Estes Industries, LLC
1295 H Street, Penrose, CO 81240-9698
Telephone: 719-372-6565, Fax: 719-372-3217
www.estesrockets.com

January 6, 2025

Dan Victoria
Fremont County
Department of Planning and Zoning
615 Macon Avenue, Suite 210
Canon City, CO 81212

Dear Mr. Victoria,

Thank you for working on the review and approval of the permits for our solar project. As you know, we are eager to get the project completed.

We spoke with our project manager at Freedom Solar this morning, Teshia Brown, who informed us about some questions around the plot line work being completed on our property. The work being done is to support the expansion of our sister company, Estes Energetics. However, this letter is to confirm that the ownership of the land will not change as a result of this work. We will still own all plots of land in question after the internal plot lines are removed.

I hope this clears up any questions you may have, and will allow the review of our permits to continue without delay. If you need any additional information, please feel free to contact me directly.

Sincerely,

Mallory Langford (Jan 6, 2025 16:22 EST)

Mallory Langford, President
Estes Industries, LLC
mlangford@estesrockets.com
719-372-9861

FREMONT COUNTY

DEPARTMENT OF PLANNING AND ZONING

615 MACON AVENUE, ROOM 210, CAÑON CITY, COLORADO, 81212
Telephone 719-276-7360 / Facsimile 719-276-7374
Email: Planning@fremontco.com

Special Review Use, Conditional Use Permit. & Commercial Development Plan

Application Packet

Note: All applications prior to submittal must have gone through a pre-application meeting.

FREMONT COUNTY PLANNING & ZONING

Process & Requirements Overview

Any application which is not complete or does not include all minimum submittal requirements will be rejected by the Fremont County Department of Planning and Zoning (Department). The department requires one (1) hard copy of the application and all required submittals. Two (2) copies of a drawing shall be prepared to professional standards, minimum size 24" X 36", drawn at a common increment scale between or including 1" = 50' and 1" = 200' unless otherwise approved by the Department prior to submittal of the application, & two (2) reduced (to 11"x17") copies. One (1) electronic copy all items shall be labeled exactly as the required submittal.

Upon receipt of a complete application, the Department will review the application and all attachments and prepare a Department Submittal Deficiency and Comment Letter (D & C Letter), which will state the submittal deficiencies which must be addressed by the applicant, Department comments and/or questions about the application, and the number of revised application packets to be supplied to the Department for placement on an agenda of the Commission. An additional full application fee may be charged to the applicant, as per Resolution approved by the Board of County Commissioners (Board), if all deficiencies as per the initial D & C Letter are not adequately addressed or provided. Each subsequent D & C Letter, based on resubmitted items, will result in another full application fee. All such fees shall be paid along with the deficiency submittal, prior to any further review of the application.

The Department, Commission, and/or Board of County Commissioners (Board) may require additional information at any time during the application process as may be deemed necessary for thorough consideration of the application and to enable an informed final decision.

Any Land Use application for that has been submitted after the use requiring the permit has been established on the property may be subject to a penalty fee in addition to the set application fee for such permit. The penalty fee shall be equal to the initial application fee for the Land Use Application. As with all land use applications payment of associated fees do not ensure approval of the application.

If the application is approved by the Board with contingencies the contingencies shall be completed to the Department within six (6) months of the approval date, or the approval shall be deemed rescinded and the application expired, after which, re-submittal of the application, including fees, and procedural requirements, will be required.

In approving an application for Land Use, the Board may require higher standards for development than required by the Fremont County Zoning Resolution (FCZR).

Modifications, major or minor, to the Land Use Permit as approved, shall be accomplished in compliance with requirements of the Fremont County Zoning Resolution.

Applicants shall pay all application fees to the Fremont County Treasurer's Office. Upon receipt of a complete application, a Department representative will provide the applicant with a payment check list to present to the Treasurer's Office with payment.

FREMONT COUNTY

DEPARTMENT OF PLANNING AND ZONING

615 MACON AVENUE, ROOM 210, CAÑON CITY, COLORADO, 81212
Telephone 719-276-7360 / Facsimile 719-276-7374
Email: Planning@fremontco.com

Check the Applicable Application		
☑ Special Review Use $1,800.00	☐ Conditional Use Permit $1,800.00	☐ Commercial Development Plan $1,800.00
☐ Minor Modification $500.00	☐ Major Modification $1,000.00	Existing Permit #

PROPERTY INFORMATION: Provide information to identify properties and the proposed development. Attach additional sheets if necessary.

Property Address(es): 1295 H ST. PENROSE, CO 81240	
Tax ID/Parcel Numbers(s): 99926018	**Parcel size(s) in Acres:** 1.069 Acres
Zone District: I	**Proposed Land Use:** Ground Mounted Solar system

PROPERTY OWNER(S) INFORMATION: Indicate the person(s) or organization(s) who own the property proposed for development. Attach additional sheets if there are multiple property owners.

Name(s) (Individual or Organization): Heidi Muckenthaler
Mailing Address: 1295 H St. Penrose,CO81240
Telephone: 719-372-6565
Email Address: hmuckenthaler@estesrockets.com

AUTHORIZATION REPRESENTATIVE / AGENT / CONSULTANT: Indicate person(s) submitting the application if different than the property owner(s). Attach additional sheets if necessary.

