II)
  - TSM-DE15M(II)
  - TSM-DD06M.05(II)

Compatible Modules continued

K2's CrossRail System was tested with the following:

- CONTINUED - Trina Solar Modules:
  - TSM-DD06H.05(II)
  - TSM-DD06M.t5(II)
  - TSM-DD06H.T5(II)
  - TSM-PE15H
  - TSM-DEG15HC.20(II)
  - TSM-DEG15MC.20(II)
  - TSM-DEG6HC.20(II)
  - TSM-DEG6MC.20(II)
  - TSM-xxxDE15V(II)
  - TSM-xxxDE19
  - TSM-xxxDEG15VC.20(II)
  - TSM-xxxDEG19C.20

- UL/NRTL Listed V Energy Modules:
  - Series 200 PV

- UL/NRTL Listed Yingli Solar Modules:
  - YL-xxxP-29b
  - YL-xxx-35b

Contents

About us

K2 Systems. Innovative mounting system from a strong team.

With sophisticated product innovations and a deep customer focus, K2 Systems is the engineering leader for all your mounting system needs. We are market leaders with more than 20 GW installed worldwide. Our systems are designed in our own product development department and we continually optimize and adapt mounting systems to the ever changing market.

A knowledgeable and friendly team

Just like a mountain climbing team, K2 Systems is built on mutual trust. This applies to our customer service as well as within the company itself, because we believe a trusting partnership leads to successful photovoltaic projects.

Our employees place total focus on the needs and wishes of our customer. This is true in all company departments.

10 locations and worldwide sales network

In our international team, everyone works together to provide customers with competent, comprehensive and entirely personalized service.

This is especially true in the constant training our employees undergo with regards to product optimization, quality assurance, or innovations in construction techniques.

Quality management and certificates

K2 Systems stands for outstanding quality standards, the highest quality products and sophisticated product innovations. Our customers and business partners deeply appreciate all of these factors. Independent authorities such as UL and Intertek have tested, confirmed, and certified our skills and components. External authorities are not the only ones to have put K2 Systems to the test. Our internal quality control ensures that all our products are subject to a constant review process.

These measurements all ensure the outstanding quality standards that exemplify products from K2 Systems. All our products are German engineered but tailored for the US and Mexico markets. Our customers can rely on our high quality and appreciate the fact that we offer a 25-year product warranty on all our components.

Product guarantee

K2 Systems offers a 25-year product warranty on all products in its portfolio. The use of high quality materials and a three-level quality inspection ensures these standards.

In a nutshell

As roof-top specialists, we offer effective and economical solutions for roofs all around the world and provide professional, fast and reliable support for our customers in the solar industry.

Project overview

Roofs

Roof	System	Module	Height	Quantity	Total power
Roof 1 Composite Shingles	Shared Rail	TSM-415NE09RC.05 69×45×1 in 415 Wp	10.0 ft	14	5.81 kWp
Total				**14**	**5.81 kWp**

Project information

Address	718 Remington St, Fort Collins, CO 80524, USA
Customer	Jordan Wiswell

Load settings

Design method	ASCE 7-16
Snow load on ground level	35.00 psf
Risk Category	II - Normal
Wind speed	140.0 mph

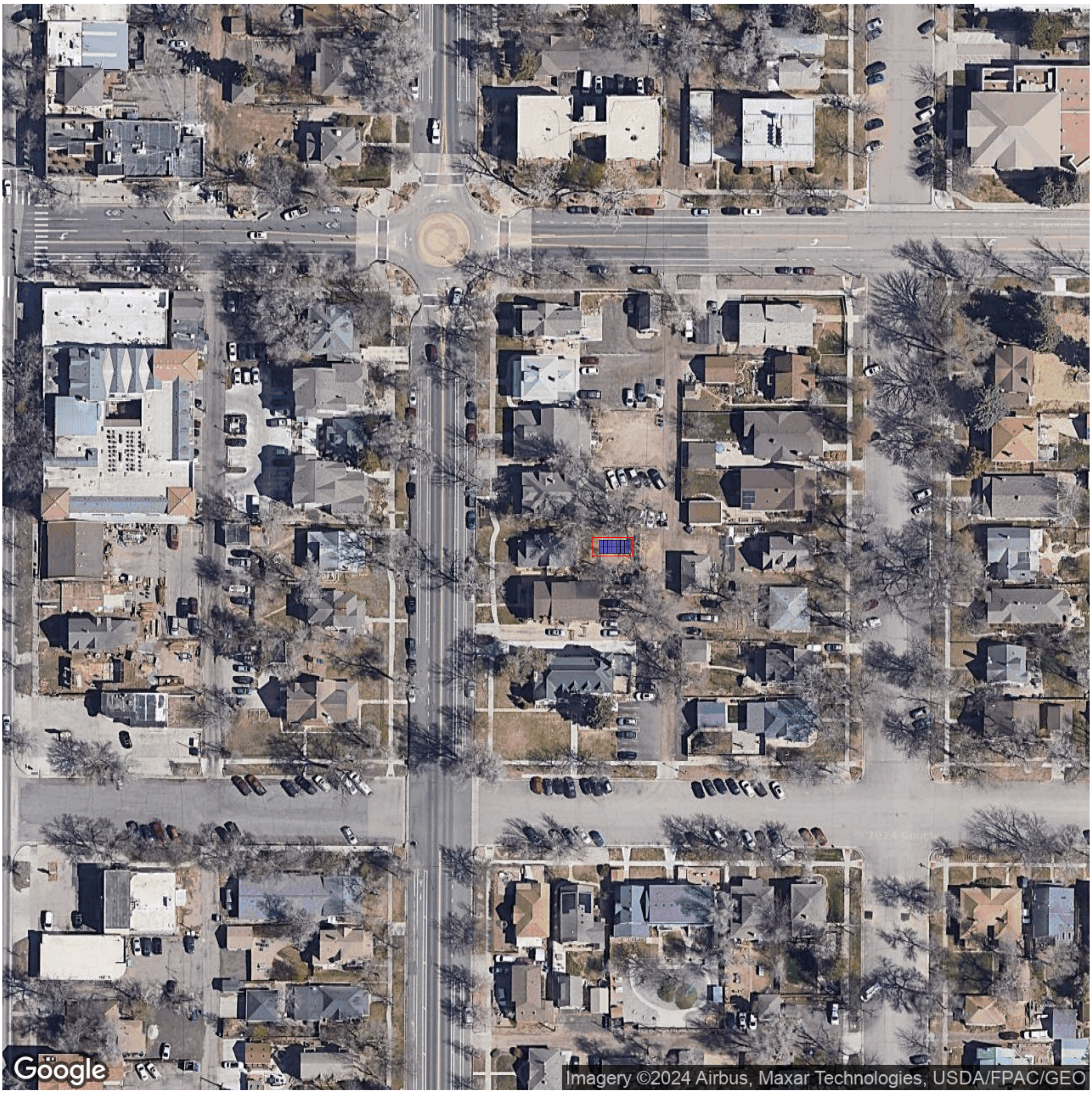
Material values

Aluminium EM-AW 6063 (EP, ET, ER/B) T66

Elastic module	E	= 70.000 N/mm²
Shear module	G	= 26.923 N/mm²
Density	g	= 2.700 kg/m³
Thermal coefficient	α_T	= $2.3e^{-5}$
Yielding strength	$f_{o,k}$	= 200 N/mm²
Ultimate strength	$f_{u,k}$	= 245 N/mm²

THE PROJECT IS VERIFIED.
The selected mounting system can be installed as planned.
Thank you for choosing a K2 mounting system.

Wiswell Pergola



Project information

Address	**718 Remington St, Fort Collins, CO 80524, USA**
Customer	**Jordan Wiswell**
Author	**Andrew Lyle**

Roofs | Roof 1 | Assembly plan

Base Rails

	Whole Rails		Rail cutting		
Type	Total Rail Length	Quantity 13.83 ft	Part of Rail	Length	Rest
3*A	26.021 ft	1*13.83 ft	13.833	12.188 from 13.833	1.612

1 cm is viewed as lost for each cutting

Red numbers are leftover rails which will not be used any longer

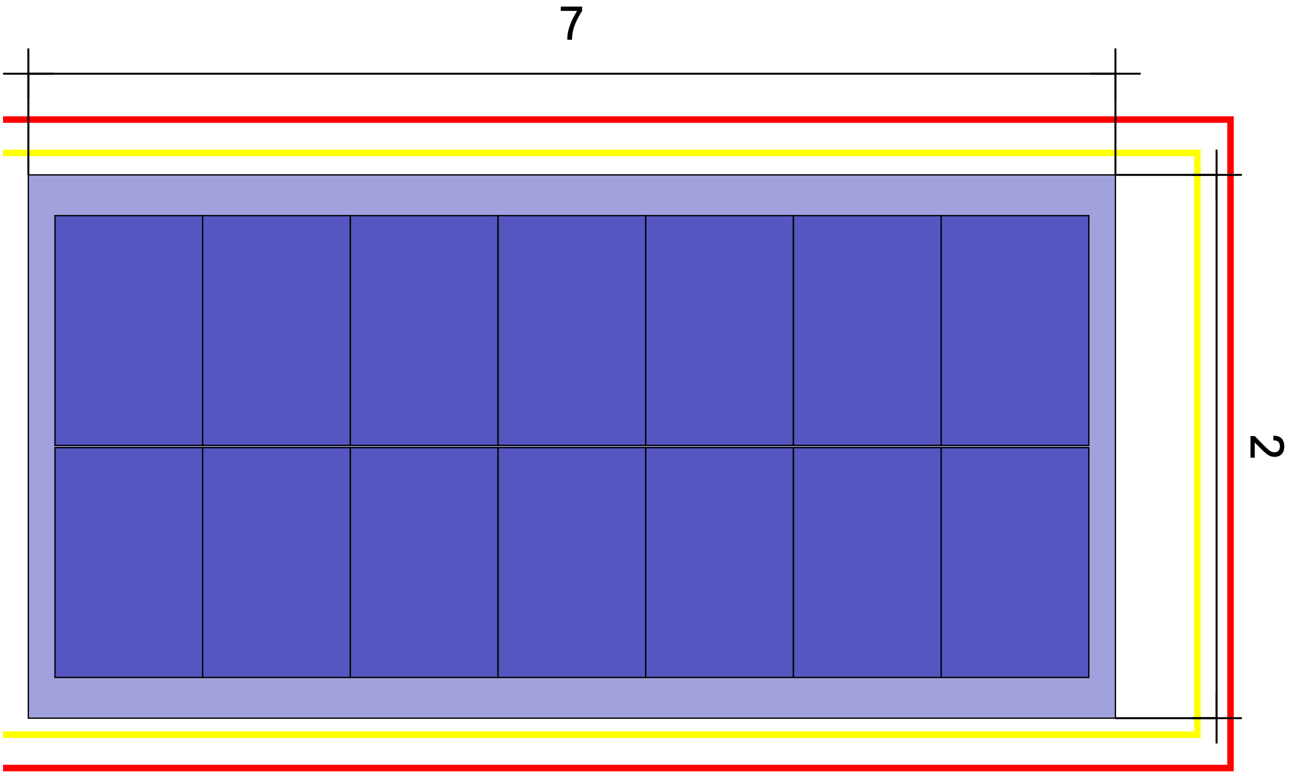
Fastener Spacing

Module	Array	Distance	maximum cantilever length	maximum fastener spacing
1	Edge (2")	2.79 ft	1.358	2.802
1	Center (1)	2.79 ft	1.358	2.802
1	Edge (2)	2.79 ft	1.358	2.802
1	Corner (3")	2.79 ft	1.358	2.802
1	Corner (3)	2.79 ft	1.358	2.802
1	Edge (2") (exposed)	2.79 ft	1.358	2.802
1	Center (1) (exposed)	2.79 ft	1.358	2.802
1	Edge (2) (exposed)	2.79 ft	1.358	2.802
1	Corner (3") (exposed)	2.79 ft	1.358	2.802

Module arrays

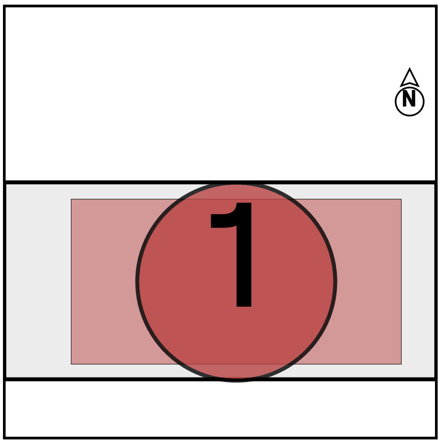
Module array	Width[ft]	Length[ft]	Width in modules	Length in modules
1	7.93	3.54	7	2

Roofs | Roof 1 | Module array 1

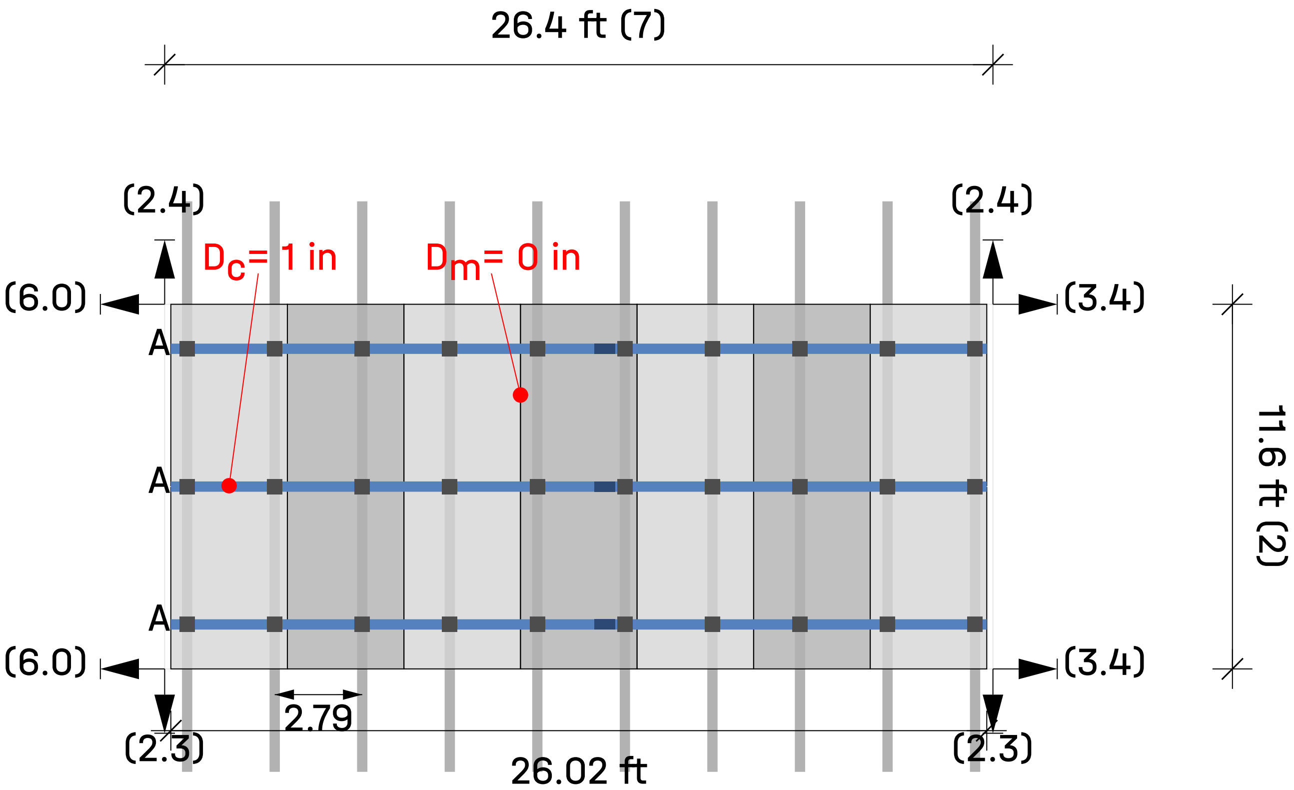


Roof 1 Module array 1

Mounting System	Shared Rail
Module	14(5.81 kWp) x TSM-415NE09RC.05
Row spacing	5.8 ft



Roofs | Roof 1 | Module array 1 | Module blocks

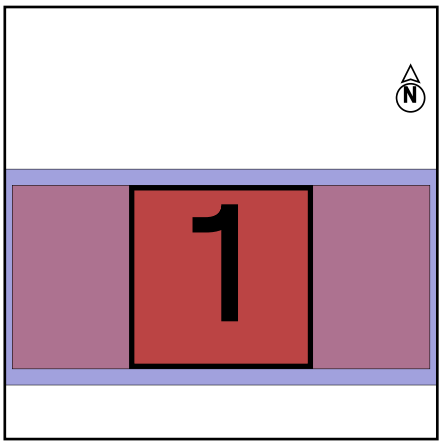


Roof (1) Module array (1) Module block [1]

Modules 7 × 2 = **14**

Legend

- Fastener
- Mounting rail: 48-X
- Distance to Roof Edge [ft]
- Dc Distance for clamping between modules
- Dm Distance between modules



Results | Roof 1

Roof	System	Module	Height	Quantity	Total power
Roof 1 Composite Shingles	Shared Rail	TSM-415NE09RC.05 69×45×1 in 415 Wp	10.0 ft	14	5.81 kWp

Module

Name	TSM-415NE09RC.05
Manufacturer	Trina
Output power	415 Wp
Dimensions	69×45×1 in
Weight	47.0 lbm

Components

Fastener	EverFlash eComp+SRS Slide Kit, Mill
Base rails	48-X

Loads on modules (module dimensioning)

Array	A-TrA [ft²]	ultimate state [psf]				serviceability [psf]			
		Pressure ⊥	Pressure ॥	Uplift ⊥	Uplift ॥	Pressure ⊥	Pressure ॥	Uplift ⊥	Uplift ॥
Edge (2'')	21.49	32.2	4.0	-9.2	0.2	32.2	4.0	-9.2	0.2
Center (1)	21.49	32.2	4.0	-6.0	0.2	32.2	4.0	-6.0	0.2
Edge (2)	21.49	32.2	4.0	-7.2	0.2	32.2	4.0	-7.2	0.2
Corner (3'')	21.49	32.2	4.0	-14.0	0.2	32.2	4.0	-14.0	0.2
Corner (3)	21.49	32.2	4.0	-9.5	0.2	32.2	4.0	-9.5	0.2
Edge (2'') (exposed)	21.49	32.2	4.0	-14.6	0.2	32.2	4.0	-14.6	0.2
Center (1) (exposed)	21.49	32.2	4.0	-9.8	0.2	32.2	4.0	-9.8	0.2
Edge (2) (exposed)	21.49	32.2	4.0	-11.5	0.2	32.2	4.0	-11.5	0.2
Corner (3'') (exposed)	21.49	32.2	4.0	-21.7	0.2	32.2	4.0	-21.7	0.2

Results | Roof 1

Utilization result

No. Module Array	roof areas	load-bearing capacity Pr σ[%]	CL σ[%]	Fst F[%]	Usab. Pr f[%]	Distances Fst [ft]	BR [ft]	maximum values CL L_{max}[ft]	Fst D_{max}[ft]
1	Edge (2'')	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Center (1)	38.6	3.4	99.6	29.1	2.792	---	1.358	2.802
1	Edge (2)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Corner (3'')	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Corner (3)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Edge (2'') (exposed)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Center (1) (exposed)	38.6	6.7	99.6	29.1	2.792	---	1.358	2.802
1	Edge (2) (exposed)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Corner (3'') (exposed)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802

Pr **Profile**
Fst **Fastener**
σ **Stress**
f **deflection**
F **Force**
CL/L_{max} **maximum cantilever length**
Fst D_{max} **maximum fastener spacing**
BR **base rail**
Usab. **usability**
CL **Cantilever**

Array Layout

Array	Rows	Columns	Length	Width	Orientation	Total Weight	Racking Weight	Distributed Weight
1	2	7	312.26 in	139.47 in	Portrait	733.44 lbm	75.44 lbm	2.413 psf

Results | Roof 1

Notes

- Ensure rail connectors do not interfere with L-feet or roof attachments. Additional fastners and/or re-positioning of their locations may be required.
- The structure was statically verified in accordance with Eurocode 9: Design of aluminum structures (DIN EN 1999-1-1:2021) and offers sufficient load-bearing capacity and stability for the loads specified in the chapter 'Maximum actions on the components'.
- Adjustment factor for wind load regarding servise life periond, fW, is according to DIN EN 1991-1-4/ NA, NDP for 4.2 (2P) note 5, table 3
- Adjustment factor for snow load regarding servise life periond, fS, is according to DIN EN 1991-1-3/ annex D, table 4
- Before installation, Contractor must verify that the system meets all applicable laws, regulations, ordinances, and codes. Contractor shall verify that the roof or other structures to which the system is being attached are capable of carrying the system loads.