Name(s) (Individual or Organization): Freedom Solar Power
Mailing Address: 4801 Freidrich Ln Suite 109, Austin TX 78744
Telephone: 940-594-9718
Email Address: commercialpm@freedomsolarpower.com

By signing this Application, the Applicant, or the agent / representative / consultant acting with due authorization on behalf of the Applicant, hereby certifies that all information contained in the application and any attachments to the Application, is true and correct to the best of the Applicant's knowledge and belief.

The Applicant understands that required private or public improvements imposed as a contingency of approval for the application may be required as a part of the approval process.

Fremont County hereby advises the Applicant that if any material information contained herein is determined to be misleading, inaccurate or false, the Board of County Commissioners may take any and all reasonable and appropriate steps to declare null and void, any actions of the Board regarding the Application.

Signing this Application is a declaration by the applicant that all plans, drawings and commitments submitted with or contained within this Application are or will be in conformance with the requirements of the Fremont County Zoning Resolution.

Printed Name	Applicant Signature	Date
Freedom Solar Power	Freedom Solar	
Printed Name	Owner Signature	Date

Fremont County Planning & Zoning Department

Special Review Use, Conditional Use Permit, &
Commercial Development Plan Application

1. Please indicate the Zone District & Current Land Use for adjacent properties.

	Zone District	Land Use
Northerly		
Easterly		
Westerly		
Southerly		

2. Master Plan – Planning District of property: Penrose/Beaver Park

3. Is access through adjacent properties? ☐ Yes ☑ No
   - If **"yes"** is access legally established through:
     ☐ Deed of Record ☐ Recorded Plat ☐ Court Order (Attach documentation marked "Exhibit 1.3").

4. Does the property lie adjacent to or within three (3) miles of any municipal boundary lines (city/town limits)? ☐ Yes ☑ No
   - If marked **"yes"** Entity Name: _____

5. Requested duration of proposed use: ☐ Life of Use ☑ Estimated use in years: 25

6. List Utility Provider information:

WATER	
SANITATION	
ELECTRICAL	Black Hills
TELEPHONE	
REFUSE	
IRRIGATION WATER	
NATURAL GAS / PROPANE	
CABLE TELEVISION	

REQUIRED EXHIBITS

Submittals and exhibits should be clearly identified with section and/or question number located on the bottom right-hand corner, or otherwise tabbed or marked. Any waiver requests shall be labeled as the same exhibit number.

LETTERS OF INTENT – SECTION TWO

☐ **EXHIBIT 2.1**	Describe in detail the proposed type of operation to include days, & hours of operation, number of employees, number of guests, machinery used, etc..
☑ **EXHIBIT 2.2**	Describe the existing land use & proposed structures, with dimensions and square footage, & the current and proposed lot coverage.
☐ **EXHIBIT 2.4**	Landscaping Plan
☐ **EXHIBIT 2.5**	Lighting Plan
☐ **EXHIBIT 2.6**	Total parking spaces standard size, compact size, ADA spaces, & loading areas. Parking surface material and thickness. Describe the lighting for all parking areas.
☐ **Exhibit 2.8**	Statement indicating how the proposed use complies with "Goals Objectives, and Implementation Strategies" of the Fremont County Master Plan District
☐ **Exhibit 2.9**	Statement indicating how the proposed use will be in harmony and compatible with surrounding land uses and development in the area and/or measures that can be taken to make it in harmony & compatible.

IMPACT ANALYSIS – SECTION THREE

☐ **EXHIBIT 3.1**	Dust and erosion measures
☐ **EXHIBIT 3.2**	Noise control measures
☐ **EXHIBIT 3.3**	Visual impact control measures
☐ **EXHIBIT 3.4**	Odor Control
☐ **EXHIBIT 3.5**	Wildlife/plant habitat protection measures
☐ **EXHIBIT 3.6**	Water quality and/or water way(s) protection measures
☐ **EXHIBIT 3.7**	Safety measures to protect adjacent properties, residents, & agricultural operations
☐ **EXHIBIT 3.8**	Measures to protect and/or preserve archaeologically or historically significant sites
☐ **EXHIBIT 3.9**	Measures to limit or control offsite discernable vibrations

REQUIRED SUBMITTALS – SECTION FOUR

☑ **Exhibit 4.1**	Current Deed of Record
☐ **Exhibit 4.2**	Water Supply documentation: Public water source requires documentation evidencing ability to provide service. Wells require documentation of a well permit and/or documentation that the existing well is adequate for the proposed use.

☐ **Exhibit 4.3**	Sanitation Documentation: Public sewer shall require documentation evidencing the ability to provide service. Onsite Wastewater System (OWTS) shall require a soils report and a design plan from a certified engineer. Existing OWTS systems shall require documentation that the existing system is adequate for the proposed use.
☐ **Exhibit 4.4**	Refuse Plan: Shall address the storage, collection, and disposal of refuse. It shall also document screening of refuse receptacles/areas. (Refuse plans require approval by the Fremont County Environmental Health Dept.)
☐ **Exhibit 4.5**	Drainage Plan & Report: (Drainage plans require approval by the County Engineer).
☐ **Exhibit 4.6**	Noxious Weed Control Plan
☑ **Exhibit 4.7**	List of owners and mailing address for all properties located within five hundred (500') foot radius of the subject property.
☑ **Exhibit 4.8**	A detailed utility plan showing the proposed or existing location of all utilities.

IF APPLICABLE SUBMITTALS – SECTION FIVE

☐ **Exhibit 5.1** ☐ **N/A**	CDOT Notification of Proposed Land Use and comments
☐ **Exhibit 5.2** ☐ **N/A**	Mineral Interest Notification and certified mailing receipt. (this is only required if the minerals interests are severed)
☐ **Exhibit 5.3** ☐ **N/A**	Copies of all local, state and federal licenses and/or status of applications.
☐ **Exhibit 5.4** ☐ **N/A**	In circumstances of Corporate Ownership, documentation evidencing whom is eligible to execute documents on behalf of the corporation
☐ **Exhibit 5.5** ☐ **N/A**	In circumstances where the applicant is not the owner written authorization from the owner specifying the extent to which the representation is authorized
☐ **Exhibit 5.6** ☐ **N/A**	In circumstances where a consultant is making application on behalf of the owner, written authorization from the owner specifying the extent to which the representation is authorized
☐ **Exhibit 5.7** ☐ **N/A**	In circumstances where the property owner of record is not involved in the operation or application, documentation indicating right to occupy and use the property shall be provided. (lease or similar document)
☐ **Exhibit 5.8** ☐ **N/A**	Buffering Plan Required for Contractor Yards, Junk Yards, Automobile Graveyards, & Vehicle Impoundment Yards
☐ **Exhibit 5.9** ☐ **N/A**	Current registration for SMM equipment or documentation that equipment is on tax rolls associated with the property, to include list of machinery.
☐ **Exhibit 5.10** ☐ **N/A**	List of Hazardous materials stored and/or used on site, to include location of storage and management practices
☐ **Exhibit 5.11** ☐ **N/A**	Copies of mining and reclamation plans (CUP's)
☐ **Exhibit 5.12** ☐ **N/A**	Required information set forth in FCRZ 8.01(a) (Airports)
☐ **Exhibit 5.13** ☐ **N/A**	Required information set forth in FCRZ 8.01(b) (Adult Uses)

☐ **Exhibit 5.14** ☐ **N/A**	Required information set forth in FCRZ 8.01(c) (Antenna or Towers)
☐ **Exhibit 5.15** ☐ **N/A**	Required information set forth in FCRZ 8.01(d) (Contractor's Yard #2)
☐ **Exhibit 5.16** ☐ **N/A**	Required information set forth in FCRZ 8.01(e) (Junkyards)
☐ **Exhibit 5.17** ☐ **N/A**	Required information set forth in FCRZ 8.01(f) (Kennel)
☐ **Exhibit 5.18** ☐ **N/A**	Required information set forth in FCRZ 8.01(g) (Solid Waste Disposal Site and Facility)
☐ **Exhibit 5.18** ☐ **N/A**	Required information set fourth in FCZR 8.01(h) Tiny Home Communities
☐ **Exhibit 5.19** ☐ **N/A**	Required information set forth in FCRZ 8.01(i) (Travel Trailer Park & Campground)

REQUIRED FORMS

☐ **CODWR**	Fremont County's Colorado Division of Water Resources Information Form
☐ **FCDOT**	Fremont County Roadway Impact Analysis Form (if accessed from a county road)
☐ **CDOT**	Colorado Department of Transportation Access Permit (if accessed from a CDOT controlled highway)
☐ **FIRE**	Fire Protection Plan

SITE PLAN

☑	Two (2) copies of a drawing shall be prepared to professional standards, minimum size 24" X 36", drawn at a common increment scale between or including 1" = 50' and 1" = 200' unless otherwise approved by the Department prior to submittal of the application. Two (2) reduced (to 11"x17") copies all of which shall include the following:
☐	Written and graphic scale with minimum of 1" = 200' max 1" = 50';
☑	Appropriate title (SPECIAL REVIEW USE PERMIT, CONDITIONAL USE PERMIT, COMMERICAL DEVELOPMENT PLAN FOR {name};
☑	Appropriate subtitle (brief description of the proposed use);
☑	Boundary drawing of the property with bearings and dimensions illustrating the legal description;
☑	Legal description of the property;
☑	Acreage or square footage of the subject property;
☑	Zoning classification of the subject property;
☑	Zoning classification of the adjoining properties;
☑	North Arrow;
☑	Vicinity map locating the subject property in relation to surrounding areas;
☑	Table indicating relationship between proposed and existing construction to remain on the property
☑	Minimum lot size, maximum lot coverage, maximum building height, minimum lot width, minimum setback requirements (Front, Two sides, & Rear)