Structural analysis report | Roof 1

General information

Name	Wiswell Pergola
Mounting System	Shared Rail

Location information

Address	718 Remington St, Fort Collins, CO 80524, USA
Ground level	4,989.8 ft

Roof information

Building height	10.0 ft
Roof type	Monopitch roof
Roof pitch	7°

min. roof edge distance	0.83 ft
Rafter spacing	2.792 ft
Set rafter to left edge	No
Rafter spacing left	13.8 in
Set rafter to right edge	No
Rafter spacing right	13.8 in

Loads

Design method	ASCE 7-16

Wind load

Wind speed	V = 140.0 mph
Hurricane prone	No
Manual Topographic Factor approved by Engineer of Record	K_{zt} = 1.0

Structural analysis report | Roof 1

Roof areas

Array	load impact area [ft²]	maxCpe21.49	minCpe21.49	wind pressure [psf]	wind uplift [psf]
Edge (2'')	21.49	0.267	-1.567	3.030	-17.795
Center (1)	21.49	0.267	-1.100	3.030	-12.493
Edge (2)	21.49	0.267	-1.267	3.030	-14.387
Corner (3'')	21.49	0.267	-2.268	3.030	-25.755
Corner (3)	21.49	0.267	-1.601	3.030	-18.179
Edge (2'') (exposed)	21.49	0.267	-1.567	4.545	-26.692
Center (1) (exposed)	21.49	0.267	-1.100	4.545	-18.740
Edge (2) (exposed)	21.49	0.267	-1.267	4.545	-21.581
Corner (3'') (exposed)	21.49	0.267	-2.268	4.545	-38.633

Snow load

Snow Load on Flat Roofs	p_f	= 24.50 psf
ExposureFactor	C_e	= 1.00
Reduction Factor		= 0.99
Slope Factor	C_s	= 1.00
ThermalFactor	C_t	= 1.00
Snow load on ground level	s_k	= 35.000 psf
Snow load on roof	s_i	= 30.000 psf
Environment	Partially exposed	

Dead Load

Weight of module	G_M	= 47.0 lbm
Weight of mounting system per module		= 5.5 lbm
Module area	A_M	= 21.49 ft²

Structural analysis report | Roof 1

Maximum load on modules (Mounting system dimensioning)

Array	A-TrA [ft²]	ultimate state [psf]				serviceability [psf]			
		Pressure ⊥	Pressure ॥	Uplift ⊥	Uplift ॥	Pressure ⊥	Pressure ॥	Uplift ⊥	Uplift ॥
Edge (2'')	21.49	32.201	3.954	-9.222	0.179	32.201	3.954	-9.222	0.179
Center (1)	21.49	32.201	3.954	-6.041	0.179	32.201	3.954	-6.041	0.179
Edge (2)	21.49	32.201	3.954	-7.178	0.179	32.201	3.954	-7.178	0.179
Corner (3'')	21.49	32.201	3.954	-13.998	0.179	32.201	3.954	-13.998	0.179
Corner (3)	21.49	32.201	3.954	-9.452	0.179	32.201	3.954	-9.452	0.179
Edge (2'') (exposed)	21.49	32.201	3.954	-14.560	0.179	32.201	3.954	-14.560	0.179
Center (1) (exposed)	21.49	32.201	3.954	-9.789	0.179	32.201	3.954	-9.789	0.179
Edge (2) (exposed)	21.49	32.201	3.954	-11.494	0.179	32.201	3.954	-11.494	0.179
Corner (3'') (exposed)	21.49	32.201	3.954	-21.725	0.179	32.201	3.954	-21.725	0.179

Max. load on fastener

Array	A-TrA [ft²]	ultimate state [lbf]				serviceability [lbf]			
		Pressure ⊥	Pressure ॥	Uplift ⊥	Uplift ॥	Pressure ⊥	Pressure ॥	Uplift ⊥	Uplift ॥
Edge (2'')	21.49	577.397	70.895	-165.358	3.203	577.397	70.895	-165.358	3.203
Center (1)	21.49	577.397	70.895	-108.323	3.203	577.397	70.895	-108.323	3.203
Edge (2)	21.49	577.397	70.895	-128.700	3.203	577.397	70.895	-128.700	3.203
Corner (3'')	21.49	577.397	70.895	-251.002	3.203	577.397	70.895	-251.002	3.203
Corner (3)	21.49	577.397	70.895	-169.492	3.203	577.397	70.895	-169.492	3.203
Edge (2'') (exposed)	21.49	577.397	70.895	-261.080	3.203	577.397	70.895	-261.080	3.203
Center (1) (exposed)	21.49	577.397	70.895	-175.528	3.203	577.397	70.895	-175.528	3.203
Edge (2) (exposed)	21.49	577.397	70.895	-206.094	3.203	577.397	70.895	-206.094	3.203
Corner (3'') (exposed)	21.49	577.397	70.895	-389.546	3.203	577.397	70.895	-389.546	3.203

Resistance Values of Components

Base Rails

Base Rails	A [cm²]	I_y [cm^4]	I_z [cm^4]	W_y [cm³]	W_z [cm³]
48-X	3.097	0.14	0.19	0.20	0.15

Structural analysis report | Roof 1

Fastener

Fastener	$R_{D,Uplift,Perpendicular}$ [lbf]	$R_{D,Pressure,Perpendicular}$ [lbf]	$R_{D,Pressure,Parallel}$ [lbf]
EverFlash eComp+SRS Slide Kit, Mill	715.00	705.00	400.00

Utilization result

		load-bearing capacity			Usab.	Distances		maximum values	
No. Module Array	roof areas	Pr σ[%]	CL σ[%]	Fst F[%]	Pr f[%]	Fst [ft]	BR [ft]	CL L_{max}[ft]	Fst Fst D_{max}[ft]
1	Edge (2'')	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Center (1)	38.6	3.4	99.6	29.1	2.792	---	1.358	2.802
1	Edge (2)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Corner (3'')	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Corner (3)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Edge (2'') (exposed)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Center (1) (exposed)	38.6	6.7	99.6	29.1	2.792	---	1.358	2.802
1	Edge (2) (exposed)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802
1	Corner (3'') (exposed)	38.6	0.0	99.6	29.1	2.792	---	1.358	2.802

Pr **Profile**
Fst **Fastener**
σ **Stress**
f **deflection**
F **Force**
CL/L_{max} **maximum cantilever length**

Fst D_{max} **maximum fastener spacing**
BR **base rail**
Usab. **usability**
CL **Cantilever**

Bill of material

Position	Item no.	Item description	Quantity	Weight
1	4000663	CrossRail 48-X 166", Dark	6	47.1 lbm
2	4000386	RailConn CR 48-X,48-XL Struct Set, Dark	3	1.5 lbm
3	4000015	EverFlash eComp+SRS Slide Kit, Mill	30	22.5 lbm
4	4000689-H	CR MC Dark, 48-50mm, Shared RL 30-47mm, 13mm Hex	26	4.5 lbm
5	4000093	CR EC Dark, 40-47mm, Shared RL 30-40mm	4	0.7 lbm
6	4000609	Shared Rail Clamp Add-On, Slide In, 10mm	26	1.2 lbm
7	4005394	Wire Management Clip, Omega, Black	14	0.1 lbm
8	4000069	Wire Management Clip, TC	28	0.3 lbm
9	4000431	CrossRail Flat EndCap, CR 48-X,48-XL	6	0.1 lbm
10	4000006-H	K2 Ground Lug, 13mm Hex Set	1	0.2 lbm
Total				**78.2 lbm**

Thank you for choosing a K2 mounting system.

Systems from K2 Systems are quick and easy to install.
We hope these instructions have helped.
Please contact us with any questions or suggestions for improvement.

Our contact data:

k2-systems.com/en/contact

Our General Terms of Business apply. Please refer to k2-systems.com

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+1 760-301-5300
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AHZ Consulting Engineers, Inc.
111 Rodeo
Irvine, CA 92602
(949) 466-1544
(901) 692-0431

04/15/2024

REFERENCE: 718 Remington Street, Fort Collins, CO 80524

To Whom It May Concern:

The following calculations are for the structural engineering design of the PV racking system and attachment and are valid only for the structural information referenced in the stamped plan set. The verification of such info is the responsibility of others. All PV mounting equipment shall be designed and installed per manufacturer's approved installation specifications.

Limitations

Installation of the solar panels must be performed in accordance with manufacturer recommendations. All work performed must be in accordance with accepted industry-wide methods and applicable safety standards. The contractor shall notify AHZ Consulting Engineers, Inc. should any damage, deterioration or discrepancies between the as-built condition of the structure and the condition described in this letter be found. The use of solar panel support span tables provided by others is allowed only where the building type, site conditions, site-specific design parameters, and solar panel configuration match the description of the span tables. The design of the solar panel racking (mounts, ballast, rails, etc.) and electrical engineering are out of the scope of this work. Waterproofing around the roof penetrations is the responsibility of the install contractor. AHZ Consulting Engineers, Inc. assumes no responsibility for improper installation of the solar array.

The evaluation of the connectors was performed and is only valid for Simpson Strong-Tie® products as referenced on the stamped plans and listed on https://www.strongtie.com/.

If you have any questions, don't hesitate to contact.

Sincerely,
Arash Zandieh, Ph.D., P.E.
a.zandieh@ahzengineers.com | 901-692-0431
AHZ Consulting Engineers, Inc.

COLORADO LICENSED PROFESSIONAL ENGINEER
ARASH ZANDIEH
53832
Exp. 10/31/2025

Arash Zandieh
2024.04.15 18:15:30-04'00'

Design Codes and Guidelines:

1. ASCE (2016). “Minimum Design Loads for Buildings and Other Structures. ASCE/SEI Standard 7-16.”
2. 2021 International Building Code (IBC)
3. ACI 318-19

Design parameters:

Risk Category: II
Design wind speed: 107 mph
Wind exposure category: C
Ground snow load: 35 psf
Building height: 10 ft
Seismic Design Category: D
Seismic Importance Factor: 1.0
S_S: 0.194g, S_1: 0.056g
Soil Site Class: D-Default Soil
S_{DS}: 0.207g, S_{D1}: 0.090g

Solar Module:

BVM7612M-540-H-HC-BF		
Length	7.47	ft
Width	3.72	ft
Weight	61.73	lbs

Weight of PV panels:

W_{PV}=	4.00	psf

Wind Load on Pergola:

Basic Wind Speed:	V	107	mph
Exposure Category:	C		
Risk Category:	II		
PV Module Angle:	θ	0	degree
Building Roof Height:	h	10	ft
Velocity Pressure Exposure Coefficient:	K_z	0.85	ASCE 7-16, Table 26.10.1
Topographic Factor:	K_{zt}	1	ASCE 7-16, Section 26.8.2
Wind Directionality Factor:	K_d	0.85	ASCE 7-16, Table 26.6.1
ground elevation factor	K_e	1	ASCE 7-16, Section 26.9 (Conservative)
Velocity pressure $q_z = 0.00256\ K_z K_{zt} K_d V^2$:	21.2	psf	ASCE 7-16, Equation 26.10-1

We use two approaches to calculate the wind pressure on solar panels:

1) using ASCE 7-16, Section 29.4.4
2) using ASCE 7-16, Section 30.3.2

We will use the maximum wind pressure from two approaches for design.

Approach 1: ASCE 7-16 Section 29.4.4

$p=q_h(GC_p)(\gamma_E)(\gamma_a)$			ASCE 7-16, Equation 29.4-7
γ_a	0.8		ASCE 7-16, Figure 9.4.8 (Conservative)
γ_E	1.5		Assume Exposed
GC_p:			ASCE 7-16, Figure 30.3.2A
External pressure coefficient Zone 1':	GC_p	0.9	

External pressure coefficient Zone 1:	GC_p	1.7	
External pressure coefficient Zone 2:	GC_p	2.3	
External pressure coefficient Zone 3:	GC_p	3.2	
External pressure coefficient (downward):	GC_p	0.3	
Use GC_p for Zone 2			
Minimum Design Wind Pressures	16	psf	ASCE 7-16, Section 30.2.2
Uplift Wind load on modules:	58.4	psf	>16 psf OK
Downward Wind load on modules:	7.6	psf	<16 psf ; Use 16 psf

Approach 2: ASCE 7-16, Section30.2.2

Design Wind Pressure $p = q_z (GC_p - GC_{pi})$			ASCE 7-16, Equation 30.3-1
Internal pressure coefficient:	GC_{pi}	0.18	ASCE 7-16, Table 26.13-1
GC_p:			ASCE 7-16, Figure 30.3.2A
External pressure coefficient Zone 1':	GC_p	0.9	
External pressure coefficient Zone 1:	GC_p	1.7	
External pressure coefficient Zone 2:	GC_p	2.3	
External pressure coefficient Zone 3:	GC_p	3.2	
External pressure coefficient (downward):	GC_p	0.3	
Use GC_p for Zone 2			
Minimum Design Wind Pressures	16	psf	ASCE 7-16, Section 30.2.2

Wind pressure acting away from the surface:	52.5	psf	>16 psf OK
Wind pressure acting toward the surface:	10.2	psf	<16 psf; Use 16 psf

Snow loads:

pg = Ground Snow Load =	35	psf	
pf = 0.7 Ce Ct I pg			(ASCE7-16 - Eq 7.3-1)
Ce = Exposure Factor =	1		(ASCE7-16 - Table 7.3-1)
Ct = Thermal Factor =	1.2		(ASCE7-16 - Table 7.3-2)
I = Importance Factor =	1		(ASCE7-16- 7.3.3)
pf = Flat Roof Snow Load =	29.4	psf	
ps = Cspf			(ASCE7-16- Eq 7.4-1)
Cs = Slope Factor =	1		(ASCE7-16- Fig. 7.4-1)
ps = Sloped Roof Snow Load =	29.4	psf	

Members Design:

The pergola elements are modeled using FORTE software, and the results are provided in Appendix 1. Conservatively, a maximum uniform load of 4 psf is assumed for the PV system.

Design Loads:

Dead Load= 4 psf
Snow= 30 psf
Wind Uplift= -52.5 psf
Wind Downward= 16 psf

Members:

4X12, Tributary width= 2’-9 ½”, Length= 15’ 7 ½”, Cantilever= 2’ 2 ¾”
6X12, Tributary width 7’-9 ¾”, Length= 15’ 7 ½”, Cantilever= 1’ 1 ¼”
6X6 Post, Tributary area= 105 psf, Length= 9’ ¼”

Additional load for 4X12= 5 psf, and for 6X12= 1.5 psf.

Attachment Check:

LSSR410Z Simpson Strong-Tie Connector:

The LSSR410Z Simpson Strong-Tie Connector are used for connecting 4X12 to 6X12. The structural output for LSSR410Z Simpson Strong-Tie Connector is given in Appendix 2. The allowable uplift is given in Appendix 2:

- Allowable Uplift Capacity: 695 lbs

The maximum uplift load (487 lbs) calculated at attachments are below the allowable values.

APT8 Simpson Strong-Tie Connector:

Edge Posts:

(1) APT8 Simpson Strong-Tie Connector are used for connecting 6X12 to the edge 6X6 posts. The structural output for APT8 Simpson Strong-Tie Connector is given in Appendix 3. The allowable uplift is given in Appendix 3:

- Allowable Uplift Capacity: 2130 lbs

The maximum uplift load (1421 lbs) calculated at attachments are below the allowable values.

Middle Posts:

(2) APT8 Simpson Strong-Tie Connector are used for connecting 6X12 to the middle 6X6 posts. The structural output for APT8 Simpson Strong-Tie Connector is given in Appendix 3. The allowable uplift is given in Appendix 3:

- Allowable Uplift Capacity: 2X2130 lbs = 4260

The maximum uplift load (3173 lbs) calculated at attachments are below the allowable values.

MPBZ™ Moment Post Base Simpson Strong-Tie:

The MPBZ™ Moment Post Base are used for connecting 6X6 posts to the foundation. The structural output for MPBZ™ Moment Post Base is given in Appendix 4. The allowable uplift is given in Appendix 4:

- Allowable Uplift Capacity: 5815 lbs

The maximum uplift load (2940 lbs) calculated at attachments are below the allowable values.

Foundation Design:

Load Combinations:

Loads are calculated for soil bearing, overturning, and sliding checks using the following ASD load combinations:
Combination 1: D
Combination 2: D + S
Combination 3: D + 0.75S
Combination 4: D + (0.6W or 0.7E)
Combination 5: D + 0.75L + 0.75(0.6W) + 0.75S
Combination 6 : D + 0.75L ± 0.75(0.7E) + 0.75S
Combination 7 : 0.6D + (0.6W or 0.7E)
Loads are calculated for footing and anchor bolts structural design using the following SD load combinations:
Combination 1: 1.4D
Combination 2: 1.2D + 0.5S
Combination 3: 1.2D + 1.6S + 0.5W
Combination 4: 1.2D + 1.0W + 0.5S
Combination 5: 1.2D + 1.0E + 0.2S
Combination 6: 0.9D + 1.0W
Combination 7: 0.9D + 1.0E
Where
D = dead load
S = snow load
W = wind load
E = earthquake (seismic load)

Design Summary:

Computer software ENERCALC was used to design foundation. The 3'-6" x 3'-6" x 1'-0" (W x L x H) concrete footing, with f'c = 3,000 psi, is needed. Furthermore, the concrete column with 1'-4" x 1'-4" x 2'-0" (W x L x H) dimensions and f'c = 3,000 psi is used on the top of the footing. Appendix 5 shows the ENERCALC design report.

Computer program Simpson Strong-Tie was used to design the anchors. Appendix 6 shows the Simpson Strong-Tie design report.
Use (3) 1/2" Machine Bolt per pad, (3) total with minimum 2.35" embedment in concrete.
The concrete slab must be minimum of 10" thick and must provide at least 1 ft edge distance for each anchor.
Structural design of the slab and its impact on the building framing is responsivity of others.
Special inspection is required for installation of the Strong-Bolt® 2 post-installed anchors.

Appendix 1

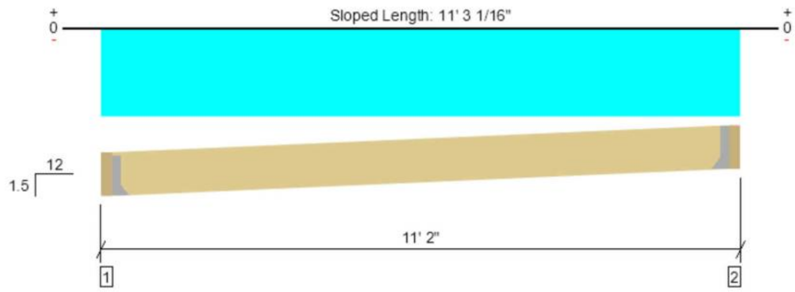
FORTE Results

FORTEWEB

MEMBER REPORT

PASSED

Level, 4X12-Uplift- rev01
1 piece(s) 4 x 12 DF No.2 @ 12" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	64 @ 3 1/2"	3281 (1.50")	Passed (2%)	--	1.0 D (All Spans)
Shear (lbs)	381 @ 1' 2 11/16"	7560	Passed (5%)	1.60	0.6 D + 0.6 W (All Spans)
Moment (Ft-lbs)	-1221 @ 5' 7"	10564	Passed (12%)	1.60	0.6 D + 0.6 W (All Spans)
Live Load Defl. (in)	0.000 @ 3 1/2"	0.533	Passed (L/999+)	--	1.0 D (All Spans)
Total Load Defl. (in)	-0.038 @ 5' 7"	0.711	Passed (L/999+)	--	0.6 D + 0.6 W (All Spans)

Member Length : 10' 9 3/8"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.5/12

- Deflection criteria: LL (L/240) and TL (L/180).
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- A 5.7% decrease in the moment capacity has been added to account for lateral stability.
- -487 lbs uplift at support located at 3 1/2". Strapping or other restraint may be required.
- -487 lbs uplift at support located at 10' 10 1/2". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Wind	Factored	
1 - Hanger on 11 1/4" DF beam	3.50"	Hanger[1]	1.50"	67	-879	67/-487	See note [1]
2 - Hanger on 11 1/4" DF beam	3.50"	Hanger[1]	1.50"	67	-879	67/-487	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' o/c	
Bottom Edge (Lu)	All Bearing Points	

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LSSR410Z	1.88"	N/A	22-16dx2.5	18-16dx2.5	
2 - Face Mount Hanger	LSSR410Z	1.88"	N/A	22-16dx2.5	18-16dx2.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Wind (1.60)	Comments
1 - Uniform (PLF)	0 to 11' 2"	N/A	12.0	-157.5	Default Load

Weyerhaeuser Notes

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
AHZ Consulting Engineers Inc.	

Weyerhaeuser

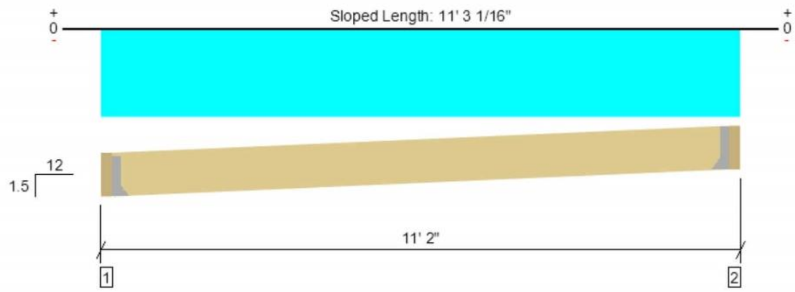
FORTEWEB

SOLUTIONS REPORT

PASSED

Level, 4X12-Uplift- rev01

Current Solution: 1 piece(s) 4 x 12 DF No.2 @ 12" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	64 @ 3 1/2"	3281 (1.50")	Passed (2%)	--	1.0 D (All Spans)
Shear (lbs)	381 @ 1' 2 11/16"	7560	Passed (5%)	1.60	0.6 D + 0.6 W (All Spans)
Moment (Ft-lbs)	-1221 @ 5' 7"	10564	Passed (12%)	1.60	0.6 D + 0.6 W (All Spans)
Live Load Defl. (in)	0.000 @ 3 1/2"	0.533	Passed (L/999+)	--	1.0 D (All Spans)
Total Load Defl. (in)	-0.038 @ 5' 7"	0.711	Passed (L/999+)	--	0.6 D + 0.6 W (All Spans)

Member Length : 10' 9 3/8"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.5/12

All Product Solutions

Depth	Series	Plies	Spacing	Cost Index
5 1/2"	1 3/4" 1.55E TimberStrand® LSL	1	24"	0.62 *
11 1/4"	4 x DF No.2	1	12"	5.25

The purpose of this report is for product comparison only. Load and support information necessary for professional design review is not displayed here. Please print an individual Member Report for submittal purposes.

ForteWEB Software Operator	Job Notes
AHZ Consulting Engineers Inc.	