☑	Size and shape of all existing & proposed structures: each structure shall be labeled/noted as existing or proposed. Dimensions from at least two property lines shall be noted;
☐	Location of all parking areas to include size, dimensions, surface type & thickness, type of space (ADA, Standard, Compact) and a table specifying the minimum numbers of spaces required for each category;
☐	Location of loading areas to include size, dimensions surface type & thickness;
☑	Labeled access points including interior roadways with dimensions, surface type & thickness, circulation pattern, and dimensions from property lines;
☐	Any proposed pedestrian areas & walkways to include dimensions, surface type & thickness;
☑	Location and dimensions of refuse areas;
☐	Identification and location of all drainageway, drainage facilities, including FEMA flood areas with the Map # and effective date, to include dimensions from property lines;
☐	Location, height & type of lighting for parking and off-loading areas;
☑	Location, type, and size of all on-site identification signage (table may be used);
☑	All easements (existing & proposed) to include dimensions from property lines (beginning, end, & centerline) width, and if they are to be vacated or relocated;
☐	Significant natural features;
☑	Soil types
☑	Open space areas
☑	Legend identifying symbols and/or lines
☑	Architectural rendering or perspectives to portray fully the whole project. The rendering shall be a minimum size of 18"x24"; multiple sheets can be used to display the project. CUP applications are excluded from this requirement.

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Total Pages: 4 Rec Fee: $28.00
Katie E. Barr - Clerk and Recorder, Fremont County, CO

960708 04/12/2018 04:15 PM
Total Pages: 4 Rec Fee: $28.00 Doc Fee: $617.00
Katie E. Barr - Clerk and Recorder, Fremont County, CO

When recorded return to:
Steptoe & Johnson LLP
1330 Connecticut Avenue, NW
Washington, DC 20036
Attention: Harold Frelich, Esq.

Rerecord to Add Date

QUIT CLAIM DEED

THIS QUIT CLAIM DEED, dated this 12 day of APRIL, 2018, between ESTES-COX CORP., a Delaware corporation ("Grantor"), whose legal address is 1295 H Street, Penrose, Colorado 81240, and ESTES INDUSTRIES, LLC, a Delaware limited liability company ("Grantee"), whose legal address is 13111 Moss Ranch Lane, Fairfax, Virginia 22033.

Witness that the Grantor, for an in consideration of the sum of Ten and 00/100 ($10.00) Dollars, the receipt and sufficiency of which is hereby acknowledged, does hereby sell and quitclaim with no warranty of any kind to the Grantee, its successors and assigns forever, all the right, title and interest which the Grantor has in and to the real property, if any, together with improvements, if any, situate, lying and being in the County of Fremont and State of Colorado, described as follows:

Parcel A:

Lots 1 and 2 in Estes Subdivision No. 1, Fremont County, Colorado.

Together with the North half of 12th Street, adjacent to Lot 1, as vacated by Resolution No. 93, Series of 1989, recorded January 26, 1990 in Book 943 page 160 at Reception No. 566621.

Parcel B:

Lots 1 through 6, inclusive, in Estes Subdivision No. 2, Fremont County, Colorado.

Parcel C:

Lots 1 and 2, Estes Subdivision No. 3, Fremont County, Colorado.

Parcel D:

All that part of Section 8 and 9, Township 19 South, Range 68 West of the 6th P.M., Beaver Land and Irrigation Company Plat No. 1, Fremont County, Colorado, described as follows:

All of the following described tracts or portion of tracts lying North of U.S. Highway No. 50:

Tracts 1, 2, 3 East half of Tract 4, South half of Tract 13, Tracts 14, 15, 16, 17 and that part of Tracts 18, 19, 20 and 32 North of said Highway in Section 8;

Tracts 22, 23, 24 and that part of Tracts 25 and 26 lying North of said Highway in Section 9;

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Page 2 of 4

Together with the South half of 12th Street , adjacent to Tract 24 in Section 9, as vacated by Resolution No. 93, Series of 1989, recorded January 26, 1990 in Book 943 page 160 at Reception No. 566621.

Together with that portion of 12th Street between Tracts 13, 14, 15, 16 and Tracts 17, 18, 19 and 20 in Section 8 as vacated by Resolution recorded March 5, 1970 in Book 521, Page 226, Reception No. 381108.

Parcel E:

The following described property in said Section 8, Township 19 South, Range 68 West of the 6th P.M., Beaver Land and Irrigation Company Plat No. 1, lying South of U.S. Highway No. 50, Fremont County, Colorado:

That part of Tracts 8, 9, 10 and 11 and the West half of Tract 12 lying South of said Highway; The West half of Tracts 54, 59 and all of Tracts 23, 24, 25, 26, 55, 56, 57 and 58.

Parcel F:

Lot 3, 13th Street Lot Line Adjustment recorded March 27, 2008 at Reception No. 849441, County of Fremont, State of Colorado.

also known as 1295 H Street, Penrose, Colorado 81240.

To have and to hold the said premises above bargained and described, with the appurtenances, unto the Grantee, its successors and assigns forever.

The singular number shall include the plural, the plural the singular, and the use of any gender shall be applicable to all genders.

[signature page follows]

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Page 3 of 4

IN WITNESS WHEREOF, Grantor has executed this deed on the date set forth above.

ESTES-COX CORP., a Delaware corporation

By: _____
Thomas S. O'Donoghue, Jr.
Chief Restructuring Officer

STATE OF Illinois)
) ss.
COUNTY OF Champaign)

The foregoing instrument was acknowledged before me this 10th day of April, 2018 by Thomas S. O'Donoghue, Jr., as Chief Restructuring Officer of Estes-Cox Corp,. a Delaware corporation, on behalf of such corporation

WITNESS MY HAND AND OFFICIAL SEAL.

My commission expires: 01/23/2020

[SEAL]

Diane M. Fall
Notary Public

OFFICIAL SEAL
DIANE M. FALL
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 1/23/2020

Fremont County Department of Planning and Zoning
Roadway Impact Analysis Form

This form shall be used in conjunction with any applications submitted in accordance with Section 8 of the Fremont County Zoning Resolution and or Section VI of the Fremont County Subdivision Regulations. This form is considered a minimum application submittal item and shall be required to be provided at the time of application submittal. This form is intended to provide the minimum items that must be addressed in the roadway impact analysis. The form can be expanded or attachments can be made to further address the roadway impact of the proposed use. **If the estimated average daily traffic increase is less than thirty (30) vehicle trips per day (*one trip to be considered as a single or one-direction vehicle movement with either the origin or the destination [exiting or entering] inside the subject property*) as per the Institute of Transportation Engineers, Trip Generation Handbook, Second Edition or subsequent editions for the entire development, as estimated by the project engineer, then a Roadway Impact Analysis will not be required to be completed by an engineer. In such situations other minimum items shall be addressed by the applicant.**

1. Project Name Estes Rockets

2. Type of application:
   - ☐ Zone Change #1
   - ☐ Zone Change #2 – Use Designation Plan
   - ☐ Zone Change #2 – Final Development Plan
   - ☐ Commercial Development Plan
   - ☐ Commercial Development Modification
   - ☐ Expansion of an existing Business or Industrial Use
   - ☒ Special Review Use Permit
   - ☐ Conditional Use Permit
   - ☐ Temporary Use Permit
   - ☐ Change of Use of Property
   - ☐ Subdivision Preliminary Plan

3. Engineer: _____ Address: _____
   City: _____ State: _____ Zip Code: _____
   Telephone #: (___) _____ Facsimile #: (___) _____ Email _____

4. Provide a detailed description of the proposed use: _____
   Freedom Solar will be using the County Road to transport the Equipment and material for the Commercial Solar Ground Mount.

5. Provide the estimated average daily traffic to be generated by the proposed use(s), using the Institute of Transportation Engineers, Trip Generation Handbook, Second Edition or subsequent editions. The estimated volumes of traffic to be generated by the proposed use(s) shall include as a minimum, the average weekday traffic volume and the peak-hour (*morning and afternoon*) traffic volumes. Specify the number of trips in each category. (*one trip to be considered as a single or one-direction vehicle movement with either the origin or the destination [exiting or entering] inside the subject property*)
   Residential: _____ daily, _____ peak-hour am, _____ peak-hour pm _____
   Employee: 10 daily, _____ peak-hour am, 7 peak-hour pm 6

Customer:_____ daily, _____ peak-hour am, _____ peak-hour pm

Truck generated by the proposed use: _____ daily, _____ peak-hour am, _____ peak-hour pm

Delivery – required by the use:_____ daily, _____ peak-hour am, _____ peak-hour pm

Total Vehicle Trips: _____ daily, _____ peak-hour am, _____ peak-hour pm

I certify that based on the proposed use(s) the total vehicle trips using the Institute of Transportation Engineers, Trip Generation Handbook, Second Edition or subsequent editions will average less than thirty (30) trips per day based on any fourteen (14) day time frame.

_____ Date _____ Seal
Colorado Licensed Professional Engineer

If the above has been certified, then the applicant can complete the form and acknowledge it. If completed by the applicant only the questions marked by asterisk (*) are required to be answered.

NOTE: If the additional information provided warrants improvements to the roadway system, even though the traffic generated by the proposed use is less than thirty (30) trips per day, such improvements will be required. If in the future the use exceeds an average of thirty (30) trips per day a complete analysis could be required.

6. *What is the general location of the subject property?_____

1295 H St. Penrose CO, 81240

7. *What are the names and/or the numbers of the public roadways that serve the site?_____

H St. & US 50

Provide a site plan drawing that shows the subject property, its proposed access points and all public roadways within a one-half (½) mile radius of the subject property, marked as Exhibit 7.1. ☐ An exhibit has been attached.

8. *What is the classification, according to the Fremont County Master Plan, of the roadway from which the project site will gain access to the public transportation system?
☐ Expressway or Freeway --- ☐ Major Arterial --- ☐ Arterial --- ☐ Collector --- ☒ Local

9. *Do the roadways in question lie within a three (3) mile radius of any incorporated town or city limits or the boundary of another County? ☐ Yes --- ☒ No
If yes, provide the name(s) of the jurisdiction(s): _____
In addition if a new roadway is to be constructed, how will it comply with the transportation plan in effect for the municipality?_____

10. *Will this project require a Fremont County Driveway Access Permit or a Colorado Department of Transportation (CDOT) State Highway Access Permit? ☐ Yes --- ☒ No
Please explain:_____

11. *Will the project require construction of, or improvement to any roadway maintained by the CDOT? ☐ Yes --- ☒ No
If yes, will the proposed construction or improvement be in compliance with CDOT's "5 Year Transportation Plan"? ☐ Yes --- ☐ No Please Explain _____

Has CDOT required that the applicant provide a traffic study? ☐ Yes --- ☐ No
If yes, a copy of the study shall be attached to this application, marked as Exhibit 11.1. ☐ An exhibit has been attached.