Weyerhaeuser

FORTEWEB FULL DETAIL REPORT *Level, 4X12-Uplift- rev01*
1 piece(s) 4 x 12 DF No.2 @ 12" OC

PASSED

Summary of Loads to Supports

All load groups / combinations / patterns		10' 7"	
Maximum Down (lbs) / LDF	67/0.90	--	67/0.90
Critical Down (lbs) / LDF	67/0.90	--	67/0.90
Maximum Uplift (lbs) / LDF	-487/1.60	--	-487/1.60
Critical Uplift (lbs) / LDF	-487/1.60	--	-487/1.60
Bearing Length	Hanger	--	Hanger
Support Fc-perp (psi)	625	--	625
Top edge required unbraced length / C_L	N/A	60.00"/0.9902	N/A
Bottom edge required unbraced length / C_L	N/A	127.99"/0.9426	N/A

1.0 Dead (LDF = 0.9)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	64		--	64	
Loads to Supports (lbs)	67		--	67	
Shear used for design (lbs)	N/A	53	--	-53	N/A
Shear at support node (lbs)	N/A	64	--	-64	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		169	--	
Live Load Deflection (in)	--		0.000"	--	
Total Load Deflection (in)	--		0.005"	--	

1.0 Dead + 0.6 Wind (LDF = 1.6)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	-436		--	-436	
Loads to Supports (lbs)	-460		--	-460	
Shear used for design (lbs)	N/A	-359	--	359	N/A
Shear at support node (lbs)	N/A	-436	--	436	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		-1154	--	
Live Load Deflection (in)	--		-0.041"	--	
Total Load Deflection (in)	--		-0.036"	--	

0.6 Dead + 0.6 Wind (LDF = 1.6)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	-462		--	-462	
Loads to Supports (lbs)	-487		--	-487	
Shear used for design (lbs)	N/A	-381	--	381	N/A
Shear at support node (lbs)	N/A	-462	--	462	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		-1221	--	
Live Load Deflection (in)	--		-0.041"	--	
Total Load Deflection (in)	--		-0.038"	--	

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

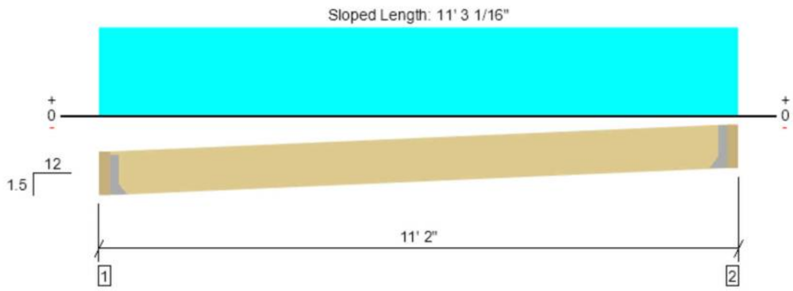
Loading On All Spans			10' 7"		
Member Reaction (lbs)	-311		--	-311	
Loads to Supports (lbs)	-328		--	-328	
Shear used for design (lbs)	N/A	-256	--	256	N/A
Shear at support node (lbs)	N/A	-311	--	311	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		-823	--	
Live Load Deflection (in)	--		-0.031"	--	
Total Load Deflection (in)	--		-0.025"	--	

FORTEWEB

MEMBER REPORT

PASSED

Level, 4X12-Downward- rev01
1 piece(s) 4 x 12 DF No.2 @ 12" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	540 @ 3 1/2"	3281 (1.50")	Passed (16%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	445 @ 1' 2 11/16"	5434	Passed (8%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1429 @ 5' 7"	7949	Passed (18%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.039 @ 5' 7"	0.533	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.044 @ 5' 7"	0.711	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 10' 9 3/8"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.5/12

- Deflection criteria: LL (L/240) and TL (L/180).
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- A 1.3% decrease in the moment capacity has been added to account for lateral stability.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Snow	Wind	Factored	
1 - Hanger on 11 1/4" DF beam	3.50"	Hanger[1]	1.50"	67	503	268	570	See note [1]
2 - Hanger on 11 1/4" DF beam	3.50"	Hanger[1]	1.50"	67	503	268	570	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' o/c	
Bottom Edge (Lu)	All Bearing Points	

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LSSR410Z	1.88"	N/A	22-16dx2.5	18-16dx2.5	
2 - Face Mount Hanger	LSSR410Z	1.88"	N/A	22-16dx2.5	18-16dx2.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Wind (1.60)	Comments
1 - Uniform (PLF)	0 to 11' 2"	N/A	12.0	90.0	48.0	Default Load

Weyerhaeuser Notes

ForteWEB Software Operator	Job Notes
AHZ Consulting Engineers Inc.	

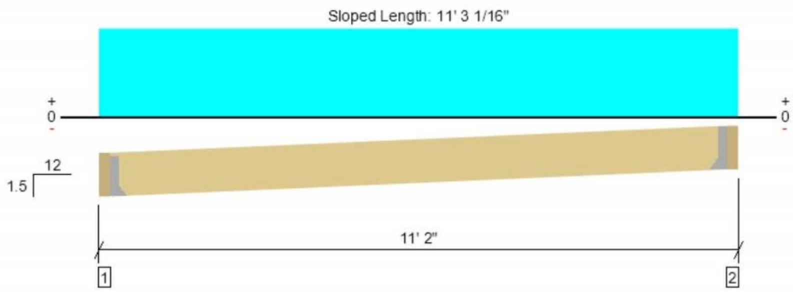
FORTEWEB

SOLUTIONS REPORT

PASSED

Level, 4X12-Downward- rev01

Current Solution: 1 piece(s) 4 x 12 DF No.2 @ 12" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
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Shear (lbs)	445 @ 1' 2 11/16"	5434	Passed (8%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1429 @ 5' 7"	7949	Passed (18%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.039 @ 5' 7"	0.533	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.044 @ 5' 7"	0.711	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 10' 9 3/8"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.5/12

All Product Solutions

Depth	Series	Plies	Spacing	Cost Index
7 1/4"	1 3/4" 1.55E TimberStrand® LSL	1	24"	0.82 *
11 1/4"	4 x DF No.2	1	12"	5.25

The purpose of this report is for product comparison only. Load and support information necessary for professional design review is not displayed here. Please print an individual Member Report for submittal purposes.

ForteWEB Software Operator	Job Notes
AHZ Consulting Engineers Inc.	

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FORTEWEB®

FULL DETAIL REPORT *Level, 4X12-Downward- rev01*
1 piece(s) 4 x 12 DF No.2 @ 12" OC

PASSED

Summary of Loads to Supports

All load groups / combinations / patterns			10' 7"		
Maximum Down (lbs) / LDF	570/1.15		--	570/1.15	
Critical Down (lbs) / LDF	570/1.15		--	570/1.15	
Maximum Uplift (lbs) / LDF	0/1.00		--	0/1.00	
Critical Uplift (lbs) / LDF	0/1.00		--	0/1.00	
Bearing Length	Hanger		--	Hanger	
Support Fc-perp (psi)	625		--	625	
Top edge required unbraced length / C_L	N/A		60.00"/0.9868	N/A	
Bottom edge required unbraced length / C_L	N/A		N/A	N/A	

1.0 Dead (LDF = 0.9)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	64		--	64	
Loads to Supports (lbs)	67		--	67	
Shear used for design (lbs)	N/A	53	--	-53	N/A
Shear at support node (lbs)	N/A	64	--	-64	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		169	--	
Live Load Deflection (in)	--		0.000"	--	
Total Load Deflection (in)	--		0.005"	--	

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	421		--	421	
Loads to Supports (lbs)	444		--	444	
Shear used for design (lbs)	N/A	347	--	-347	N/A
Shear at support node (lbs)	N/A	421	--	-421	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		1114	--	
Live Load Deflection (in)	--		0.029"	--	
Total Load Deflection (in)	--		0.034"	--	

1.0 Dead + 0.6 Wind (LDF = 1.6)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	216		--	216	
Loads to Supports (lbs)	228		--	228	
Shear used for design (lbs)	N/A	178	--	-178	N/A
Shear at support node (lbs)	N/A	216	--	-216	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		573	--	
Live Load Deflection (in)	--		0.012"	--	
Total Load Deflection (in)	--		0.018"	--	

0.6 Dead + 0.6 Wind (LDF = 1.6)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	191		--	191	
Loads to Supports (lbs)	201		--	201	

Shear used for design (lbs)	N/A	157	--	-157	N/A
Shear at support node (lbs)	N/A	191	--	-191	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		505	--	
Live Load Deflection (in)	--		0.012"	--	
Total Load Deflection (in)	--		0.016"	--	

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Snow (LDF = 1.6)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	535		--	535	
Loads to Supports (lbs)	565		--	565	
Shear used for design (lbs)	N/A	441	--	-441	N/A
Shear at support node (lbs)	N/A	535	--	-535	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		1417	--	
Live Load Deflection (in)	--		0.038"	--	
Total Load Deflection (in)	--		0.044"	--	

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	178		--	178	
Loads to Supports (lbs)	188		--	188	
Shear used for design (lbs)	N/A	147	--	-147	N/A
Shear at support node (lbs)	N/A	178	--	-178	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		472	--	
Live Load Deflection (in)	--		0.009"	--	
Total Load Deflection (in)	--		0.015"	--	

1.0 Dead + 1.0 Snow (LDF = 1.15)

Loading On All Spans			10' 7"		
Member Reaction (lbs)	540		--	540	
Loads to Supports (lbs)	570		--	570	
Shear used for design (lbs)	N/A	445	--	-445	N/A
Shear at support node (lbs)	N/A	540	--	-540	N/A
Shear at span point load (lbs)	--		N/A	--	
Moment (Ft-lbs)	--		1429	--	
Live Load Deflection (in)	--		0.039"	--	
Total Load Deflection (in)	--		0.044"	--	

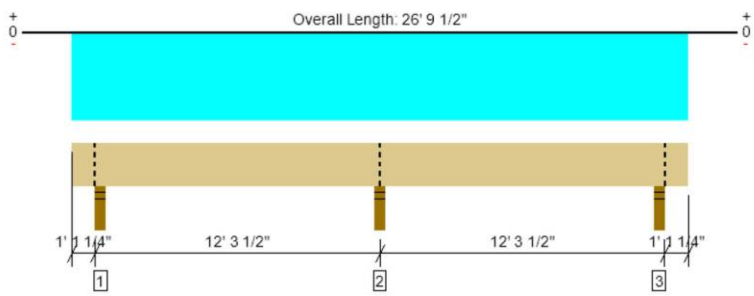
FORTEWEB

MEMBER REPORT

PASSED

Level, 6X12-Uplift

1 piece(s) 6 x 12 DF No.2 @ 12" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1079 @ 13' 4 3/4"	12031 (3.50")	Passed (9%)	--	1.0 D (All Spans)
Shear (lbs)	1359 @ 14' 6"	11469	Passed (12%)	1.60	0.6 D + 0.6 W (Adj Spans)
Moment (Ft-lbs)	3867 @ 13' 4 3/4"	14091	Passed (27%)	1.60	0.6 D + 0.6 W (Adj Spans)
Live Load Defl. (in)	0.034 @ 0	0.200	Passed (2L/886)	--	1.0 D + 0.6 W (Alt Spans)
Total Load Defl. (in)	0.030 @ 0	0.200	Passed (2L/990)	--	0.6 D + 0.6 W (Alt Spans)

Member Length : 26' 9 1/2"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (0.2").
- A 0.4% decrease in the moment capacity has been added to account for lateral stability.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Wind	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.50"	425	-2797	425/-1423	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	1079	-6377	1079/-3178	Blocking
3 - Stud wall - DF	3.50"	3.50"	1.50"	425	-2797	425/-1423	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' o/c	
Bottom Edge (Lu)	All Bearing Points	

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Wind (1.60)	Comments
1 - Uniform (PLF)	0 to 26' 9 1/2"	N/A	72.0	-420.0	Default Load

ForteWEB Software Operator	Job Notes
AHZ Consulting Engineers Inc.	

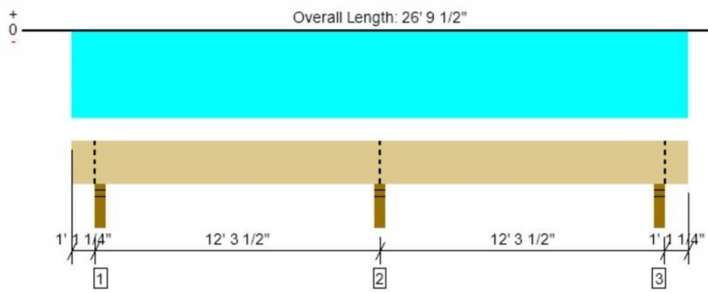
FORTEWEB

SOLUTIONS REPORT

PASSED

Level, 6X12-Uplift

Current Solution: 1 piece(s) 6 x 12 DF No.2 @ 12" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1079 @ 13' 4 3/4"	12031 (3.50")	Passed (9%)	--	1.0 D (All Spans)
Shear (lbs)	1359 @ 14' 6"	11469	Passed (12%)	1.60	0.6 D + 0.6 W (Adj Spans)
Moment (Ft-lbs)	3867 @ 13' 4 3/4"	14091	Passed (27%)	1.60	0.6 D + 0.6 W (Adj Spans)
Live Load Defl. (in)	0.034 @ 0	0.200	Passed (2L/886)	--	1.0 D + 0.6 W (Alt Spans)
Total Load Defl. (in)	0.030 @ 0	0.200	Passed (2L/990)	--	0.6 D + 0.6 W (Alt Spans)

Member Length : 26' 9 1/2"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

All Product Solutions

Depth	Series	Plies	Spacing	Cost Index
11 1/2"	6 x DF No.2	1	12"	x

The purpose of this report is for product comparison only. Load and support information necessary for professional design review is not displayed here. Please print an individual Member Report for submittal purposes.

FORTEWEB

FULL DETAIL REPORT *Level, 6X12-Uplift*
1 piece(s) 6 x 12 DF No.2 @ 12" OC

PASSED

Summary of Loads to Supports

All load groups / combinations / patterns	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Maximum Down (lbs) / LDF	--	425/0.90	--	1079/0.90	--	425/0.90	--
Critical Down (lbs) / LDF	--	425/0.90	--	1079/0.90	--	425/0.90	--
Maximum Uplift (lbs) / LDF	--	-1423/1.60	--	-3178/1.60	--	-1423/1.60	--
Critical Uplift (lbs) / LDF	--	-1423/1.60	--	-3178/1.60	--	-1423/1.60	--
Bearing Length	--	3.50"	--	3.50"	--	3.50"	--
Support Fc-perp (psi)	--	625	--	625	--	625	--
Top edge required unbraced length / C_L	36.00"/0.9963	36.00"/0.9963	36.00"/0.9963	36.00"/0.9963	36.00"/0.9963	36.00"/0.9963	36.00"/0.9963
Bottom edge required unbraced length / C_L	15.00"/0.9992	145.75"/0.9917	145.75"/0.9834	145.75"/0.9917	145.75"/0.9834	145.75"/0.9917	15.00"/0.9992

1.0 Dead (LDF = 0.9)

Loading On All Spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	425	--	1079	--	425	--
Loads to Supports (lbs)	--	425	--	1079	--	425	--
Shear used for design (lbs)	--	-11 / 255	--	-460 / 460	--	-255 / 11	--
Shear at support node (lbs)	--	-90 / 335	--	-540 / 540	--	-335 / 90	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-56	723	-1300	723	-56	0
Live Load Deflection (in)	0.000"	--	0.000"	--	0.000"	--	0.000"
Total Load Deflection (in)	-0.006"	--	0.016"	--	0.016"	--	-0.006"

1.0 Dead + 0.6 Wind (LDF = 1.6)

Loading On All Spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	-1062	--	-2698	--	-1062	--
Loads to Supports (lbs)	--	-1062	--	-2698	--	-1062	--
Shear used for design (lbs)	--	26 / -638	--	1150 / -1150	--	638 / -26	--
Shear at support node (lbs)	--	225 / -837	--	1349 / -1349	--	837 / -225	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	141	-1806	3249	-1806	141	0
Live Load Deflection (in)	0.021"	--	-0.055"	--	-0.055"	--	0.021"
Total Load Deflection (in)	0.015"	--	-0.039"	--	-0.039"	--	0.015"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ALTERNATE span loading on odd # spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	281	--	-809	--	-918	--
Loads to Supports (lbs)	--	281	--	-809	--	-918	--
Shear used for design (lbs)	--	26 / 426	--	-289 / -979	--	809 / 11	--
Shear at support node (lbs)	--	225 / 506	--	-369 / -1178	--	1008 / 90	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	141	1918	975	-2880	-56	0
Live Load Deflection (in)	-0.013"	--	0.044"	--	-0.097"	--	0.034"
Total Load Deflection (in)	-0.019"	--	0.059"	--	-0.081"	--	0.028"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ALTERNATE span loading on even # spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	-918	--	-809	--	281	--
Loads to Supports (lbs)	--	-918	--	-809	--	281	--
Shear used for design (lbs)	--	-11 / -809	--	979 / 289	--	-426 / -26	--
Shear at support node (lbs)	--	-90 / -1008	--	1178 / 369	--	-506 / -225	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-56	-2880	975	1918	141	0
Live Load Deflection (in)	0.034"	--	-0.097"	--	0.044"	--	-0.013"
Total Load Deflection (in)	0.028"	--	-0.081"	--	0.059"	--	-0.019"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 1	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	-1254	--	-785	--	277	--
Loads to Supports (lbs)	--	-1254	--	-785	--	277	--
Shear used for design (lbs)	--	26 / -830	--	959 / 293	--	-422 / -26	--
Shear at support node (lbs)	--	225 / -1029	--	1158 / 373	--	-502 / -225	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	141	-2798	925	1890	141	0
Live Load Deflection (in)	0.032"	--	-0.094"	--	0.043"	--	-0.013"
Total Load Deflection (in)	0.026"	--	-0.079"	--	0.058"	--	-0.019"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 2	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	-723	--	-2747	--	-723	--
Loads to Supports (lbs)	--	-723	--	-2747	--	-723	--
Shear used for design (lbs)	--	-11 / -614	--	1175 / -1175	--	614 / 11	--
Shear at support node (lbs)	--	-90 / -813	--	1373 / -1373	--	813 / 90	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-56	-1892	3347	-1892	-56	0
Live Load Deflection (in)	0.022"	--	-0.057"	--	-0.057"	--	0.022"
Total Load Deflection (in)	0.016"	--	-0.041"	--	-0.041"	--	0.016"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 3	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	277	--	-785	--	-1254	--

Loads to Supports (lbs)	--	277		--	-765		--	-1254		--
Shear used for design (lbs)	--	26	422	--	-293	-959	--	830	-26	--
Shear at support node (lbs)	--	225	502	--	-373	-1158	--	1029	-225	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	141		1890	925		-2798	141		0
Live Load Deflection (in)	-0.013"	--		0.043"	--		-0.094"	--		0.032"
Total Load Deflection (in)	-0.019"	--		0.058"	--		-0.079"	--		0.026"

0.6 Dead + 0.6 Wind (LDF = 1.6)

Loading On All Spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	-1232		--	-3130		--	-1232		--
Loads to Supports (lbs)	--	-1232		--	-3130		--	-1232		--
Shear used for design (lbs)	--	30	-741	--	1334	-1334	--	741	-30	--
Shear at support node (lbs)	--	261	-971	--	1565	-1565	--	971	-261	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	163		-2095	3769		-2095	163		0
Live Load Deflection (in)	0.021"	--		-0.055"	--		-0.055"	--		0.021"
Total Load Deflection (in)	0.017"	--		-0.045"	--		-0.045"	--		0.017"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ALTERNATE span loading on odd # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	111		--	-1241		--	-1088		--
Loads to Supports (lbs)	--	111		--	-1241		--	-1088		--
Shear used for design (lbs)	--	30	324	--	-105	-1163	--	912	6	--
Shear at support node (lbs)	--	261	372	--	-153	-1394	--	1142	54	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	163		1764	1495		-3158	-34		0
Live Load Deflection (in)	-0.013"	--		0.044"	--		-0.097"	--		0.034"
Total Load Deflection (in)	-0.017"	--		0.053"	--		-0.087"	--		0.030"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ALTERNATE span loading on even # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	-1088		--	-1241		--	111		--
Loads to Supports (lbs)	--	-1088		--	-1241		--	111		--
Shear used for design (lbs)	--	-6	-912	--	1163	105	--	-324	-30	--
Shear at support node (lbs)	--	-54	-1142	--	1394	153	--	-372	-261	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-34		-3158	1495		1764	163		0
Live Load Deflection (in)	0.034"	--		-0.097"	--		0.044"	--		-0.013"
Total Load Deflection (in)	0.030"	--		-0.087"	--		0.053"	--		-0.017"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 1	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	-1423		--	-1217		--	107		--
Loads to Supports (lbs)	--	-1423		--	-1217		--	107		--
Shear used for design (lbs)	--	30	-932	--	1143	109	--	-320	-30	--
Shear at support node (lbs)	--	261	-1162	--	1374	157	--	-368	-261	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	163		-3073	1445		1730	163		0
Live Load Deflection (in)	0.032"	--		-0.094"	--		0.043"	--		-0.013"
Total Load Deflection (in)	0.028"	--		-0.085"	--		0.052"	--		-0.016"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 2	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	-893		--	-3178		--	-893		--
Loads to Supports (lbs)	--	-893		--	-3178		--	-893		--
Shear used for design (lbs)	--	-6	-716	--	1359	-1359	--	716	6	--
Shear at support node (lbs)	--	-54	-947	--	1589	-1589	--	947	54	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-34		-2181	3867		-2181	-34		0
Live Load Deflection (in)	0.022"	--		-0.057"	--		-0.057"	--		0.022"
Total Load Deflection (in)	0.019"	--		-0.047"	--		-0.047"	--		0.019"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 3	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	107		--	-1217		--	-1423		--
Loads to Supports (lbs)	--	107		--	-1217		--	-1423		--
Shear used for design (lbs)	--	30	320	--	-109	-1143	--	932	-30	--
Shear at support node (lbs)	--	261	368	--	-157	-1374	--	1162	-261	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	163		1730	1445		-3073	163		0
Live Load Deflection (in)	-0.013"	--		0.043"	--		-0.094"	--		0.032"
Total Load Deflection (in)	-0.016"	--		0.052"	--		-0.085"	--		0.028"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

Loading On All Spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	-690		--	-1754		--	-690		--
Loads to Supports (lbs)	--	-690		--	-1754		--	-690		--
Shear used for design (lbs)	--	17	-415	--	748	-748	--	415	-17	--
Shear at support node (lbs)	--	146	-544	--	877	-877	--	544	-146	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	91		-1174	2112		-1174	91		0
Live Load Deflection (in)	0.016"	--		-0.041"	--		-0.041"	--		0.016"

Total Load Deflection (in)	0.010"	--		-0.025"	--		-0.025"	--		0.010"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ALTERNATE span loading on odd # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	317		--	-337		--	-582		--
Loads to Supports (lbs)	--	317		--	-337		--	-582		--
Shear used for design (lbs)	--	17	384	--	-332	-619	--	543	11	--
Shear at support node (lbs)	--	146	463	--	-411	-749	--	672	90	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	91		1581	406		-1989	-56		0
Live Load Deflection (in)	-0.010"	--		0.033"	--		-0.072"	--		0.025"
Total Load Deflection (in)	-0.016"	--		0.048"	--		-0.057"	--		0.019"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ALTERNATE span loading on even # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	-582		--	-337		--	317		--
Loads to Supports (lbs)	--	-582		--	-337		--	317		--
Shear used for design (lbs)	--	-11	-543	--	619	332	--	-384	-17	--
Shear at support node (lbs)	--	-90	-672	--	749	411	--	-463	-146	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-56		-1989	406		1581	91		0
Live Load Deflection (in)	0.025"	--		-0.072"	--		0.033"	--		-0.010"
Total Load Deflection (in)	0.019"	--		-0.057"	--		0.048"	--		-0.016"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ADJACENT span loading on support 1	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	-834		--	-319		--	314		--
Loads to Supports (lbs)	--	-834		--	-319		--	314		--
Shear used for design (lbs)	--	17	-558	--	604	335	--	-381	-17	--
Shear at support node (lbs)	--	146	-688	--	733	414	--	-460	-146	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	91		-1929	369		1562	91		0
Live Load Deflection (in)	0.024"	--		-0.070"	--		0.033"	--		-0.010"
Total Load Deflection (in)	0.018"	--		-0.055"	--		0.047"	--		-0.016"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ADJACENT span loading on support 2	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	-436		--	-1790		--	-436		--
Loads to Supports (lbs)	--	-436		--	-1790		--	-436		--
Shear used for design (lbs)	--	-11	-397	--	766	-766	--	397	11	--
Shear at support node (lbs)	--	-90	-526	--	895	-895	--	526	90	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-56		-1238	2186		-1238	-56		0
Live Load Deflection (in)	0.017"	--		-0.042"	--		-0.042"	--		0.017"
Total Load Deflection (in)	0.011"	--		-0.027"	--		-0.027"	--		0.011"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ADJACENT span loading on support 3	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	314		--	-319		--	-834		--
Loads to Supports (lbs)	--	314		--	-319		--	-834		--
Shear used for design (lbs)	--	17	381	--	-335	-604	--	558	-17	--
Shear at support node (lbs)	--	146	460	--	-414	-733	--	688	-146	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	91		1562	369		-1929	91		0
Live Load Deflection (in)	-0.010"	--		0.033"	--		-0.070"	--		0.024"
Total Load Deflection (in)	-0.016"	--		0.047"	--		-0.055"	--		0.018"