12. *Will the project require construction of, or improvement to any roadway currently maintained or proposed to be maintained by the County? ☐ Yes --- ☒ No
If yes, what would be the social, economic, land use, safety and environmental impacts and effects of the new roadway on the existing transportation system and neighborhood?_____

13. *Are any roadways proposed to be vacated or closed in conjunction with the proposed project? ☐ Yes --- ☒ No
If yes, please explain._____

14. *Is the proposed project site adjacent to or viewable from any portion of the Gold Belt Tour Scenic Byway or other scenic corridor designated by the Master Plan? ☒ Yes --- ☐ No
If yes, identify the byway and or scenic corridor: **US Highway 50 serves as the East-West transportation for the County**

If yes, explain how the scenic quality will be affected by the proposed project.

If yes, what measures will be taken to not have a negative impact on the byway and or scenic corridor?_____

15. *Will the proposed project gain access to the public transportation system via 3rd, 9th, K and or R Streets in the Penrose-Beaver Park Area of the County? ☒ Yes --- ☐ No

16. *Does the subject property have frontage on a public roadway? ☐ Yes --- ☐ No
If answered no, then documentation evidencing a "right of access" to the subject property for the proposed use shall be attached marked as Exhibit 16.1. ☐ An exhibit has been attached. If answered no, then please explain what the right of access consists of:_____

17. *What is the right-of-way width of the public roadway(s) that serve the site?_____

18. *What is the surface type of the public roadway(s) that serve the site?_____

19. *What is the surface width of the public roadway(s) that serve the site?_____

_____

20. *What are the existing drainage facilities for the public roadway(s) that serve the site?_____

_____

21. *Does the public roadway(s) that serves the site have curb and gutter? ☐ Yes --- ☒ No
If answered yes, what is the type of curb and gutter?_____

_____

22. *Does the public roadway(s) that serves the site have adjacent sidewalks or other pedestrian ways?
☐ Yes --- ☒ No
If answered yes, what is the width(s) and surface type(s)?_____

_____

23. *How many access points will the subject property have to public roadways? 1

_____

24. *Will the proposed roadways that access the public roadways intersect the public roadways other than at perpendicular? ☐ Yes --- ☒ No
If answered yes, please explain:_____

_____

_____

25. *What are the sight distances, in all directions, from the subject property access point(s) along the public roadway that serves the site? (*mark and provide distance for each that is applicable*)
☐ Northerly, site distance: _____ ☐ Southerly, site distance:_____
☐ Easterly, site distance: _____ ☐ Westerly, site distance:_____

26. *What are the distances from the subject property access point(s), in all directions, to the nearest intersection with another public roadway along the public roadway that serves the site? (*mark and provide distance for each that is applicable*)
☐ Northerly, distance: _____ ☐ Southerly, distance:_____
☐ Easterly, distance: _____ ☐ Westerly, distance:_____

27. *What are the distances from the subject property access point(s), in all directions, to the nearest driveway(s) along the public roadway that serves the site? (*mark and provide distance for each that is applicable*)
☐ Northerly, distance: _____ ☐ Southerly, distance:_____
☐ Easterly, distance: _____ ☐ Westerly, distance:_____

28. *What are the distances from the subject property access point(s), in all directions, to the nearest blind curve(s) along the public roadway that serves the site? (*mark and provide distance for each that is applicable*)
☐ Northerly, distance: _____ ☐ Southerly, distance:_____
☐ Easterly, distance: _____ ☐ Westerly, distance:_____

29. *What are the distances from the subject property access point(s), in all directions, to the nearest blind hill(s) along the public roadway that serves the site? (*mark and provide distance for each that is applicable*)

☐ Northerly, distance: _____ ☐ Southerly, distance: _____

☐ Easterly, distance: _____ ☐ Westerly, distance: _____

30. *Identify any and all hazardous conditions with regard to the public roadway(s) that provide access to the subject property in the general area of the subject property: _____

If the public roadway(s) that currently serve the subject property have any hazardous conditions, then recommendations shall be made for improvements that will decrease the hazardous conditions on the public roadway(s): _____

31. *Explain what effect the proposed use will have on the existing traffic in the neighborhood. If no change is expected, please explain why no change is expected: _____

No Change is expected. We will only be on and off site 2 times a day for about 6 -8 weeks.

32. *Will the proposed use, due to the increase in traffic or the type of vehicle traffic generated by the proposed use, change the level and or type of required maintenance for the public roadway(s) that serve the site? ☐ Yes --- ☒ No, (*please explain*) _____

If the proposed use, due to the increase in traffic or the type of vehicle traffic generated by the proposed use, changes the level and or type of required maintenance for the public roadway(s) that serve the site, then recommendations shall be made that would lessen the maintenance impact for the entity in control of maintenance of the public roadway(s): _____

Note: If improvements are required, it may be mandatory that such improvement be installed prior to final approval of the application.