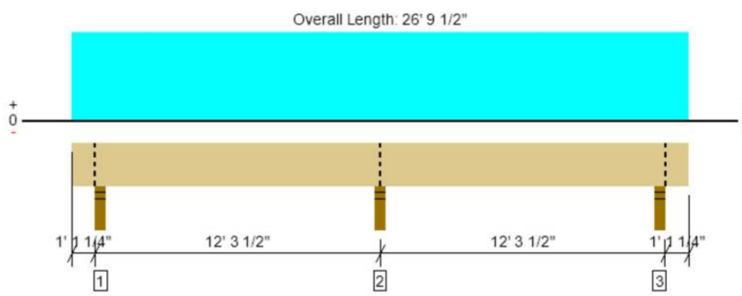
FORTEWEB

MEMBER REPORT

PASSED

Level, 6X12-Downward

1 piece(s) 6 x 12 DF No.2 @ 12" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4700 @ 13' 4 3/4"	12031 (3.50")	Passed (39%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	2005 @ 14' 6"	8244	Passed (24%)	1.15	1.0 D + 1.0 S (Adj Spans)
Moment (Ft-lbs)	-5678 @ 13' 4 3/4"	10053	Passed (56%)	1.15	1.0 D + 1.0 S (Adj Spans)
Live Load Defl. (in)	0.076 @ 19' 11 7/16"	0.405	Passed (L/999+)	--	1.0 D + 0.45 W + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.091 @ 20' 3/8"	0.607	Passed (L/999+)	--	1.0 D + 0.45 W + 0.75 L + 0.75 S (Alt Spans)

Member Length : 26' 9 1/2"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- A 1.1% decrease in the moment capacity has been added to account for lateral stability.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Snow	Wind	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.50"	425	1507	853	1939	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	1079	3621	1943	4700	Blocking
3 - Stud wall - DF	3.50"	3.50"	1.50"	425	1507	853	1939	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' o/c	
Bottom Edge (Lu)	All Bearing Points	

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Wind (1.60)	Comments
1 - Uniform (PLF)	0 to 26' 9 1/2"	N/A	72.0	240.0	128.0	Default Load

Weyerhaeuser Notes

ForteWEB Software Operator	Job Notes
AHZ Consulting Engineers Inc.	

Weyerhaeuser

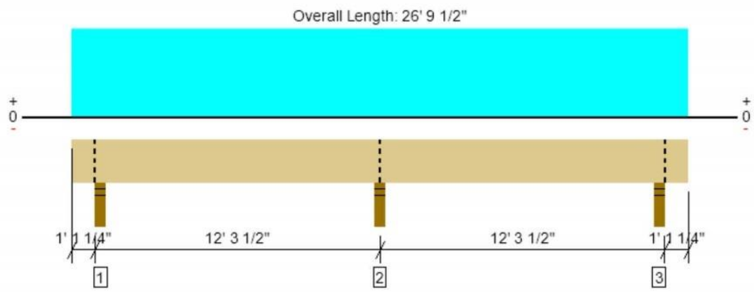
FORTEWEB

SOLUTIONS REPORT

PASSED

Level, 6X12-Downward

Current Solution: 1 piece(s) 6 x 12 DF No.2 @ 12" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4700 @ 13' 4 3/4"	12031 (3.50")	Passed (39%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	2005 @ 14' 6"	8244	Passed (24%)	1.15	1.0 D + 1.0 S (Adj Spans)
Moment (Ft-lbs)	-5678 @ 13' 4 3/4"	10053	Passed (56%)	1.15	1.0 D + 1.0 S (Adj Spans)
Live Load Defl. (in)	0.076 @ 19' 11 7/16"	0.405	Passed (L/999+)	--	1.0 D + 0.45 W + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.091 @ 20' 3/8"	0.607	Passed (L/999+)	--	1.0 D + 0.45 W + 0.75 L + 0.75 S (Alt Spans)

Member Length : 26' 9 1/2"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

All Product Solutions				
Depth	**Series**	**Plies**	**Spacing**	**Cost Index**
9 1/2"	1 3/4" 1.55E TimberStrand® LSL	2	24"	2.15 *
11 1/2"	6 x DF No.2	1	12"	6.85

The purpose of this report is for product comparison only. Load and support information necessary for professional design review is not displayed here. Please print an individual Member Report for submittal purposes.

ForteWEB Software Operator	Job Notes
AHZ Consulting Engineers Inc.	

Weyerhaeuser

FORTEWEB

FULL DETAIL REPORT *Level, 6X12-Downward*
1 piece(s) 6 x 12 DF No.2 @ 12" OC

PASSED

Summary of Loads to Supports

All load groups / combinations / patterns	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Maximum Down (lbs) / LDF	--	1939/1.60	--	4700/1.15	--	1939/1.60	--
Critical Down (lbs) / LDF	--	1932/1.15	--	4700/1.15	--	1932/1.15	--
Maximum Uplift (lbs) / LDF	--	0/1.00	--	0/1.00	--	0/1.00	--
Critical Uplift (lbs) / LDF	--	0/1.00	--	0/1.00	--	0/1.00	--
Bearing Length	--	3.50"	--	3.50"	--	3.50"	--
Support Fc-perp (psi)	--	625	--	625	--	625	--
Top edge required unbraced length / C_L	N/A	N/A	36.00"/0.9974	N/A	36.00"/0.9974	N/A	N/A
Bottom edge required unbraced length / C_L	15.00"/0.9989	145.75"/0.9890	145.75"/0.9890	145.75"/0.9890	145.75"/0.9890	145.75"/0.9890	15.00"/0.9989

1.0 Dead (LDF = 0.9)

Loading On All Spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	425	--	1079	--	425	--
Loads to Supports (lbs)	--	425	--	1079	--	425	--
Shear used for design (lbs)	--	-11 255	--	-460 460	--	-255 11	--
Shear at support node (lbs)	--	-90 335	--	-540 540	--	-335 90	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-56	723	-1300	723	-56	0
Live Load Deflection (in)	0.000"	--	0.000"	--	0.000"	--	0.000"
Total Load Deflection (in)	-0.006"	--	0.016"	--	0.016"	--	-0.006"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

Loading On All Spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	1487	--	3777	--	1487	--
Loads to Supports (lbs)	--	1487	--	3777	--	1487	--
Shear used for design (lbs)	--	-37 894	--	-1610 1610	--	-894 37	--
Shear at support node (lbs)	--	-315 1172	--	-1889 1889	--	-1172 315	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-197	2529	-4548	2529	-197	0
Live Load Deflection (in)	-0.015"	--	0.039"	--	0.039"	--	-0.015"
Total Load Deflection (in)	-0.021"	--	0.055"	--	0.055"	--	-0.021"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ALTERNATE span loading on odd # spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	1007	--	3103	--	1436	--
Loads to Supports (lbs)	--	1007	--	3103	--	1436	--
Shear used for design (lbs)	--	-37 514	--	-1096 1549	--	-955 24	--
Shear at support node (lbs)	--	-315 692	--	-1275 1828	--	-1233 203	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-197	1283	-3736	2891	-127	0
Live Load Deflection (in)	-0.003"	--	0.006"	--	0.054"	--	-0.020"
Total Load Deflection (in)	-0.009"	--	0.021"	--	0.069"	--	-0.026"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ALTERNATE span loading on even # spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	1436	--	3103	--	1007	--
Loads to Supports (lbs)	--	1436	--	3103	--	1007	--
Shear used for design (lbs)	--	-24 955	--	-1549 1096	--	-514 37	--
Shear at support node (lbs)	--	-203 1233	--	-1828 1275	--	-692 315	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-127	2891	-3736	1283	-197	0
Live Load Deflection (in)	-0.020"	--	0.054"	--	0.006"	--	-0.003"
Total Load Deflection (in)	-0.026"	--	0.069"	--	0.021"	--	-0.009"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ADJACENT span loading on support 1	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	1555	--	3094	--	1009	--
Loads to Supports (lbs)	--	1555	--	3094	--	1009	--
Shear used for design (lbs)	--	-37 962	--	-1542 1095	--	-515 37	--
Shear at support node (lbs)	--	-315 1240	--	-1820 1274	--	-694 315	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-197	2856	-3719	1289	-197	0
Live Load Deflection (in)	-0.019"	--	0.053"	--	0.006"	--	-0.003"
Total Load Deflection (in)	-0.025"	--	0.068"	--	0.021"	--	-0.009"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ADJACENT span loading on support 2	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	1366	--	3795	--	1366	--
Loads to Supports (lbs)	--	1366	--	3795	--	1366	--
Shear used for design (lbs)	--	-24 885	--	-1619 1619	--	-885 24	--
Shear at support node (lbs)	--	-203 1163	--	-1897 1897	--	-1163 203	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-127	2559	-4584	2559	-127	0
Live Load Deflection (in)	-0.015"	--	0.040"	--	0.040"	--	-0.015"
Total Load Deflection (in)	-0.021"	--	0.055"	--	0.055"	--	-0.021"

1.0 Dead + 0.75 Floor + 0.75 Snow (LDF = 1.15)

ADJACENT span loading on support 3	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	1009	--	3094	--	1555	--

Loads to Supports (lbs)	--	1009	--	3094	--	1555	--
Shear used for design (lbs)	--	-37 / 515	--	-1095 / 1542	--	-962 / 37	--
Shear at support node (lbs)	--	-315 / 694	--	-1274 / 1820	--	-1240 / 315	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-197	1289	-3719	2856	-197	0
Live Load Deflection (in)	-0.003"	--	0.006"	--	0.053"	--	-0.019"
Total Load Deflection (in)	-0.009"	--	0.021"	--	0.068"	--	-0.025"

1.0 Dead + 0.6 Wind (LDF = 1.6)

Loading On All Spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	878	--	2230	--	878	--
Loads to Supports (lbs)	--	878	--	2230	--	878	--
Shear used for design (lbs)	--	-22 / 528	--	-951 / 951	--	-528 / 22	--
Shear at support node (lbs)	--	-186 / 692	--	-1115 / 1115	--	-692 / 186	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-116	1493	-2686	1493	-116	0
Live Load Deflection (in)	-0.006"	--	0.017"	--	0.017"	--	-0.006"
Total Load Deflection (in)	-0.012"	--	0.032"	--	0.032"	--	-0.012"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ALTERNATE span loading on odd # spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	469	--	1655	--	834	--
Loads to Supports (lbs)	--	469	--	1655	--	834	--
Shear used for design (lbs)	--	-22 / 203	--	-512 / 899	--	-580 / 11	--
Shear at support node (lbs)	--	-186 / 283	--	-592 / 1063	--	-744 / 90	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-116	439	-1993	1805	-56	0
Live Load Deflection (in)	0.004"	--	-0.013"	--	0.029"	--	-0.010"
Total Load Deflection (in)	-0.002"	--	-0.005"	--	0.045"	--	-0.016"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ALTERNATE span loading on even # spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	834	--	1655	--	469	--
Loads to Supports (lbs)	--	834	--	1655	--	469	--
Shear used for design (lbs)	--	-11 / 580	--	-899 / 512	--	-203 / 22	--
Shear at support node (lbs)	--	-90 / 744	--	-1063 / 592	--	-283 / 186	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-56	1805	-1993	439	-116	0
Live Load Deflection (in)	-0.010"	--	0.029"	--	-0.013"	--	0.004"
Total Load Deflection (in)	-0.016"	--	0.045"	--	-0.005"	--	-0.002"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 1	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	936	--	1647	--	470	--
Loads to Supports (lbs)	--	936	--	1647	--	470	--
Shear used for design (lbs)	--	-22 / 586	--	-893 / 511	--	-204 / 22	--
Shear at support node (lbs)	--	-186 / 750	--	-1057 / 591	--	-284 / 186	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-116	1776	-1978	444	-116	0
Live Load Deflection (in)	-0.010"	--	0.029"	--	-0.013"	--	0.004"
Total Load Deflection (in)	-0.016"	--	0.044"	--	-0.005"	--	-0.002"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 2	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	775	--	2245	--	775	--
Loads to Supports (lbs)	--	775	--	2245	--	775	--
Shear used for design (lbs)	--	-11 / 520	--	-958 / 958	--	-520 / 11	--
Shear at support node (lbs)	--	-90 / 685	--	-1123 / 1123	--	-685 / 90	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-56	1519	-2716	1519	-56	0
Live Load Deflection (in)	-0.007"	--	0.017"	--	0.017"	--	-0.007"
Total Load Deflection (in)	-0.013"	--	0.033"	--	0.033"	--	-0.013"

1.0 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 3	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	470	--	1647	--	936	--
Loads to Supports (lbs)	--	470	--	1647	--	936	--
Shear used for design (lbs)	--	-22 / 204	--	-511 / 893	--	-586 / 22	--
Shear at support node (lbs)	--	-186 / 284	--	-591 / 1057	--	-750 / 186	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-116	444	-1978	1776	-116	0
Live Load Deflection (in)	0.004"	--	-0.013"	--	0.029"	--	-0.010"
Total Load Deflection (in)	-0.002"	--	-0.005"	--	0.044"	--	-0.016"

0.6 Dead + 0.6 Wind (LDF = 1.6)

Loading On All Spans	1' 3"	▲	12' 1 3/4"	▲	12' 1 3/4"	▲	1' 3"
Member Reaction (lbs)	--	708	--	1799	--	708	--
Loads to Supports (lbs)	--	708	--	1799	--	708	--
Shear used for design (lbs)	--	-18 / 426	--	-767 / 767	--	-426 / 18	--
Shear at support node (lbs)	--	-150 / 558	--	-899 / 899	--	-558 / 150	--
Shear at span point load (lbs)	N/A	--	N/A	--	N/A	--	N/A
Moment (Ft-lbs)	0	-94	1204	-2166	1204	-94	0
Live Load Deflection (in)	-0.006"	--	0.017"	--	0.017"	--	-0.006"

Total Load Deflection (in)	-0.010"	--		0.026"	--		0.026"	--		-0.010"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ALTERNATE span loading on odd # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	299		--	1223		--	664		--
Loads to Supports (lbs)	--	299		--	1223		--	664		--
Shear used for design (lbs)	--	-18	101	--	-328	715	--	-478	8	--
Shear at support node (lbs)	--	-150	149	--	-376	847	--	-610	54	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-94		163	-1473		1518	-34		0
Live Load Deflection (in)	0.004"	--		-0.013"	--		0.029"	--		-0.010"
Total Load Deflection (in)	0.000"	--		-0.007"	--		0.039"	--		-0.014"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ALTERNATE span loading on even # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	664		--	1223		--	299		--
Loads to Supports (lbs)	--	664		--	1223		--	299		--
Shear used for design (lbs)	--	-6	478	--	-715	328	--	-101	18	--
Shear at support node (lbs)	--	-54	610	--	-847	376	--	-149	150	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-34		1518	-1473		163	-94		0
Live Load Deflection (in)	-0.010"	--		0.029"	--		-0.013"	--		0.004"
Total Load Deflection (in)	-0.014"	--		0.039"	--		-0.007"	--		0.000"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 1	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	766		--	1216		--	300		--
Loads to Supports (lbs)	--	766		--	1216		--	300		--
Shear used for design (lbs)	--	-18	484	--	-709	327	--	-102	18	--
Shear at support node (lbs)	--	-150	616	--	-841	375	--	-150	150	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-94		1490	-1458		167	-94		0
Live Load Deflection (in)	-0.010"	--		0.029"	--		-0.013"	--		0.004"
Total Load Deflection (in)	-0.013"	--		0.038"	--		-0.007"	--		0.000"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 2	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	605		--	1814		--	605		--
Loads to Supports (lbs)	--	605		--	1814		--	605		--
Shear used for design (lbs)	--	-6	418	--	-774	774	--	-418	6	--
Shear at support node (lbs)	--	-54	551	--	-907	907	--	-551	54	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-34		1230	-2196		1230	-34		0
Live Load Deflection (in)	-0.007"	--		0.017"	--		0.017"	--		-0.007"
Total Load Deflection (in)	-0.010"	--		0.027"	--		0.027"	--		-0.010"

0.6 Dead + 0.6 Wind (LDF = 1.6)

ADJACENT span loading on support 3	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	300		--	1216		--	766		--
Loads to Supports (lbs)	--	300		--	1216		--	766		--
Shear used for design (lbs)	--	-18	102	--	-327	709	--	-484	18	--
Shear at support node (lbs)	--	-150	150	--	-375	841	--	-616	150	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-94		167	-1458		1490	-94		0
Live Load Deflection (in)	0.004"	--		-0.013"	--		0.029"	--		-0.010"
Total Load Deflection (in)	0.000"	--		-0.007"	--		0.038"	--		-0.013"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Snow (LDF = 1.6)

Loading On All Spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1827		--	4641		--	1827		--
Loads to Supports (lbs)	--	1827		--	4641		--	1827		--
Shear used for design (lbs)	--	-45	1098	--	-1978	1978	--	-1098	45	--
Shear at support node (lbs)	--	-387	1440	--	-2320	2320	--	-1440	387	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-242		3107	-5588		3107	-242		0
Live Load Deflection (in)	-0.020"	--		0.052"	--		0.052"	--		-0.020"
Total Load Deflection (in)	-0.026"	--		0.067"	--		0.067"	--		-0.026"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Snow (LDF = 1.6)

ALTERNATE span loading on odd # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1040		--	3534		--	1743		--
Loads to Supports (lbs)	--	1040		--	3534		--	1743		--
Shear used for design (lbs)	--	-45	474	--	-1135	1878	--	-1198	24	--
Shear at support node (lbs)	--	-387	653	--	-1314	2220	--	-1540	203	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-242		1075	-4256		3704	-127		0
Live Load Deflection (in)	0.000"	--		-0.013"	--		0.076"	--		-0.027"
Total Load Deflection (in)	-0.006"	--		0.013"	--		0.091"	--		-0.033"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Snow (LDF = 1.6)

ALTERNATE span loading on even # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1743		--	3534		--	1040		--

Loads to Supports (lbs)	--	1743		--	3534		--	1040		--
Shear used for design (lbs)	--	-24	1198	--	-1878	1135	--	-474	45	--
Shear at support node (lbs)	--	-203	1540	--	-2220	1314	--	-653	387	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-127		3704	-4256		1075	-242		0
Live Load Deflection (in)	-0.027"	--		0.076"	--		-0.013"	--		0.000"
Total Load Deflection (in)	-0.033"	--		0.091"	--		0.013"	--		-0.006"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Snow (LDF = 1.6)

ADJACENT span loading on support 1	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1939		--	3520		--	1043		--
Loads to Supports (lbs)	--	1939		--	3520		--	1043		--
Shear used for design (lbs)	--	-45	1210	--	-1866	1133	--	-477	45	--
Shear at support node (lbs)	--	-387	1552	--	-2208	1312	--	-656	387	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-242		3648	-4227		1085	-242		0
Live Load Deflection (in)	-0.026"	--		0.074"	--		-0.012"	--		0.000"
Total Load Deflection (in)	-0.032"	--		0.090"	--		0.013"	--		-0.006"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Snow (LDF = 1.6)

ADJACENT span loading on support 2	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1628		--	4669		--	1628		--
Loads to Supports (lbs)	--	1628		--	4669		--	1628		--
Shear used for design (lbs)	--	-24	1084	--	-1993	1993	--	-1084	24	--
Shear at support node (lbs)	--	-203	1426	--	-2335	2335	--	-1426	203	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-127		3156	-5646		3156	-127		0
Live Load Deflection (in)	-0.021"	--		0.053"	--		0.053"	--		-0.021"
Total Load Deflection (in)	-0.027"	--		0.068"	--		0.068"	--		-0.027"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Snow (LDF = 1.6)

ADJACENT span loading on support 3	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1043		--	3520		--	1939		--
Loads to Supports (lbs)	--	1043		--	3520		--	1939		--
Shear used for design (lbs)	--	-45	477	--	-1133	1866	--	-1210	45	--
Shear at support node (lbs)	--	-387	656	--	-1312	2208	--	-1552	387	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-242		1085	-4227		3648	-242		0
Live Load Deflection (in)	0.000"	--		-0.012"	--		0.074"	--		-0.026"
Total Load Deflection (in)	-0.006"	--		0.013"	--		0.090"	--		-0.032"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

Loading On All Spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	765		--	1943		--	765		--
Loads to Supports (lbs)	--	765		--	1943		--	765		--
Shear used for design (lbs)	--	-19	460	--	-828	828	--	-460	19	--
Shear at support node (lbs)	--	-162	603	--	-971	971	--	-603	162	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-101		1301	-2339		1301	-101		0
Live Load Deflection (in)	-0.005"	--		0.013"	--		0.013"	--		-0.005"
Total Load Deflection (in)	-0.011"	--		0.028"	--		0.028"	--		-0.011"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ALTERNATE span loading on odd # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	458		--	1511		--	732		--
Loads to Supports (lbs)	--	458		--	1511		--	732		--
Shear used for design (lbs)	--	-19	216	--	-499	789	--	-499	11	--
Shear at support node (lbs)	--	-162	296	--	-579	932	--	-642	90	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-101		506	-1819		1533	-56		0
Live Load Deflection (in)	0.003"	--		-0.010"	--		0.022"	--		-0.008"
Total Load Deflection (in)	-0.003"	--		0.007"	--		0.038"	--		-0.014"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ALTERNATE span loading on even # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	732		--	1511		--	458		--
Loads to Supports (lbs)	--	732		--	1511		--	458		--
Shear used for design (lbs)	--	-11	499	--	-789	499	--	-216	19	--
Shear at support node (lbs)	--	-90	642	--	-932	579	--	-296	162	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-56		1533	-1819		506	-101		0
Live Load Deflection (in)	-0.008"	--		0.022"	--		-0.010"	--		0.003"
Total Load Deflection (in)	-0.014"	--		0.038"	--		0.007"	--		-0.003"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ADJACENT span loading on support 1	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	809		--	1505		--	459		--
Loads to Supports (lbs)	--	809		--	1505		--	459		--
Shear used for design (lbs)	--	-19	503	--	-784	498	--	-217	19	--
Shear at support node (lbs)	--	-162	647	--	-926	578	--	-297	162	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-101		1511	-1808		510	-101		0
Live Load Deflection (in)	-0.007"	--		0.021"	--		-0.010"	--		0.003"

Total Load Deflection (in)	-0.013"	--		0.037"	--		0.007"	--		-0.003"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ADJACENT span loading on support 2	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	687		--	1954		--	687		--
Loads to Supports (lbs)	--	687		--	1954		--	687		--
Shear used for design (lbs)	--	-11	454	--	-834	834	--	-454	11	--
Shear at support node (lbs)	--	-90	597	--	-977	977	--	-597	90	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-56		1320	-2362		1320	-56		0
Live Load Deflection (in)	-0.005"	--		0.013"	--		0.013"	--		-0.005"
Total Load Deflection (in)	-0.011"	--		0.029"	--		0.029"	--		-0.011"

1.0 Dead + 0.45 Wind + 0.75 Floor + 0.75 Roof (LDF = 1.6)

ADJACENT span loading on support 3	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	459		--	1505		--	809		--
Loads to Supports (lbs)	--	459		--	1505		--	809		--
Shear used for design (lbs)	--	-19	217	--	-496	784	--	-503	19	--
Shear at support node (lbs)	--	-162	297	--	-576	928	--	-647	162	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-101		510	-1808		1511	-101		0
Live Load Deflection (in)	0.003"	--		-0.010"	--		0.021"	--		-0.007"
Total Load Deflection (in)	-0.003"	--		0.007"	--		0.037"	--		-0.013"

1.0 Dead + 1.0 Snow (LDF = 1.15)

Loading On All Spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1841		--	4677		--	1841		--
Loads to Supports (lbs)	--	1841		--	4677		--	1841		--
Shear used for design (lbs)	--	-46	1107	--	-1994	1994	--	-1107	46	--
Shear at support node (lbs)	--	-390	1451	--	-2338	2338	--	-1451	390	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-244		3131	-5631		3131	-244		0
Live Load Deflection (in)	-0.020"	--		0.052"	--		0.052"	--		-0.020"
Total Load Deflection (in)	-0.026"	--		0.068"	--		0.068"	--		-0.026"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ALTERNATE span loading on odd # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1202		--	3777		--	1773		--
Loads to Supports (lbs)	--	1202		--	3777		--	1773		--
Shear used for design (lbs)	--	-46	600	--	-1308	1912	--	-1188	28	--
Shear at support node (lbs)	--	-390	812	--	-1520	2257	--	-1533	240	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-244		1472	-4548		3614	-150		0
Live Load Deflection (in)	-0.004"	--		0.008"	--		0.072"	--		-0.026"
Total Load Deflection (in)	-0.010"	--		0.023"	--		0.087"	--		-0.032"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ALTERNATE span loading on even # spans	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1773		--	3777		--	1202		--
Loads to Supports (lbs)	--	1773		--	3777		--	1202		--
Shear used for design (lbs)	--	-28	1188	--	-1912	1308	--	-600	46	--
Shear at support node (lbs)	--	-240	1533	--	-2257	1520	--	-812	390	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-150		3614	-4548		1472	-244		0
Live Load Deflection (in)	-0.026"	--		0.072"	--		0.008"	--		-0.004"
Total Load Deflection (in)	-0.032"	--		0.087"	--		0.023"	--		-0.010"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ADJACENT span loading on support 1	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1932		--	3766		--	1204		--
Loads to Supports (lbs)	--	1932		--	3766		--	1204		--
Shear used for design (lbs)	--	-46	1198	--	-1903	1306	--	-602	46	--
Shear at support node (lbs)	--	-390	1542	--	-2247	1518	--	-814	390	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-244		3568	-4525		1480	-244		0
Live Load Deflection (in)	-0.025"	--		0.070"	--		0.008"	--		-0.004"
Total Load Deflection (in)	-0.031"	--		0.086"	--		0.023"	--		-0.010"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ADJACENT span loading on support 2	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1680		--	4700		--	1680		--
Loads to Supports (lbs)	--	1680		--	4700		--	1680		--
Shear used for design (lbs)	--	-28	1095	--	-2005	2005	--	-1095	28	--
Shear at support node (lbs)	--	-240	1440	--	-2350	2350	--	-1440	240	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-150		3171	-5678		3171	-150		0
Live Load Deflection (in)	-0.021"	--		0.053"	--		0.053"	--		-0.021"
Total Load Deflection (in)	-0.027"	--		0.069"	--		0.069"	--		-0.027"

1.0 Dead + 1.0 Snow (LDF = 1.15)

ADJACENT span loading on support 3	1' 3"	▲		12' 1 3/4"	▲		12' 1 3/4"	▲		1' 3"
Member Reaction (lbs)	--	1204		--	3766		--	1932		--

Loads to Supports (lbs)	--	1204		--	3766		--	1932		--
Shear used for design (lbs)	--	-46	602	--	-1308	1903	--	-1198	46	--
Shear at support node (lbs)	--	-390	814	--	-1518	2247	--	-1542	390	--
Shear at span point load (lbs)	N/A	--		N/A	--		N/A	--		N/A
Moment (Ft-lbs)	0	-244		1480	-4525		3568	-244		0
Live Load Deflection (in)	-0.004"	--		0.008"	--		0.070"	--		-0.025"
Total Load Deflection (in)	-0.010"	--		0.023"	--		0.086"	--		-0.031"

Appendix 2

LSSR410Z Simpson Strong-Tie Connector

HS Hanger Selector

Job List

Job	Model	Quantity	TF Fasteners	Face Fasteners	Joist Fasteners
716 Remington	LSSR410Z	1	-	(26) 0.162 x 2 1/2 Nail (N16)	(18) 0.162 x 2 1/2 Nail (N16)

Fastener Totals
(44) 0.162 x 2 1/2 Nail (N16)

716 Remington inputs

Input

Settings

Country	Connection Type
USA	Joist (Flush Top)

Job Settings

Hanger Type	Download Duration	Uplift Duration	Job ID	Quantity
All Types	Quake/Wind (160)	Quake/Wind (160)	716 Remington	1

Header

Member Type	Lumber Species	Width	Depth	Number of Plies	Member ID	Rough Lumber
Solid Sawn	DF (Douglas Fir)	6x (5 1/2")	12 (11 1/2")	1	Header 1	No

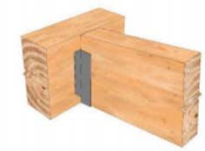
Joist

Member Type	Lumber Species	Width	Depth	Number of Plies	Member ID	Rough Lumber	Download (ASD)	Uplift (ASD)
Solid Sawn	DF (Douglas Fir)	4x (3 1/2")	12 (11 1/4")	1	Joist 1	No	570	478

Hanger Options

Skew Type	Skew (Degrees)	Slope Type	Slope (Degrees)	Open Closed Type	Top Flange Bend (Degrees)	Sloped Down Type	Top Flange Slope (Degrees)	Offset Direction	High, Low, Center Flush
No Skew	0	No Sloped	-7	Normal	0	No Sloped	0	Centered (No Offset)	Center

3D Model



716 Remington output

Output

Result

Show Optimized Models: Yes

	Model	Installed Cost	Width	Height	Bearing	TF Depth	TF Fasteners	Face Fasteners	Joist Fasteners	Download (lbs)	Uplift (lbs)
●	LSSR410Z	Lowest	3.563	8.938	1.875	-	-	(26) 0.162 x 2 1/2 Nail (N16)	(18) 0.162 x 2 1/2 Nail (N16)	3015	695
○	LSSR410Z	Lowest	3.563	8.938	1.875	-	-	(22) 0.162 x 2 1/2 Nail (N16)	(18) 0.162 x 2 1/2 Nail (N16)	2365	695
○	U410X SLU7	+25.00%	3.563	8.375	2	-	-	(14) 0.148 x 3 Nail (10d Common)	(6) 0.148 x 3 Nail (10d Common)	2600	730
○	U410X SLU7	+26.00%	3.563	8.375	2	-	-	(14) 0.148 x 1.5 Nail (N10)	(6) 0.148 x 3 Nail (10d Common)	2105	730
○	U410X SLU7	+26.00%	3.563	8.375	2	-	-	(14) 0.162 x 3 1/2 Nail (16d Common)	(6) 0.148 x 3 Nail (10d Common)	2900	730
○	HHUS48X SLU7	+42.00%	3.625	7.125	3	-	-	(22) 0.148 x 3 Nail (10d Common)	(8) 0.148 x 3 Nail (10d Common)	3310	1080
○	HHUS48X SLU7	+42.00%	3.625	7.125	3	-	-	(22) 0.162 x 3 1/2 Nail (16d Common)	(8) 0.162 x 3 1/2 Nail (16d Common)	3885	1265
○	U414X SLU7	+45.00%	3.563	10	2	-	-	(16) 0.148 x 3 Nail (10d Common)	(6) 0.148 x 3 Nail (10d Common)	2900	730
○	U414X SLU7	+46.00%	3.563	10	2	-	-	(16) 0.162 x 3 1/2 Nail (16d Common)	(6) 0.148 x 3 Nail (10d Common)	3000	730
○	U414X SLU7	+46.00%	3.563	10	2	-	-	(16) 0.148 x 1.5 Nail (N10)	(6) 0.148 x 3 Nail (10d Common)	2330	730

Table Notes

1. All loads are displayed in units of pounds and based on Allowable Stress Design
2. Click on the Models above to be taken to the product page for more information, refer to the current Wood Construction Connectors catalog for General Notes and Installation Instructions

Appendix 3

APT8 Simpson Strong-Tie Connector

PBS
Post-to-Beam Selector

Input

Cap Information

Cap Style	Orientation Of Post Straps
Mid-Beam Cap	Standard

Job Settings

Job Id	Quantity
718 Remington Street	1

Post

Post Type Species	Post Width	Post Thickness (W2)
Solid Sawn DF/SP	6x	6

Post Orientation **Lumber Finish**

☐ Rotate Post Orientation ☐ Rough Sawn

Beam

Type Species	Width (W1)	Height (H1)
Solid Sawn DF/SP	6x	10

Lumber Finish

☐ Rough Sawn

3D Model

Output

Result

Show Optimized Models: No

Models	Installed Cost	Uplift (160) (lb)[1,2]	Total Download (100) (lb)[1,2]	Lateral Loads (lb)[1,2]	Material / Coating[5]	Fastening Method[3]	Notes[2]
66T	Lowest	-	-	-	G90	Nails	This product is not load rated. Install in pairs
LPC6Z	+30%	920	-	885	ZMAX®	Nails	Loads apply only when used in pairs
PSQ218	+68%	2,815	-	-	Gray Paint	SDWH Screws	
AC6	+78%	2,815	-	2,075	G90	Nails/SD Screws	Loads apply only when used in pairs
PS218	+82%	1,740	-	-	Gray Paint	Machine Bolts	
BC6	+86%	1,185	-	1,825	G90	Nails	
128T	+124%	-	-	-	G90	Nails	This product is not load rated. Install in pairs
OS	+125%	1,565	-	-	PC Black	Machine Bolts	
PSQ418	+157%	3,045	-	-	Gray Paint	SDWH Screws	
PS418	+172%	1,740	-	-	Gray Paint	Machine Bolts	
APST412	+172%	850	-	-	ZMAX® with black powder coat	SDWS22312DB8 with STN22	Loads apply only when used in pairs. For single part installations, use half the listed values.
APVST412	+172%	850	-	-	ZMAX® with black powder coat	SDWS22312DB8 with STN22	Loads apply only when used in pairs. For single part installations, use half the listed values.
APVT4	+182%	1,330	-	1,015	ZMAX® with black powder coat	SDWS22312DB8 with STN22	Loads apply only when used in pairs. For single part installations, use half the listed values.
APT4	+182%	1,330	-	1,015	ZMAX® with black powder coat	SDWS22312DB8 with STN22	Loads apply only when used in pairs. For single part installations, use half the listed values.
APST612	+199%	1,505	-	-	ZMAX® with black powder coat	SDWS22312DB8 with STN22	Loads apply only when used in pairs. For single part installations, use half the listed values.
APVST610	+199%	1,505	-	-	ZMAX® with black powder coat	SDWS22312DB8 with STN22	Loads apply only when used in pairs. For single part installations, use half the listed values.
OHS	+239%	2,015	-	-	PC Black	Machine Bolts	
ACH6Z	+254%	4,045	-	2,640	ZMAX® with black powder coat	Nails/SD Screws	Loads apply only when used in pairs
PC6Z	+258%	1,480	-	1,260	ZMAX®	Nails/SD Screws	
CBT2Z-KT	+277%	2,020	6,890	750	ZMAX®	Dowel Pins or Machine Bolts	Values shown for standard installation of a continuous beam
HST2	+301%	5,220	-	-	Gray Paint	Machine Bolts	
CBT4Z-KT	+411%	4,215	18,140	1,655	ZMAX®	Dowel Pins or Machine Bolts	Values shown for standard installation of a continuous beam
APVT6	+417%	2,130	-	1,425	ZMAX® with black powder coat	SDWS22312DB8 with STN22	Loads apply only when used in pairs. For single part installations, use half the listed values.
APT6	+417%	2,130	-	1,426	ZMAX® with black powder coat	SDWS22312DB8 with STN22	Loads apply only when used in pairs. For single part installations, use half the listed values.
HST3	+439%	7,650	-	-	Gray Paint	Machine Bolts	

Models	Installed Cost	Uplift (160) (lb)[1,2]	Total Download (100) (lb)[1,2]	Lateral Loads (lb)[1,2]	Material / Coating[5]	Fastening Method[3]	Notes[2]
AC6SS	+673%	2,815	-	2,075	Stainless Steel	Nails/SD Screws	Loads apply only when used in pairs
OT	+717%	2,585	-	815	PC Black	Machine Bolts	Loads apply only when used in pairs
OHS135	+723%	5,045	-	-	PC Black	Machine Bolts	
HST6	+739%	15,425	-	-	Gray Paint	Machine Bolts	
HST5	+766%	10,650	-	-	Gray Paint	Machine Bolts	
1212HT	+998%	2,585	-	815	G90	Machine Bolts	Loads apply only when used in pairs
CC66	+1,015%	5,545	33,275	-	Gray Paint	Machine Bolts	Load depends on post size
CCQ66SDS2.5	+1,022%	6,785	33,275	-	Gray Paint	SDS Screws	Load depends on post size
1616HTQ	+1,056%	2,670	-	870	HDG	SDWH Screws	Loads apply only when used in pairs
OHS195	+1,117%	10,085	-	-	PC Black	Machine Bolts	
OHT	+1,259%	2,585	-	815	PC Black	Machine Bolts	Loads apply only when used in pairs
CCQ5X-SDS2.5 W1 = 5.5, W2 = 5.5	+1,262%	-	-	-	Available with Gray Paint (std), PC Black, HDG, or SS. Specify when ordering.	SDS Screws	Load depends on post size
CC66PC	+1,308%	5,545	33,275	-	PC Black	Machine Bolts	Load depends on post size
1616HT	+1,310%	2,585	-	815	G90	Machine Bolts	Loads apply only when used in pairs
CC6X W1 = 5.5, W2 = 5.5	+1,336%	-	-	-	Available with Gray Paint (std), PC Black, HDG, or SS. Specify when ordering.	Machine Bolts	Load depends on post size
CCQ6X-SDS2.5 W1 = 5.5, W2 = 5.5	+1,367%	-	-	-	Available with Gray Paint (std), PC Black, HDG, or SS. Specify when ordering.	SDS Screws	Load depends on post size
CC7X W1 = 5.5, W2 = 5.5	+1,471%	-	-	-	Available with Gray Paint (std), PC Black, HDG, or SS. Specify when ordering.	Machine Bolts	Load depends on post size
CC66HDG	+1,513%	5,545	33,275	-	HDG	Machine Bolts	Load depends on post size
CCQ66-SDS2.5HDG	+1,641%	6,785	33,275	-	HDG	SDS Screws	Load depends on post size
OCC66	+3,311%	4,040	30,250	-	PC Black	Machine Bolts	Load depends on post size
CCQ6XSS-SDS2.5 W1 = 5.5, W2 = 5.5	+7,533%	-	-	-	Stainless Steel	SDS Screws	Load depends on post size
CCQ66SS-SDS2.5	+7,731%	6,785	33,275	-	Stainless Steel	SDS Screws	Load depends on post size
CC66SS	-	5,545	33,275	-	Stainless Steel	Machine Bolts	Load depends on post size
CCQ5X-SDS2.5HDG W1 = 5.5, W2 = 5.5	-	-	-	-	HDG	SDS Screws	Load depends on post size
CCQ6X-SDS2.5HDG W1 = 5.5, W2 = 5.5	-	-	-	-	HDG	SDS Screws	Load depends on post size

Table Notes

1. DF/SP values shown.
2. Other loads and applicable notes can be viewed on individual product information pages.
3. Unless mentioned on the product information page, fasteners are not included.
4. Spliced beams per Designer.
5. Refer to General Corrosion Information for materials and coatings.

Appendix 4

MPBZ™ Moment Post Base

MPBZ™

Moment Post Base

The patent-pending MPBZ is specifically designed to provide moment resistance for columns or posts. An innovative overlapping sleeve design encapsulates the post, helping to resist rotation around its base. It is available for 4x4, 6x6 and 8x8 posts. The MPBZ is ideal for outdoor structures, such as carports, fences and decks. Built-in stand-off tabs provide the required 1" stand-off to resist decay of the post while eliminating multiple parts and assembly. Additionally, the MPBZ is available in ZMAX® as the standard finish to meet exposure conditions in many environments. For 10" stemwalls or round footings, see engineering letters, L-C-10MPBZ and L-C-MPBZ at **strongtie.com**.

Features:

- Internal top-of-concrete tabs
- 1" standoff tabs
- Additional holes provided to attach trim material
- Weep hole provided for water drainage

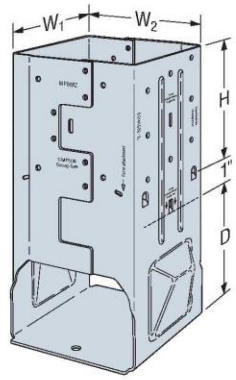
Material: 12 gauge

Finish: ZMAX coating

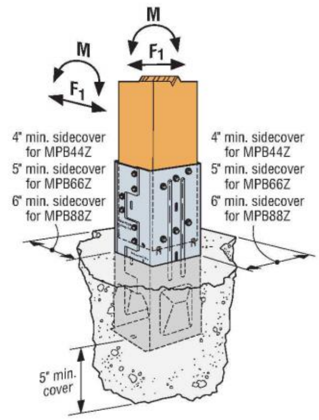
Installation:

- Use all specified fasteners; see General Notes.
- Install MPBZ before concrete is placed using embedment level indicators and form board attachment holes.
- Place post on tabs 1" above top of concrete.
- Install Strong-Drive® SDS Heavy-Duty Connector screws, which are supplied with the MPBZ. (Lag screws will not achieve the same load.)
- Concrete level inside the part must not exceed ¼" above embedment line to allow for water drainage.
- Annual inspection of connectors used in outdoor application is advised. If significant corrosion is apparent or suspected, then the wood, fasteners and connectors should be evaluated by a qualified engineer or inspector.

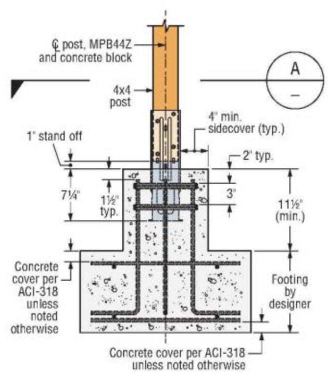
Codes: See p. 13 for Code Reference Key Chart



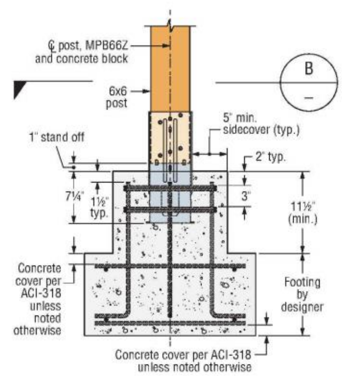
MPB88Z
(MPB44Z, MPB66Z similar)
US Patent 11,072,940



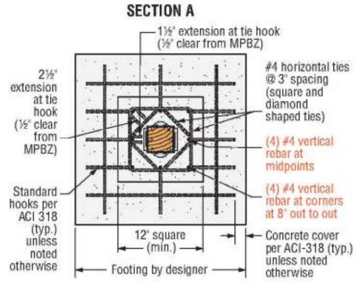
Typical MPB66Z Nonreinforced Installation
(others similar)



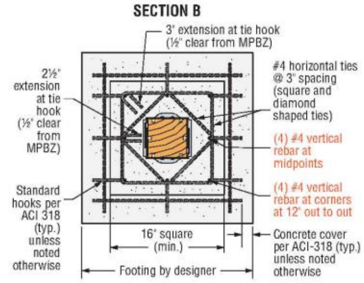
SECTION A



SECTION B



MPB44Z
Reinforced Concrete Footing
Footing (size and reinforcement) by designer. Standard hook geometry in accordance with ACI 318 unless noted otherwise.



MPB66Z
Reinforced Concrete Footing
Footing (size and reinforcement) by designer. Standard hook geometry in accordance with ACI 318 unless noted otherwise.

These reinforced MPBZ details are available on **strongtie.com/mpbz**.

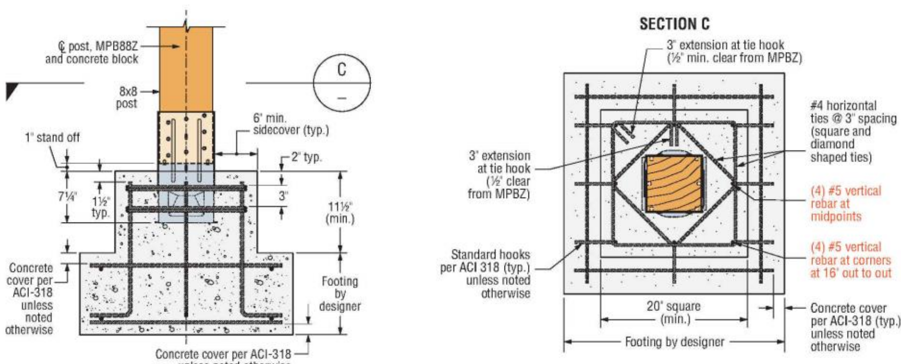
MPBZ™

Moment Post Base (cont.)