33. *Are new roadways proposed to be constructed, on or off site, in association with the proposed project? ☐ Yes --- ☒ No If yes, provide evidence that the roadways will be constructed to conform to natural contours in order to minimize soil disturbance, cut and fills, protect drainageways and not create to unstable slopes. _____

34. Provide an analysis of the existing traffic volumes on the adjacent roadway system, including the average weekday traffic (*vehicles per day*) and the weekday peak-hour traffic (*vehicles per hour – am and pm*), showing the dates and times of traffic counts or source utilized for traffic volume counts. Determine the existing level of service or percentage of roadway capacity currently in use.

Roadway name or # _____ average weekday traffic_____
Weekday peak-hour traffic _____ am _____ dates _____ times
Weekday peak-hour traffic _____ pm _____ dates _____ times
Current level of service - % of roadway in use_____
_____

Roadway name or # _____ average weekday traffic _____

Weekday peak-hour traffic _____ am _____ dates _____ times

Weekday peak-hour traffic _____ pm _____ dates _____ times

Current level of service / % of roadway in use_____
_____

Roadway name or # _____ average weekday traffic _____
Weekday peak-hour traffic _____ am _____ dates _____ times
Weekday peak-hour traffic _____ pm _____ dates _____ times
Current level of service / % of roadway in use_____
_____

35. Provide an estimate of the probable traffic directional distribution from and to the subject property based on the proposed use(s) and assignment of the estimated traffic volumes to the adjacent roadway network. Estimate the future background and resulting total traffic volumes (*including the estimated generated traffic due to the proposed use*) on the adjacent roadway system for a twenty (20) year design period, showing volumes for both left and right turn movements as well as through traffic._____
_____
_____

36. Determine the projected future levels of service or percentage of roadway capacity to be in use at the subject property's access points and key adjacent intersections. Provide recommendations for street and access improvements if any portions of the roadways do not have the capacity to accept the additional estimated traffic volumes. All necessary improvements will be required to be designed, completed and accepted by the County prior to any final action regarding the application.
_____
_____
_____
_____
_____

37. Please provide any additional information considered by the Certifying Engineer to be pertinent to the roadway impact in association with the proposed project:_____

_____

_____

_____

_____

I hereby certify that the foregoing information was prepared by myself or under my direct supervision and is true and correct to the best of my knowledge and belief.

_____ Date _____ SEAL

Colorado Licensed Professional Engineer

If not completed by an Engineer, then the following acknowledgement shall be signed by the applicant and/or owner.

By signing this Application, the Applicant, or the agent/representative acting with due authorization on behalf of the Applicant, hereby certifies that all information contained in the application and any attachments to the Application, is true and correct to the best of Applicant's knowledge and belief.

Applicant understands that any required private or public improvements imposed as a contingency for approval of the application may be required as a part of the approval process.

Fremont County hereby advises Applicant that if any material information contained herein is determined to be misleading, inaccurate or false, the Board of Commissioners may take any and all reasonable and appropriate steps to declare actions of the Board regarding the Application to be null and void.

Signing this Application is a declaration by the Applicant to conform to all plans, drawings, and commitments submitted with or contained within this Application, provided that the same is in conformance with the Fremont County Zoning Resolution.

Freedom Solar Power	Freedom Solar LLC	
Applicant Printed Name	Signature	Date
Owner Printed Name	Signature	Date

Dear Fremont County,

On Behalf of Freedom Solar LLC and Estes Rockets

We are writing to formally request a **waiver for Exhibits 2.4 & 2.5** as they do not pertain to the **Estes Rockets** project. At this time, we are seeking an exemption from these requirements due to the project being a Commercial Solar Ground Mount system.

Please let me know if any additional information is required to process this request. We sincerely appreciate your time and consideration.

Freedom Solar LLC

FREMONT COUNTY WEED MANAGEMENT
1901 East Main St.
Cañon City, CO 81212
719-276-7317
brittany.pierce@fremontco.com

Integrated Weed Management Plan

Project/Owner Name : Estes Rockets DATE _____

Address (or location of property) Legal Description-**1295 H St. - SEC 8-19-68 Tracts 1 & 2 Tracts 15 & 16 Tracts 17 & 18 & 32 LYING North of HWY 50**

List of Noxious Weeds and Control Plan:

Noxious Weeds Present Control Measures:
Reference "Guideline for Weed Management Plans April 2015"

State Law requires all landowners to manage noxious weeds on their property. The following weeds under Colorado Noxious Weed Act, if present, are considered a threat to the economic and environmental value of our state lands. These listed under the Noxious Weed Act shall be managed under the provisions of this article. The following species under this act have been identified in this county and should be managed in the appropriate manner as mandated throughout the term of the permit and thereafter.

"List A" species - These are rare noxious weed species that are subject to eradication upon confirmed identification during any interval of reclamation to the site. Such List A species confirmed in Fremont County may include, but are not limited to:

*Myrtle Spurge, *Japanese Knotweed, *Giant Reed, *Elongated Mustard

"List B" species - These are noxious weed species distributed throughout the State of Colorado and are subject to eradication, containment, or suppression in order to halt the continued spread. Species identified within Fremont County may include, but are not limited to:

Absinth Wormwood, Black Henbane, Bouncingbet, *Bull Thistle, *Canada Thistle, Common Teasel, *Dalmatian Toadflax, Dame's Rocket, *Diffuse Knapweed, Eurasian Watermilfoil, *Hoary Cress, *Houdstongue, Hybrid Knapweed, Hybrid Toadflax, Jointed Goatgrass, *Leafy Spurge, *Musk Thistle, Oxeye Daisy, Perennial Pepperweed, *Russian Knapweed, Russian-olive, *Salt Cedar, Scentless Chamomile, Scotch Thistle, *Spotted Knapweed, *Yellow Toadflax.