These products are available with additional corrosion protection. For more information, see p. 16.

Model No.	Nominal Column Size	Dimensions (in.) W1 / W2	D	H	Strong-Drive® SDS Screws	Concrete Allowable Loads: Uplift Uncracked	Uplift Cracked	Lateral F_1 Uncracked	Lateral F_1 Cracked	Moment M (ft.-lb.) Uncracked	Moment M (ft.-lb.) Cracked	Wood Assembly DF/SP Allowable Loads: Download (100)	Download (160)	Moment M (ft.-lb.) (160)	Rotational Stiffness (in.-lb./rad.)	Code Ref.
Nonreinforced Concrete																
Wind and Seismic Design Category A&B																
MPB44Z	4x4	3 1/16	7 1/4	7 1/4	(16) 1/4" x 2 1/2"	4,900	3,820	1,750	1,225	1,350	945	6,240	6,410	1,520	1,245,000	IBC®, FL, LA
MPB66Z	6x6	5 1/16	7 1/4	7 1/4	(24) 1/4" x 2 1/2"	5,815	5,815	3,435	2,405	2,680	1,875	9,360	10,855	3,730	2,405,000	
MPB88Z	8x8	7 1/16	7 1/4	7 1/4	(36) 1/4" x 3"	11,860	9,315	7,200	5,560	4,160	2,910	15,120	17,690	4,560	5,515,000	
Seismic Design Category C–F																
MPB44Z	4x4	3 1/16	7 1/4	7 1/4	(16) 1/4" x 2 1/2"	4,785	3,350	1,535	1,075	1,180	830	6,240	6,410	1,520	1,245,000	IBC, FL, LA
MPB66Z	6x6	5 1/16	7 1/4	7 1/4	(24) 1/4" x 2 1/2"	5,815	5,815	3,015	2,110	2,055	1,645	9,360	10,855	3,730	2,405,000	
MPB88Z	8x8	7 1/16	7 1/4	7 1/4	(36) 1/4" x 3"	10,155	8,165	6,965	4,875	3,470	2,550	15,120	17,690	4,560	5,515,000	
Reinforced Concrete																
Wind and Seismic Design Category A&B																
MPB44Z	4x4	3 1/16	7 1/4	7 1/4	(16) 1/4" x 2 1/2"	4,900	3,820	1,750	1,225	1,520	1,520	6,240	6,410	1,520	1,245,000	IBC, FL, LA
MPB66Z	6x6	5 1/16	7 1/4	7 1/4	(24) 1/4" x 2 1/2"	5,815	5,815	3,435	2,405	3,730	3,190	9,360	10,855	3,730	2,405,000	
MPB88Z	8x8	7 1/16	7 1/4	7 1/4	(36) 1/4" x 3"	11,860	9,315	7,200	5,560	4,560	4,560	15,120	17,690	4,560	5,515,000	
Seismic Design Category C–F																
MPB44Z	4x4	3 1/16	7 1/4	7 1/4	(16) 1/4" x 2 1/2"	4,785	3,350	1,535	1,075	1,520	1,520	6,240	6,410	1,520	1,245,000	IBC, FL, LA
MPB66Z	6x6	5 1/16	7 1/4	7 1/4	(24) 1/4" x 2 1/2"	5,815	5,815	3,015	2,110	3,350	2,795	9,360	10,855	3,730	2,405,000	
MPB88Z	8x8	7 1/16	7 1/4	7 1/4	(36) 1/4" x 3"	10,155	8,165	6,965	4,875	4,560	4,560	15,120	17,690	4,560	5,515,000	

1. Loads may not be increased for duration of load.
2. Higher download can be achieved by solidly packing grout in the 1" standoff area before installation of the post. Allowable download shall be based on either the wood post design or the concrete design calculated per code.
3. Concrete shall have a minimum compressive strength of f'_c = 2,500 psi.
4. Tabulated rotational stiffness accounts for the rotation of the base assembly attributable to deflection of the connector, fastener slip, and post deformation. Designer must account for additional deflection attributable to bending of the post.
5. Multiply seismic and wind ASD uplift and lateral load values by 1.43 or 1.67, respectively, to obtain LRFD capacities.
6. In accordance with IBC, Section 1613.1, detached one- and two-family dwellings in Seismic Design Category (SDC) C may use "Wind and SDC A&B" allowable loads.
7. Foundation dimensions are for anchorage only. Foundation design (size and reinforcement) by designer.
8. Allowable load shall be the lesser of the wood assembly or concrete allowable load.
9. For loading simultaneously in more than one direction, the allowable load must be evaluated using the following equation: (Design Uplift / Allowable Uplift, or Design Download / Allowable Download) + (Design Moment / Allowable Moment) + (Design Lateral / Allowable Lateral) ≤ 1.0.
10. To account for shrinkage up to 3%, multiply rotational stiffness by 0.75. Reduction may be linearly interpolated for shrinkage less than 3%.
11. Tabulated load values may be used for rough sawn lumber or larger size posts without reduction factors. Rough-size and larger-size posts shall be planed uniformly on all four sides such that centerline of post is concentric with the center line of MPBZ.



MPB88Z
Reinforced Concrete Footing

Footing (size and reinforcement) by designer. Standard hook geometry in accordance with ACI 318 unless noted otherwise.

Appendix 5

ENERCALC Design Report

AHZ Consulting Engineers Inc.

718 Remington FOUNDATION DESIGN

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 14 APR 2024, 10:09PM

Concrete Column

File: Case1.ec6

Lic. # : KW-06012537 AHZ Consulting Engineers

DESCRIPTION: Pile Footing Structural

Code References

Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10
Load Combinations Used : ASCE 7-16

General Information

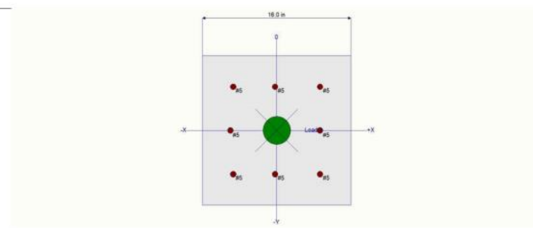
f'c : Concrete 28 day strength	=	3.0	ksi
E =	=	3,122.02	ksi
Density	=	150.0	pcf
β	=	0.850	
fy - Main Rebar	=	60.0	ksi
E - Main Rebar	=	29,000.0	ksi
Allow. Reinforcing Limits		*ASTM A615 Bars Used*	
Min. Reinf.	=	0.50	%
Max. Reinf.	=	8.0	%

Overall Column Height = 2.0 ft
End Fixity Top Pinned, Bottom Fixed
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 2.0 ft, K = 0.80
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 2.0 ft, K = 0.80

Column Cross Section

Column Dimensions : 16.0in Square Column, Column Edge to Rebar Edge Cover = 3.0in

Column Reinforcing : 4 - #5 bars @ corners,, 1 - #5 bars top & bottom between corner bars, 1 - #5 bars left & right between corner bars



Applied Loads

Entered loads are factored per load combinations specified by user.

Column self weight included : 533.33 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 2.0 ft above base, D = 0.7350, S = 2.10, W = 1.20 k
BENDING LOADS . . .
Lat. Point Load at 0.0 ft creating Mx-x, D = 0.080, S = 0.250, W = 0.140 k
Moment acting about Y-Y axisat 0.0 ft, D = 0.720, S = 2.250, W = 1.260 k-ft

DESIGN SUMMARY

Load Combination +1.20D+1.60S+0.50W
Location of max.above base 1.987 ft

Maximum Stress Ratio **0.013 : 1**
Ratio = (Pu^2+Mu^2)^.5 / (PhiPn^2+PhiMn^2)^.5

Pu =	5.482 k	φ * Pn =	413.544 k
Mu-x =	0.0 k-ft	φ * Mn-x =	-0.1976 k-ft
Mu-y =	0.0 k-ft	φ * Mn-y =	-0.07809 k-ft
Mu Angle =	0.0 deg		
Mu at Angle =	0.0 k-ft	φMn at Angle =	0.6409 k-ft

Pn & Mn values located at Pu-Mu vector intersection with capacity curve

Column Capacities . . .

Pnmax : Nominal Max. Compressive Axial Capacity	795.28 k
Pnmin : Nominal Min. Tension Axial Capacity	k
φ Pn, max : Usable Compressive Axial Capacity	413.544 k
φ Pn, min : Usable Tension Axial Capacity	k

Maximum SERVICE Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination :

Along X-X 0.0 in at 0.0 ft above base
for load combination :

General Section Information . φ = 0.650 β = 0.850 θ = 0.80

ρ : % Reinforcing	0.9688 % Rebar % Ok
Reinforcing Area	2.480 in^2
Concrete Area	256.0 in^2

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DESCRIPTION: Pile Footing Structural

Governing Load Combination Results

Governing Factored Load Combination	Moment X-X	Moment Y-Y	Dist. from base ft	Axial Load k Pu	φ * Pn	δ x	δ x * Mux	δ y	δ y * Muy	Bending Analysis k-ft Alpha (deg)	δ Mu	φ Mn	Utilization Ratio
+1.40D	Actual		1.99	1.78	413.54	1.000	0.00			0.000	0.00	0.64	**0.004**
+1.20D	Actual		1.99	1.52	413.54	1.000	0.00			0.000	0.00	0.64	**0.004**
+1.20D+0.50S	Actual		1.99	2.57	413.54	1.000	0.00			0.000	0.00	0.64	**0.006**
+1.20D+0.50W	Actual		1.99	2.12	413.54	1.000	0.00			0.000	0.00	0.64	**0.005**
+1.20D+1.60S	Actual		1.99	4.88	413.54	1.000	0.00			0.000	0.00	0.64	**0.012**
+1.20D+1.60S+0.50W	Actual		1.99	5.48	413.54	1.000	0.00			0.000	0.00	0.64	**0.013**
+1.20D+W	Actual		1.99	2.72	413.54	1.000	0.00			0.000	0.00	0.64	**0.007**
+1.20D+0.50S+W	Actual		1.99	3.77	413.54	1.000	0.00			0.000	0.00	0.64	**0.009**
+0.90D+W	Actual		1.99	2.34	413.54	1.000	0.00			0.000	0.00	0.64	**0.006**
+1.20D+0.20S	Actual		1.99	1.94	413.54	1.000	0.00			0.000	0.00	0.64	**0.005**
+0.90D	Actual		1.99	1.14	413.54	1.000	0.00			0.000	0.00	0.64	**0.003**

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Axial Reaction @ Base	My - End Moments k-ft @ Base	My - End Moments @ Top	Mx - End Moments @ Base	Mx - End Moments @ Top
D Only					1.268	0.000			
+D+S			0.000	0.000	3.368	0.000			
+D+0.750S					2.843	0.000			
+D+0.60W					1.988	0.000			
+D+0.450W					1.808	0.000			
+D+0.750S+0.450W			0.000	0.000	3.383	0.000			
+0.60D+0.60W					1.481	0.000			
+0.60D					0.761	0.000			
S Only					2.100	0.000			
W Only					1.200	0.000			

Maximum Moment Reactions

Note: Only non-zero reactions are listed.

Load Combination	Moment About X-X Axis @ Base	Moment About X-X Axis @ Top		Moment About Y-Y Axis @ Base	Moment About Y-Y Axis @ Top	
D Only	0.000		k-ft			k-ft
+D+S	0.000		k-ft			k-ft
+D+0.750S	0.000		k-ft			k-ft
+D+0.60W	0.000		k-ft			k-ft
+D+0.450W	0.000		k-ft			k-ft
+D+0.750S+0.450W	0.000		k-ft			k-ft
+0.60D+0.60W	0.000		k-ft			k-ft
+0.60D	0.000		k-ft			k-ft
S Only	0.000		k-ft			k-ft
W Only	0.000		k-ft			k-ft

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+S	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.750S	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.60W	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.450W	0.0000	in	0.000	ft	0.000	in	0.000	ft
+D+0.750S+0.450W	0.0000	in	0.000	ft	0.000	in	0.000	ft
+0.60D+0.60W	0.0000	in	0.000	ft	0.000	in	0.000	ft
+0.60D	0.0000	in	0.000	ft	0.000	in	0.000	ft
S Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
W Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

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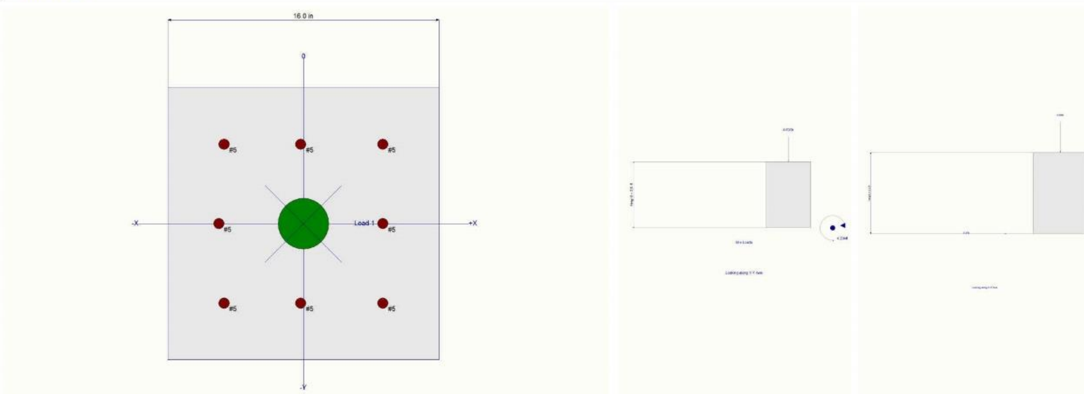
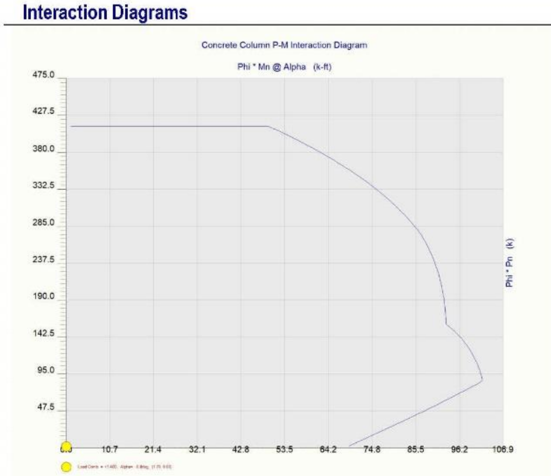
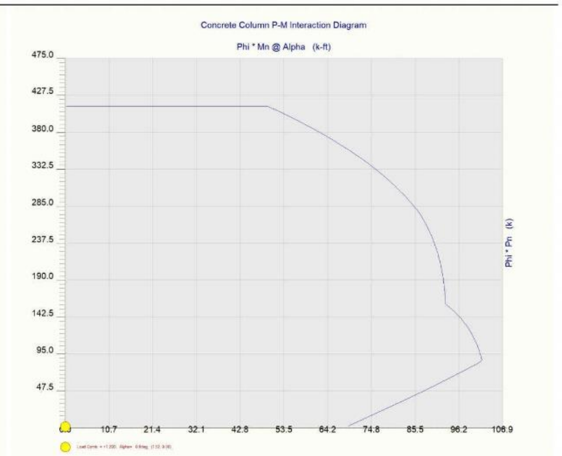
Sketches



Interaction Diagrams





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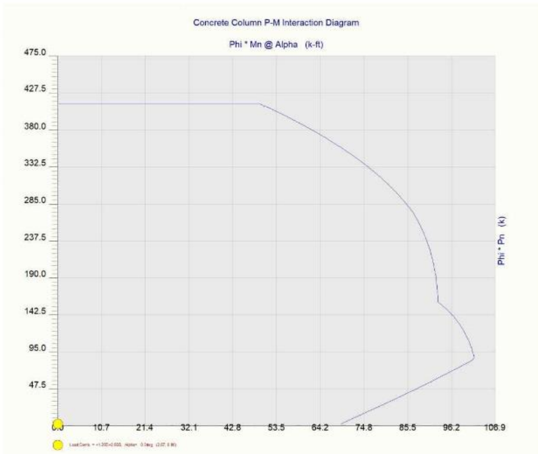

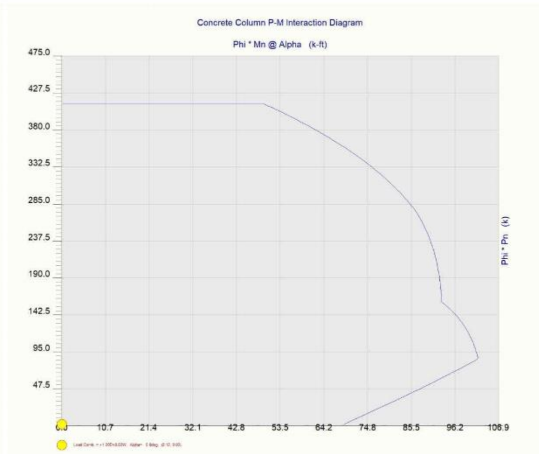

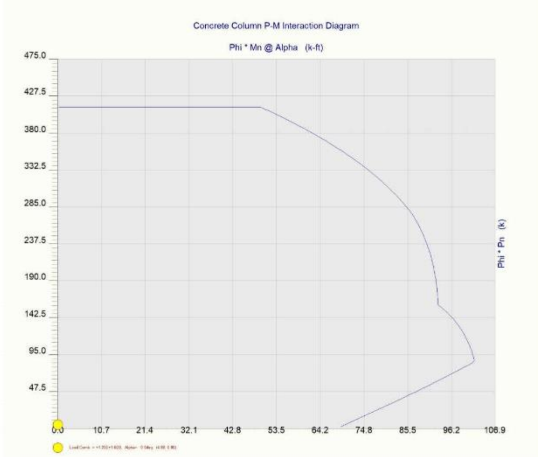

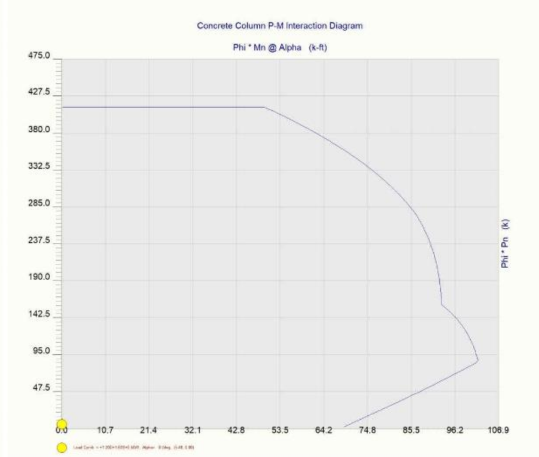

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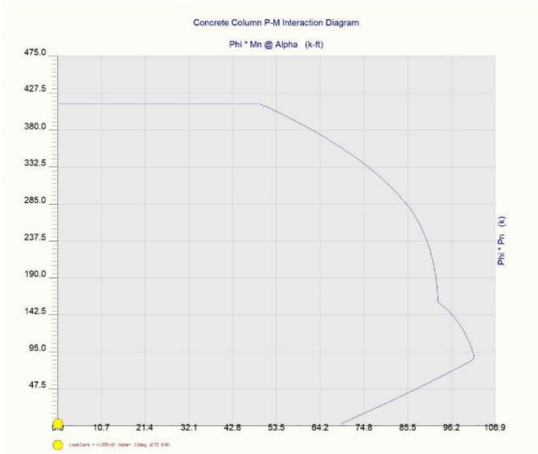

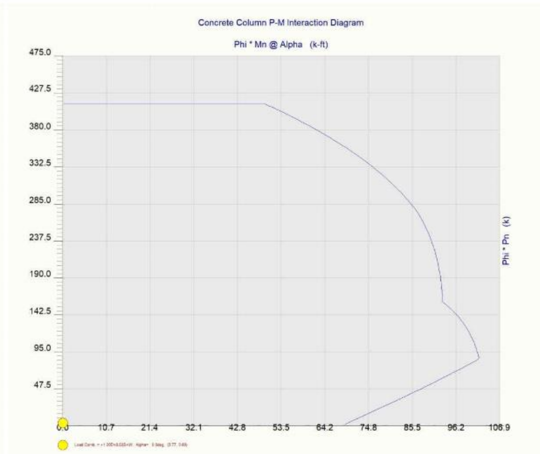

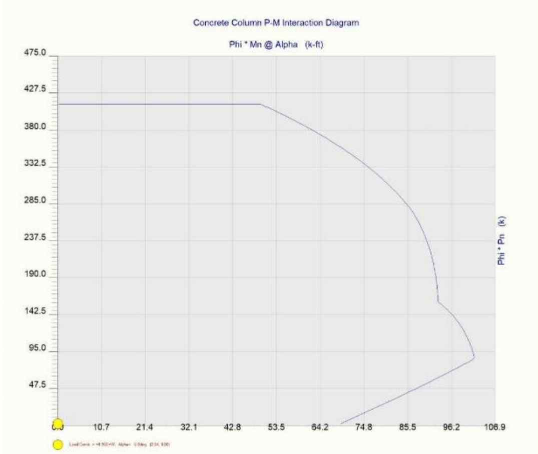

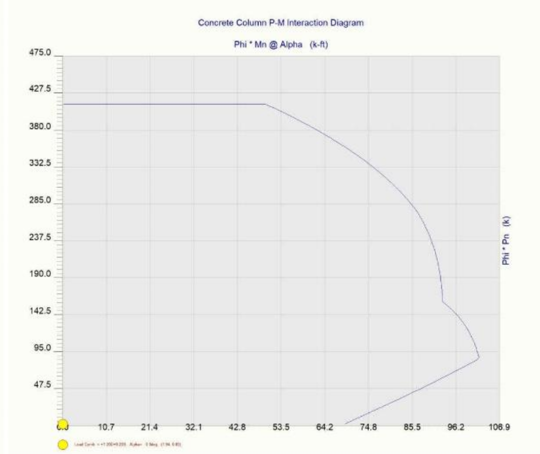

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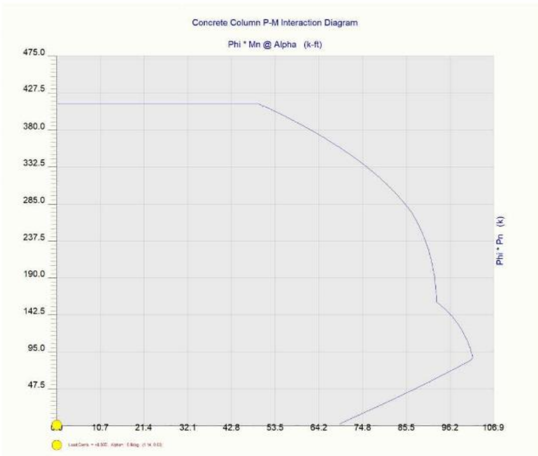

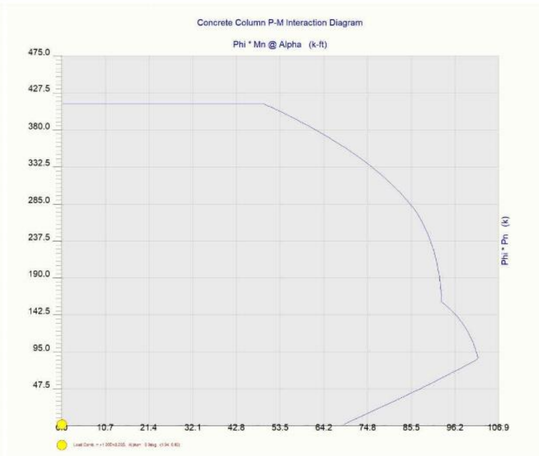

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General Footing

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DESCRIPTION: Solar Pergola

Code References

Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.02 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	Yes
Use Pedestal wt for stability, mom & shear	:	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

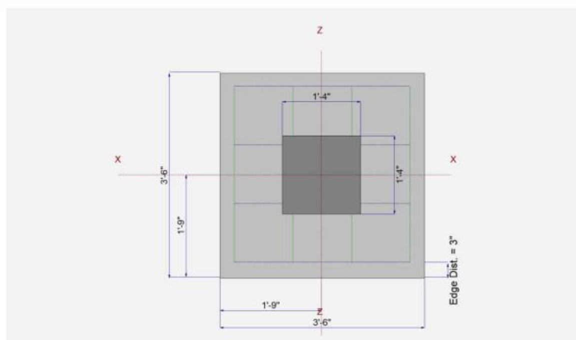
Footing base depth below soil surface	=	2.50 ft
Allow press. increase per foot of depth	=	ksf
when footing base is below	=	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

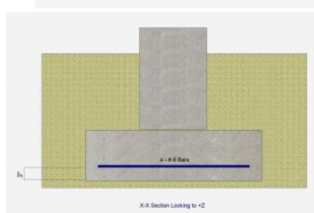
Dimensions

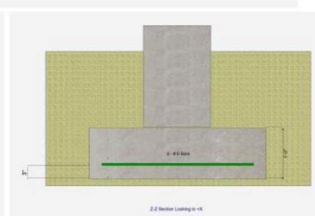
Width parallel to X-X Axis	=	3.50 ft
Length parallel to Z-Z Axis	=	3.50 ft
Footing Thickness	=	12.0 in
Pedestal dimensions...		
px : parallel to X-X Axis	=	16.0 in
pz : parallel to Z-Z Axis	=	16.0 in
Height	=	24.0 in
Rebar Centerline to Edge of Concrete...		
at Bottom of footing	=	3.0 in



Reinforcing

Bars parallel to X-X Axis		
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 6
Bars parallel to Z-Z Axis		
Number of Bars	=	4
Reinforcing Bar Size	=	# 6
Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		n/a
# Bars required within zone		n/a
# Bars required on each side of zone		n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	0.7350			2.10	1.20			k
OB : Overburden	=								ksf
M-xx	=	0.720			2.250	1.260			k-ft
M-zz	=								k-ft
V-x	=	0.080			0.250	0.140			k
V-z	=								k

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DESCRIPTION: Solar Pergola

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.740	Soil Bearing	1.110 ksf	1.50 ksf	+D+0.750S+0.450W
PASS	4.039	Overturning - X-X	2.970 k-ft	11.996 k-ft	+D+S
PASS	12.117	Overturning - Z-Z	0.990 k-ft	11.996 k-ft	+D+S
PASS	11.531	Sliding - X-X	0.3305 k	3.811 k	+D+0.750S+0.450W
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.04886	Z Flexure (+X)	0.9406 k-ft/ft	19.250 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.03637	Z Flexure (-X)	0.7001 k-ft/ft	19.250 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.04972	X Flexure (+Z)	0.9571 k-ft/ft	19.250 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.03637	X Flexure (-Z)	0.7001 k-ft/ft	19.250 k-ft/ft	+1.20D+1.60S+0.50W
PASS	0.06431	1-way Shear (+X)	5.284 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.04597	1-way Shear (-X)	3.777 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.06763	1-way Shear (+Z)	5.556 psi	82.158 psi	+1.20D+1.60S+0.50W
PASS	0.01851	1-way Shear (-Z)	1.521 psi	82.158 psi	+1.40D
PASS	0.04190	2-way Punching	6.884 psi	164.317 psi	+1.20D+1.60S+0.50W

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location: Bottom Left	Top Left	Top Right	Bottom Right	Actual / Allow Ratio
, D Only								0.000
, 71.6 deg CCW	1.50	0.6057	1.817	0.4546	0.2551	0.3216	0.5211	0.347
, +D+S								0.000
, 71.6 deg CCW	1.50	1.733	5.199	0.8339	0.01094	0.2853	1.108	0.739
, +D+0.750S								0.000
, 71.6 deg CCW	1.50	1.521	4.564	0.7391	0.07199	0.2944	0.9614	0.641
, +D+0.60W								0.000
, 71.6 deg CCW	1.50	1.078	3.235	0.5832	0.1743	0.3106	0.7196	0.480
, +D+0.450W								0.000
, 71.6 deg CCW	1.50	0.9723	2.917	0.5511	0.1945	0.3134	0.670	0.447
, +D+0.750S+0.450W								0.000
, 71.6 deg CCW	1.50	1.732	5.196	0.8355	0.01134	0.2861	1.110	0.740
, +0.60D+0.60W								0.000
, 71.6 deg CCW	1.50	1.330	3.990	0.4014	0.07221	0.1819	0.5111	0.341
, +0.60D								0.000
, 71.6 deg CCW	1.50	0.6057	1.817	0.2728	0.1531	0.1930	0.3127	0.209

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	0.720 k-ft	8.321 k-ft	11.557	OK
X-X, +D+S	2.970 k-ft	11.996 k-ft	4.039	OK
X-X, +D+0.750S	2.408 k-ft	11.077 k-ft	4.601	OK
X-X, +D+0.60W	1.476 k-ft	9.581 k-ft	6.491	OK
X-X, +D+0.450W	1.287 k-ft	9.266 k-ft	7.20	OK
X-X, +D+0.750S+0.450W	2.975 k-ft	12.022 k-ft	4.042	OK
X-X, +0.60D+0.60W	1.188 k-ft	6.252 k-ft	5.263	OK
X-X, +0.60D	0.4320 k-ft	4.992 k-ft	11.557	OK
Z-Z, D Only	0.240 k-ft	8.321 k-ft	34.670	OK
Z-Z, +D+S	0.990 k-ft	11.996 k-ft	12.117	OK
Z-Z, +D+0.750S	0.8025 k-ft	11.077 k-ft	13.803	OK
Z-Z, +D+0.60W	0.4920 k-ft	9.581 k-ft	19.473	OK
Z-Z, +D+0.450W	0.4290 k-ft	9.266 k-ft	21.599	OK
Z-Z, +D+0.750S+0.450W	0.9915 k-ft	12.022 k-ft	12.125	OK
Z-Z, +0.60D+0.60W	0.3960 k-ft	6.252 k-ft	15.789	OK
Z-Z, +0.60D	0.1440 k-ft	4.992 k-ft	34.670	OK

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DESCRIPTION: Solar Pergola

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
X-X, D Only	0.080 k	3.176 k	39.705	OK
X-X, +D+S	0.330 k	3.806 k	11.535	OK
X-X, +D+0.750S	0.2675 k	3.649 k	13.641	OK
X-X, +D+0.60W	0.1640 k	3.392 k	20.685	OK
X-X, +D+0.450W	0.1430 k	3.338 k	23.346	OK
X-X, +D+0.750S+0.450W	0.3305 k	3.811 k	11.531	OK
X-X, +0.60D+0.60W	0.1320 k	2.822 k	21.378	OK
X-X, +0.60D	0.0480 k	2.606 k	54.289	OK
Z-Z, D Only	0.0 k	3.176 k	No Sliding	OK
Z-Z, +D+S	0.0 k	3.806 k	No Sliding	OK
Z-Z, +D+0.750S	0.0 k	3.649 k	No Sliding	OK
Z-Z, +D+0.60W	0.0 k	3.392 k	No Sliding	OK
Z-Z, +D+0.450W	0.0 k	3.338 k	No Sliding	OK
Z-Z, +D+0.750S+0.450W	0.0 k	3.811 k	No Sliding	OK
Z-Z, +0.60D+0.60W	0.0 k	2.822 k	No Sliding	OK
Z-Z, +0.60D	0.0 k	2.606 k	No Sliding	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.4212	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.40D	0.3726	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D	0.3610	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D	0.3193	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+0.50S	0.5133	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+0.50S	0.4173	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+0.50W	0.4469	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+0.50W	0.3748	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+1.60S	0.8655	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+1.60S	0.6444	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+1.60S+0.50W	0.9571	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+1.60S+0.50W	0.7001	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+W	0.5327	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+W	0.4303	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+0.50S+W	0.6850	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+0.50S+W	0.5283	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +0.90D+W	0.4425	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +0.90D+W	0.3504	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+0.20S	0.4219	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +1.20D+0.20S	0.3585	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +0.90D	0.2708	+Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
X-X, +0.90D	0.2395	-Z	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.40D	0.3726	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.40D	0.4181	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D	0.3193	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D	0.3584	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+0.50S	0.4173	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+0.50S	0.5072	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+0.50W	0.3748	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+0.50W	0.4423	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+1.60S	0.6444	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+1.60S	0.8510	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+1.60S+0.50W	0.7001	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+1.60S+0.50W	0.9406	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+W	0.4303	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+W	0.5262	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+0.50S+W	0.5283	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+0.50S+W	0.6751	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +0.90D+W	0.3504	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +0.90D+W	0.4367	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+0.20S	0.3585	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +1.20D+0.20S	0.4179	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK
Z-Z, +0.90D	0.2395	-X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK

AHZ Consulting Engineers Inc.

718 Remington FOUNDATION DESIGN

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 14 APR 2024, 9:59PM

General Footing

File: Case1.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24
Lic. # : KW-06012537
AHZ Consulting Engineers

DESCRIPTION: Solar Pergola

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +0.90D	0.2688	+X	Bottom	0.2592	Min Temp %	0.5029	19.250	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	2.04 psi	2.33 psi	1.52 psi	2.38 psi	2.38 psi	82.16 psi	0.03	OK
+1.20D	1.75 psi	1.99 psi	1.30 psi	2.04 psi	2.04 psi	82.16 psi	0.02	OK
+1.20D+0.50S	2.27 psi	2.83 psi	1.25 psi	2.93 psi	2.93 psi	82.16 psi	0.04	OK
+1.20D+0.50W	2.05 psi	2.47 psi	1.28 psi	2.54 psi	2.54 psi	82.16 psi	0.03	OK
+1.20D+1.60S	3.48 psi	4.78 psi	1.03 psi	5.02 psi	5.02 psi	82.16 psi	0.06	OK
+1.20D+1.60S+0.50W	3.78 psi	5.28 psi	0.99 psi	5.56 psi	5.56 psi	82.16 psi	0.07	OK
+1.20D+W	2.34 psi	2.94 psi	1.25 psi	3.05 psi	3.05 psi	82.16 psi	0.04	OK
+1.20D+0.50S+W	2.86 psi	3.78 psi	1.19 psi	3.95 psi	3.95 psi	82.16 psi	0.05	OK
+0.90D+W	1.90 psi	2.44 psi	0.92 psi	2.54 psi	2.54 psi	82.16 psi	0.03	OK
+1.20D+0.20S	1.96 psi	2.33 psi	1.28 psi	2.40 psi	2.40 psi	82.16 psi	0.03	OK
+0.90D	1.31 psi	1.50 psi	0.98 psi	1.53 psi	1.53 psi	82.16 psi	0.02	OK

All units k

Two-Way "Punching" Shear

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	4.73 psi	164.32 psi	0.02881	OK
+1.20D	4.06 psi	164.32 psi	0.02469	OK
+1.20D+0.50S	4.80 psi	164.32 psi	0.02924	OK
+1.20D+0.50W	4.48 psi	164.32 psi	0.02729	OK
+1.20D+1.60S	6.45 psi	164.32 psi	0.03925	OK
+1.20D+1.60S+0.50W	6.88 psi	164.32 psi	0.0419	OK
+1.20D+W	4.91 psi	164.32 psi	0.02989	OK
+1.20D+0.50S+W	5.66 psi	164.32 psi	0.03443	OK
+0.90D+W	3.90 psi	164.32 psi	0.02371	OK
+1.20D+0.20S	4.36 psi	164.32 psi	0.02651	OK
+0.90D	3.04 psi	164.32 psi	0.01852	OK

Appendix 6

Strong-Bolt Machine Bolt

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 3.2.2311.2

Company:	AHZ Consulting Engineers, In	Date:	4/8/2024
Engineer:		Page:	1/5
Project:	718 Remington Street		
Address:			
Phone:			
E-mail:			

1.Project information

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.500
Nominal Embedment depth (inch): 3.250
Effective Embedment depth, h_{ef} (inch): 2.350
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 5.00
c_{ac} (inch): 3.56
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 5.00
State: Cracked
Compressive strength, f'_c (psi): 4000
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 5.00 x 5.00 x 0.25

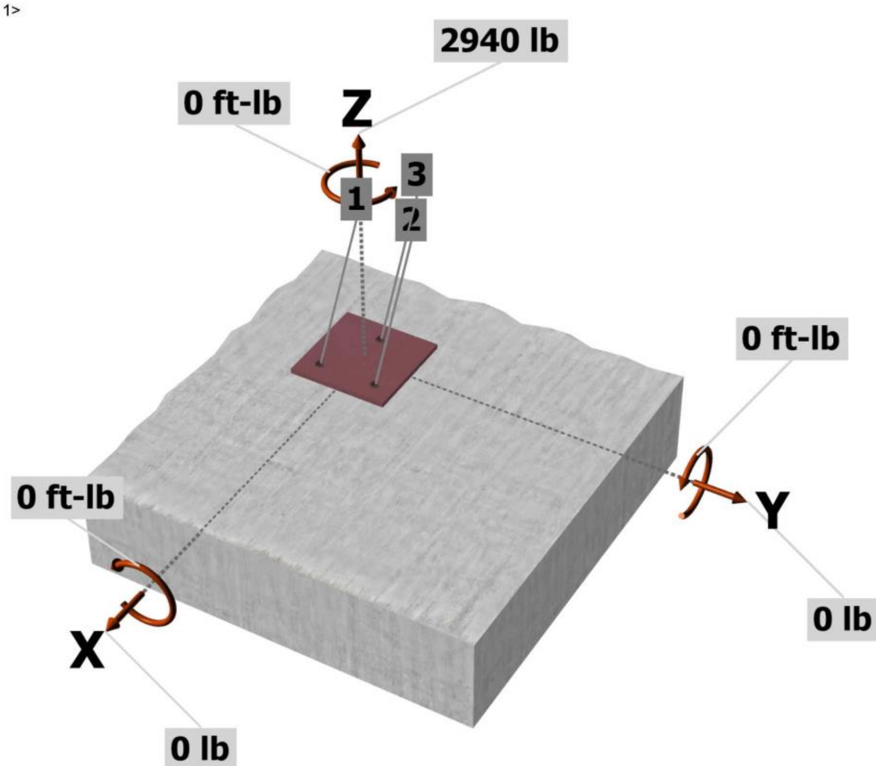
Recommended Anchor
Anchor Name: Titen HD® - 1/2"Ø Titen HD, hnom:3.25" (83mm)
Code Report: ICC-ES ESR-2713

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

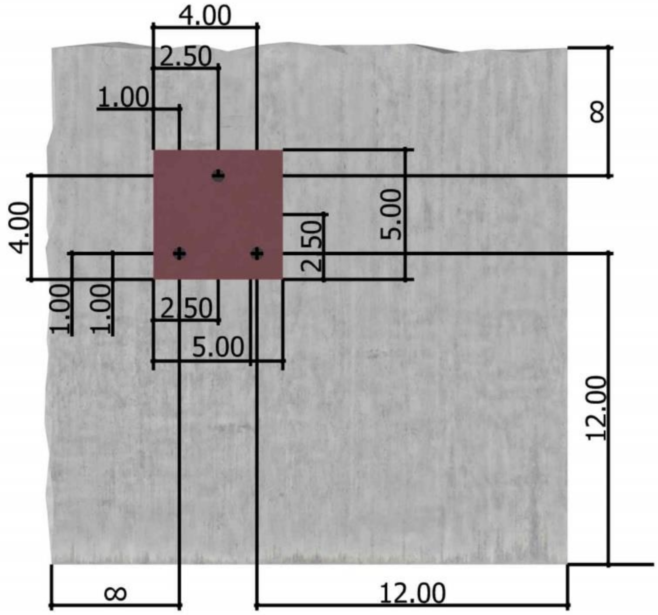
N_{ua} [lb]: 2940
V_{uax} [lb]: 0
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



Company:	AHZ Consulting Engineers, In	Date:	4/8/2024
Engineer:		Page:	3/5
Project:	718 Remington Street		
Address:			
Phone:			
E-mail:			

<Figure 2>



SIMPSON Strong-Tie®

Anchor Designer™
Software
Version 3.2.2311.2

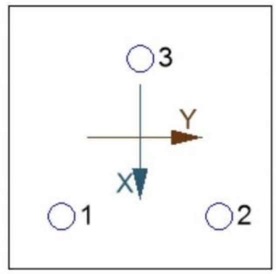
Company:	AHZ Consulting Engineers, In	Date:	4/8/2024
Engineer:		Page:	4/5
Project:	718 Remington Street		
Address:			
Phone:			
E-mail:			

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	735.7	0.0	0.0	0.0
2	735.7	0.0	0.0	0.0
3	1468.6	0.0	0.0	0.0
Sum	2940.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2940
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.50

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
20130	0.65	13085

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	4000	2.350	3873

$\phi N_{cbg} = \phi\,(A_{Nc} / A_{Nco})\,\Psi_{ec,N}\,\Psi_{ed,N}\,\Psi_{c,N}\,\Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1b)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
92.00	49.70	12.00	0.876	1.000	1.00	1.000	3873	0.65	4083

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.6)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	1469	13085	0.11	Pass
Concrete breakout	**2940**	**4083**	**0.72**	**Pass (Governs)**

1/2"Ø Titen HD, hnom:3.25" (83mm) meets the selected design criteria.

Company:	AHZ Consulting Engineers, In	Date:	4/8/2024
Engineer:		Page:	5/5
Project:	718 Remington Street		
Address:			
Phone:			
E-mail:			

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

GENERAL:
- STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH JOB SPECIFICATIONS AND ARCHITECTURAL, MECHANICAL, ELECTRICAL, PLUMBING, AND SITE DRAWINGS.
- DIMENSIONS AND CONDITIONS ST BE VERIFIED IN THE FIELD. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH THE AFFECTED PART OF THE WORK.
- DO NOT SCALE DRAWINGS TO OBTAIN DIMENSIONAL INFORMATION.
- AT ALL TIMES THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE CONDITIONS OF THE JOBSITE INCLUDING SAFETY OF PERSONS AND PROPERTY.
- ENGINEERS' PRESENCE OR REVIEW OF WORK DOES NOT INCLUDE THE ADEQUACY OF THE CONTRACTORS' MEANS OR METHODS OF CONSTRUCTION.
- SHORING, BRACING AND PROTECTION OF EXISTING AND ADJACENT STRUCTURES DURING CONSTRUCTION IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- PROTECT AND MAINTAIN THE INTEGRITY OF ADJACENT STREETS, BUILDINGS AND ALL OTHER STRUCTURES.
- THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE STRUCTURE IS COMPLETE.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ERECTION PROCEDURES AND SEQUENCE TO INSURE SAFETY OF THE BUILDING AND ITS COMPONENTS DURING ERECTION. THIS INCLUDES THE ADDITION OF NECESSARY SHORING, SHEETING, TEMPORARY BRACING, GUYS OR TIEDOWNS.
- THE CONTRACTOR IS SOLELY RESPONSIBLE FOR INITIATING, MAINTAINING AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK.
- THE ENGINEER OF RECORD IS NOT RESPONSIBLE FOR ANY MEANS AND METHODS OF CONSTRUCTION OR FOR ANY RELATED SAFETY PRECAUTIONS OR PROGRAMS.

DESIGN LOADS:
THE STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH THE IBC2021, ASCE 7-16, AND NDS 2018 CODE AND APPLICABLE REFERENCE STANDARDS.
- THE FOLLOWING SUPERIMPOSED LOADINGS HAVE BEEN UTILIZED:

- CONTRACTOR PROPOSED CHANGES AND SUBSTITUTIONS:
- PROPOSED CHANGES OR SUBSTITUTIONS TO STRUCTURAL DETAILS OR PLANS SHALL BE SUBMITTED TO A.ZANDIEH@AHZENGINEERS.COM TO THE AHZ CONSULTING ENGINEERING , INC FOR REVIEW AND APPROVAL.
- SUBMITTALS SHALL CONTAIN FULL DOCUMENTATION OF CHANGES OR SUBSTITUTIONS WITH SUPPORTING, SEALED CALCULATIONS (WHERE APPLICABLE).
- THE REVIEW OF CHANGES AND SUBSTITUTIONS, RE-ANALYSIS AND/OR RE-DRAFTING TO INCORPORATE CHANGES OR SUBSTITUTIONS INTO CONTRACT DOCUMENTS ARE ADDITIONAL SERVICES FOR THE EOR.
- CONSTRUCTION COST REVISIONS ARE BETWEEN THE CONTRACTOR AND OWNER AND ARE NOT REVIEWED BY AHZ CONSULTING ENGINEERING , INC.

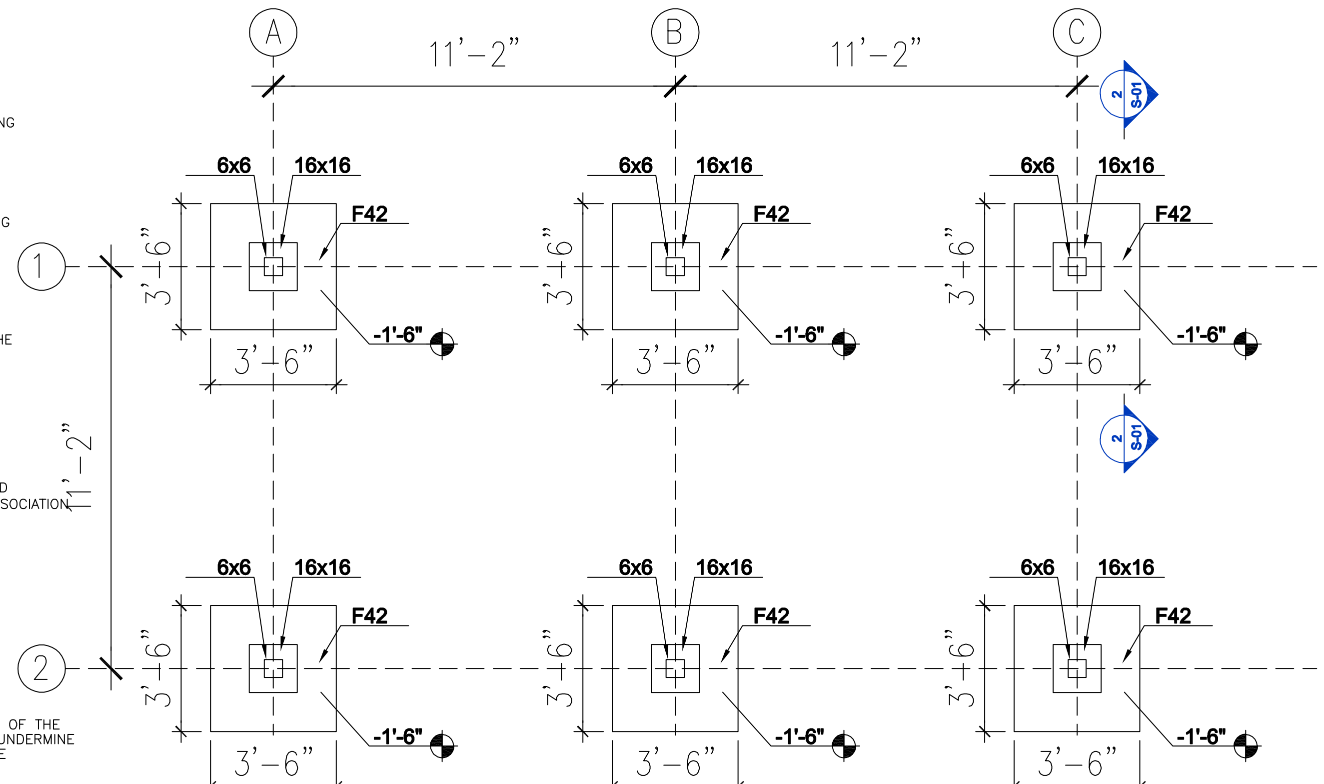
WOOD:
- STRUCTURAL WOOD COMPONENTS (BEAMS, JOISTS, RAFTERS, ETC.) SHALL HAVE THE FOLLOWING MINIMUM ALLOWABLE FIBER STRESSES OF NO. 1 SOUTHERN PINE CONFORMING TO THE LATEST EDITION OF NDS, AS FOLLOWS:
  - SHEAR Fv 175 psi
  - BENDING 2X4 Fb 1,100 psi
  - BENDING 2X6 Fb 1,000 psi
  - BENDING 2X8 Fb 925 psi
  - BENDING 2X10 Fb 800 psi
  - BENDING 2X12 Fb 750 psi
- AS SHOWN ON STRUCTURAL DRAWINGS, ALL WOOD MEMBERS SHALL BE PROTECTED
- OR PRESSURETREATED IN ACCORDANCE WITH AMERICAN WOOD – PRESERVERS' ASSOCIATION STANDARDS.
- MEMBER SIZES SHOWN ARE NOMINAL UNLESS NOTED OTHERWISE.
- SUBSTITUTIONS ARE ACCEPTABLE WITH THE APPROVAL OF THE STRUCTURAL ENGINEER.
- UNLESS SHOWN OTHERWISE, INSTALL SIZE AND NUMBER OF FASTENERS SHOWN IN LATEST SIMPSON CATALOG.
- SEE TABLE FOR REQUIRED CONNECTOR MATERIAL AND FINISHES BASED ON APPLICATION.

FOUNDATIONS:
- DEWATERING OF THE SITE DURING CONSTRUCTION IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. PRECAUTIONS SHALL BE TAKEN BY THE CONTRACTOR NOT TO UNDERMINE EXISTING FOUNDATIONS. METHOD OF DEWATERING AND CALCULATIONS FOR THE APPROPRIATE SYSTEM ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- ALL SOIL BEARING SURFACES SHALL BE INSPECTED AND APPROVED BY A GEOTECHNICAL ENGINEER IMMEDIATELY PRIOR TO THE PLACEMENT OF CONCRETE.
- ARE DESIGNED FOR AN ALLOWABLE SOIL BEARING PRESSURE OF 1,5000 psf ON COMPACTED FILL.
- BEFORE CONSTRUCTION COMMENCES, SOIL BEARING CAPACITY SHALL BE VERIFIED BY A SUBSURFACE INVESTIGATION, AS WELL AS FIELD AND LABORATORY TESTS PERFORMED BY A CERTIFIED TESTING LABORATORY, WHOSE REPORT SHALL INCLUDE ANALYSIS AND RECOMMENDATIONS FOR SITE PREPARATION IN ORDER TO BEAR THE FOUNDATION LOADS.

CONCRETE:
- SHALL BE PER AN APPROVED MIX DESIGN PROPORTIONED TO ACHIEVE A STRENGTH AT 28 DAYS AS LISTED BELOW WITH A PLASTIC AND WORKABLE MIX:
  - 3000 psi FOR FOUNDATIONS AND SLABS ON GRADE.
- CONCRETE SHALL BE PLACED AND CURED ACCORDING TO ACI STANDARDS AND SPECIFICATIONS.
- SUBMIT PROPOSED MIX DESIGN WITH RECENT FIELD CYLINDER OR LAB TESTS FOR REVIEW PRIOR TO USE.
- MIX SHALL BE UNIQUELY IDENTIFIED BY MIX NUMBER OR OTHER POSITIVE IDENTIFICATION.
- MIX SHALL MEET THE REQUIREMENTS OF ASTM C33 FOR COARSE AGGREGATE.
- CONCRETE SHALL COMPLY WITH THE REQUIREMENTS OF ASTM STANDARD C94 FOR MEASURING, MIXING, TRANSPORTING, ETC.

CONCRETE TESTING:
- AN INDEPENDENT TESTING LABORATORY SHALL PERFORM THE FOLLOWING TESTS ON CAST IN PLACE CONCRETE:
- ASTM C143: "STANDARD TEST METHOD FOR SLUMP OF PORTLAND CEMENT CONCRETE." MAXIMUM SLUMP SHALL BE XX INCHES.
- ASTM C39: "STANDARD TEST METHOD FOR COMPRESSIVE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS." A SEPARATE TEST SHALL BE CONDUCTED FOR EACH CLASS, FOR EVERY 50 CUBIC YARDS (OR FRACTION THEREOF), PLACED PER DAY. REQUIRED CYLINDER(S) QUANTITIES AND TEST AGE AS FOLLOWS:
  - 1 AT 3 DAYS
  - 1 AT 7 DAYS
  - 2 AT 28 DAYS
- ONE ADDITIONAL RESERVE CYLINDER TO BE TESTED UNDER THE DIRECTION OF THE ENGINEER, IF REQUIRED. IF 28 DAY STRENGTH IS ACHIEVED, THE ADDITIONAL CYLINDER(S) MAY BE DISCARDED.

REINFORCING STEEL:
- SHALL BE ASTM A615 GRADE 60 DEFORMED BARS, FREE FROM OIL, SCALE AND RUST AND PLACED IN ACCORDANCE WITH THE TYPICAL BENDING DIAGRAM AND PLACING DETAILS OF ACI STANDARDS AND SPECIFICATIONS.



1 Foundation Plan
S-01 1" = 1"

NOTES:

1. CONC. FOOTINGS TO REST ON UNDISTURBED SOIL WITH MIN. BEARING PRESSURE OF 1500 psf.
GENERAL NOTES FOR CONC. STRENGTH.

2A. WHEN BEARING CAPACITY OF SOIL IS LESS THAN 1500 psf, STRUCTURAL ENGINEER SHOULD BE NOTIFIED IMMEDIATELY PRIOR TO COMMENCEMENT OF WORK

3. ALL FOOTINGS ON ENGINEER FILL TO BE INSPECTED BY A SOIL ENGINEER.

Design loads and assumptions:
– Design according to 2021 International Building Code (IBC), and ACI 318-19, and Engineering design in Wood standard

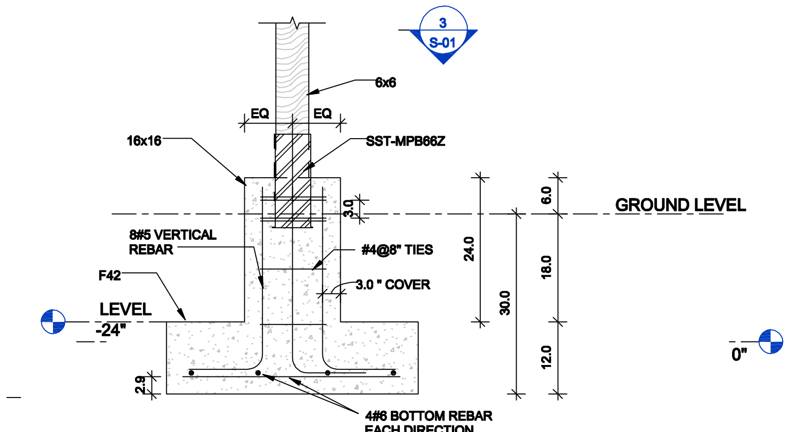
1) Dead load : 4 psf + self weight of members

2) Snow load:
   Ground snow load (Ss)------------ 35 psf
   Roof snow load ---------------- 30 psf
3) Wind load:
   Wind Downward --------------- 16 psf
   Wind Uplift ------------------ 52.5 psf
   Category II (open structure)

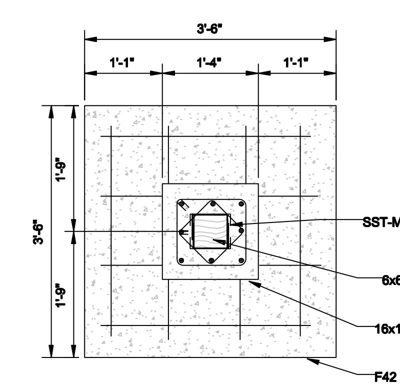
4) Live load ------------------ Not Applicable

* No side cladding is permitted in the future.
* 20 psf minimum live load does not combine with design snow load.
* All wood grades are Douglas Fir No.2 or better and are pressure treated.
* Maximum construction concentrated load on rafters 300 lb .

AHZ Consulting Engineers, Inc.
111 Rodeo
Irvine, CA 92602
(949) 466-1544
(901) 692-0431



2 Foundation Section 2
S-01 NTS



3 Foundation Section 3
S-01 NTS

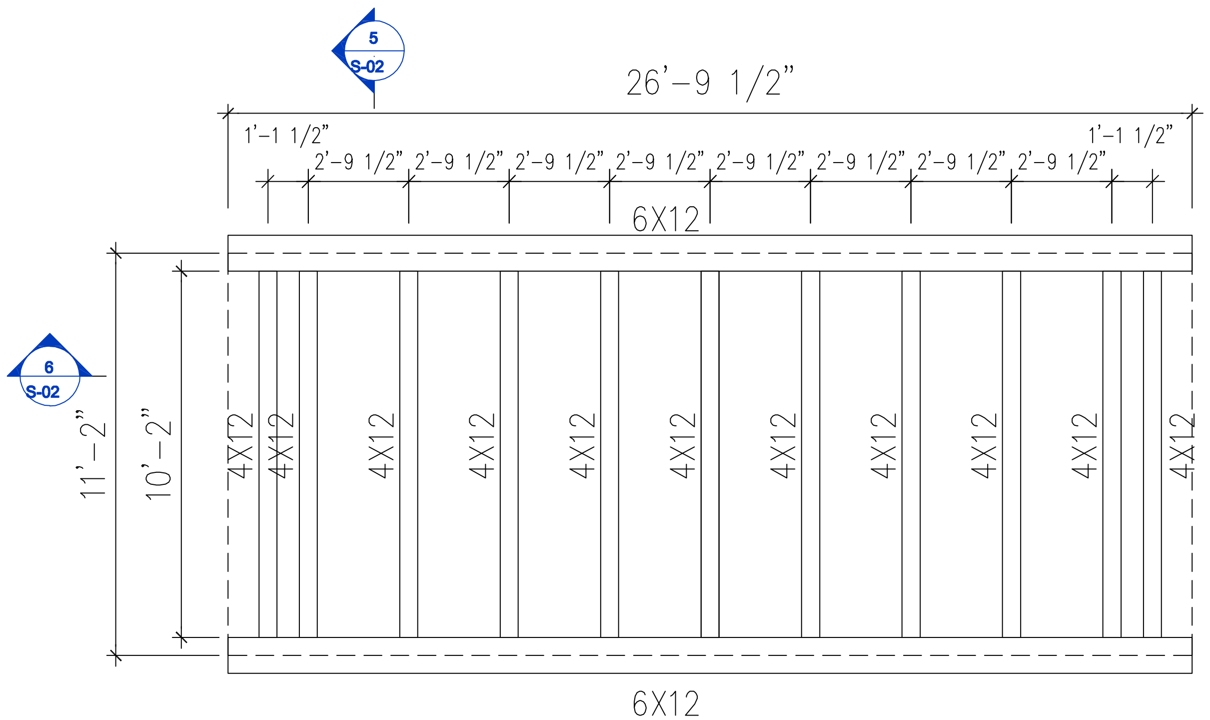
Contractor must check and verify all dimensions and be responsible for same, reporting any discrepancies to the Engineer before commencing work.
Prints shall not be used for construction until signed 'Approved For Construction' by the Engineer.
Prints are not to be scaled.
All drawings, prints and specifications are the property of the Engineer and shall be returned to him on completion of the work.
All work shall be performed in accordance with the latest edition of the STATE BUILDING CODE, NATIONAL BUILDING CODE and regulatory regulations of the Building Department.
These notes are to be read in conjunction with all drawings and specifications.

The Contractor shall check all dimensions and other data from the job and report any discrepancies to the Engineer before proceeding.

No.	Date:	Revision:	D'wn.	Eng.
1.	APRIL.07.24	ISSUED FOR REVIEW	P.K..	F.R.

COLORADO LICENSED PROFESSIONAL ENGINEER ARASH ZANDIEH 53832
Exp. 10/31/2025

Sheet title: PERGOLA PLANS AND ELEVATIONS
Address: 718 Remington Street, FortCollins, CO 80524
Project: Pergola- 718 Remington Street
Job. no. 24-419
S-01

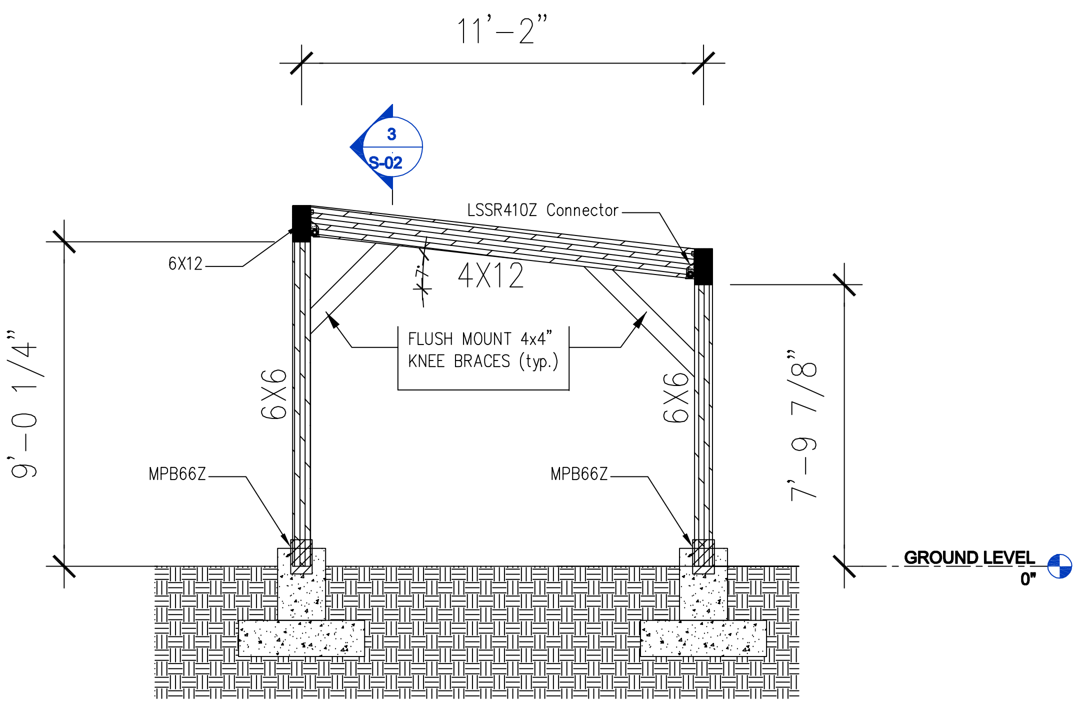


4 / S02 Roof
1" = 1"

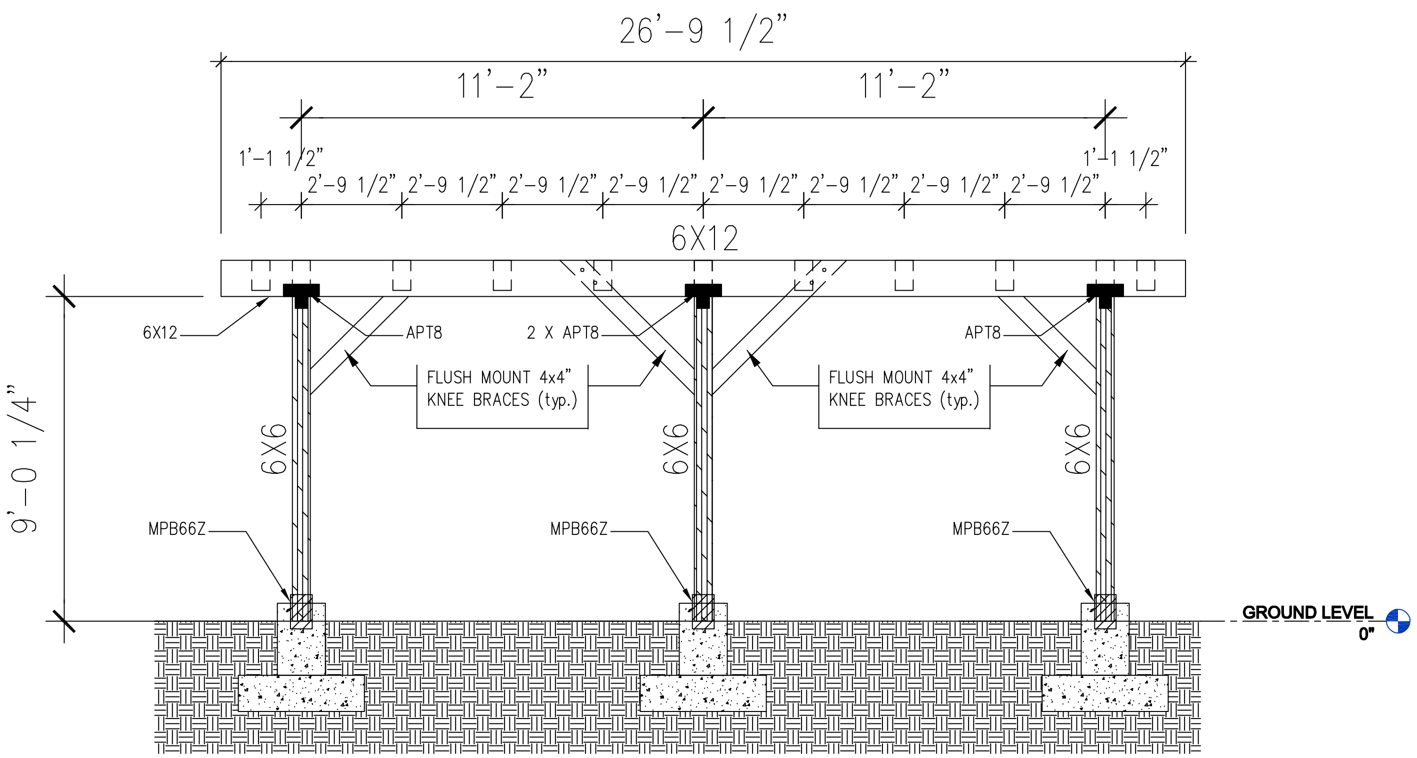
BRIDGING
- 1"X3" (19mmx64mm) OR 2"X2" (38mmx38mm) CROSS BRIDGING @ MAX, 6'-11" (2.1m)o.c STRAPPING
- 1"X3" (19mmx64mm) NAILED TO U/S OF JOISTS @ MAX . 6'11"(2.1m) O.C.

for proper moisture protection
and to preserve the life of the
Douglas-fir (d.f.), please use a proper
and certified clear wood sealer and stain
and follow the manufacturers specification

The notches are limited to the following dimension
Notch depth <= (1/6) beam depth
Notch length <= (1/3) beam depth



5 / S-02 Elevation 1
1" = 1"



6 / S-02 Elevation 2
1" = 1"

AHZ Consulting Engineers, Inc.
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Irvine, CA 92602
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Contractor must check and verify all dimensions and be responsible for same, reporting any discrepancies to the Engineer before commencing work.
Prints shall not be used for construction until signed 'Approved For Construction' by the Engineer.
Prints are not to be scaled.
All drawings, prints and specifications are the property of the Engineer and shall be returned to him on completion of the work.
All work shall be performed in accordance with the latest edition of the PROVINCE BUILDING CODE, NATIONAL BUILDING CODE and regulatory regulations of the Building Department.
These notes are to be read in conjunction with all drawings and specifications.

The Contractor shall check all dimensions and other data from the job and report any discrepancies to the Engineer before proceeding.

No.	Date:	Revision:	D'wn.	Eng.
1.	APRIL.07.24	ISSUED FOR REVIEW	P.K..	F.R.

COLORADO LICENSED PROFESSIONAL ENGINEER
ARASH ZANDIEH
53832
Exp. 10/31/2025

Sheet title: PERGOLA BEAM PLAN

Address: 718 Remington Street, FortCollins, CO 80524

Project: Pergola- 718 Remington Street

Job. no. 24-419

S-02