"List C" species - Are well-established noxious weed species and are widespread throughout the State for which control is only recommended. Common species in Fremont County include, but are not limited to:

Chicory, Common Burdock, Common Mullein, Downy Brome, Field Bindweed, Halogeton, Johnsongrass, Perennial Sowthistle, Poison Hemlock, Puncturevine, Redstem Filaree

Identification and treatment can be conducted through Fremont County Weed Management or a recommended partnering agency. Please see Fremont County Weed Control's booklet, "Guideline for Weed Management Plans" for more details such as herbicide rates and specifics about weed control methods.

Fremont County Weed Management is operated by Qualified Licensed Applicators under the Department of Agriculture. Any management or treatment involving chemical treatment should be carried out as indicated on the label. The label is the law. Any information on management planning or about receiving cost share that is available to the public can be discussed with the department to confirm eligibility.

*These weed species receive priority for cost-share funding.

Other Required Action: Though not always present, it is highly advisable to keep an eye out for these species as well as any other state-listed noxious weeds if they begin to emerge. Heavy traffic and soil disturbances can bring about the growth of other seeds dormant in the soil. Watching for this type of activity is key to monitoring this type of occurrence. In the event any 'List A' or large populations of 'List B' species are observed, a site visit would be recommended during the peak growing season to discuss further management plans. In order to do this, please consider all factors in choosing a time (such as weather, presence of actively growing plants, and operation plans or activities). Any additional questions or concerns in completing this management plan please contact Fremont County Weed Management to discuss available options. (719-276-7317)

Freedom Solar

Applicant Signature _____ Date _____

Owner/Manager Signature _____ Date _____

Brittany Pierce
Fremont County Weed Management Representative _____ Date _____

FREMONT COUNTY'S
COLORADO DIVISION OF WATER RESOURCES
INFORMATION FORM FOR
SPECIAL USE, ZONING, AND OTHER LAND USE ACTIONS

The Fremont County Department of Planning & Zoning (Department) is required to submit proposed land use actions to the State Engineer's Office (SEO) at the Colorado Division of Water Resources (CDWR). The SEO is responsible for providing an opinion regarding material injury likely to occur to decreed water rights by virtue of diversion of water necessary or proposed to be used to supply the proposed land use action.

This CDWR Information Form must be filled out completely and accurately to ensure that the submittal to the CDWR regarding this proposed land use action includes the necessary information required by that agency. The CDWR has 21 days to respond to County submittals. Incomplete submittals will be returned to the County for additional information and then must be resubmitted to the CDWR.

Please note that the CDWR timeframe for review may not coincide with the County deadlines or meetings, and if the CDWR requires additional information, further delays may occur.

Attachments can be made to this application to provide expanded narrative for any application item including supportive documentation or evidence for provided application item answers. Please indicate at the application item that there is an attachment and label it as an exhibit with the application item number, a period and the number of the attachment for that item (*as an example, the first attached document providing evidence in support of the answer given at application item number 8 would be marked* - Exhibit CDWR-8.1, *the fifth attached document supporting the narrative provided for application item 8 would be marked* - Exhibit CDWR-8.5). Exhibit numbers should be placed in the lower right hand area of the exhibit.

1. Name of proposed project: Estes Rockets

2. Provide a map of proposed improvements with an identified location that includes a quarter-quarter, section, township, range and principle meridian (PLSS).

3. Legal description of subject property: 1295 H St. - SEC 8-19-68 Tracts 1 & 2 Tracts 15 & 16 Tracts 17 & 18 & 32 LYING North of HWY 50

4. What is the size of the existing parcel? 1.069 [x] Acres --- [ ] Square feet

5. What are the proposed uses of the subject property?
   - [ ] Residential Only
   - [x] Commercial
   - [ ] Commercial and Residential

6. What are the current uses of water on this parcel?
   a. Are there any established uses that require water? [x] Yes --- [ ] No
   b. Number of existing homes: 0

X

If one or more, date this use was established: _____

c. Home lawn / garden irrigation: ☐ Yes --- ☒ No

If yes, amount: _____ ☐ Acres --- ☐ Square feet
Date this use was established: _____

d. Livestock watering: ☐ Yes --- ☒ No

If yes, commercial or non-commercial livestock? *(Circle one)*

If yes, date this use was established: _____

e. Other uses: _____
Dates established: _____

7. What will be the proposed uses of water for this parcel? N/A

a. Number of proposed homes (including the home above if it will remain): _____

b. Lawn / garden watering, amount: _____ ☐ Acres --- ☐ Square feet

c. Livestock watering: ☐ Yes --- ☐ No

If yes, commercial or non-commercial livestock? *(Circle one)*

d. Number of Employees per day: _____ Number of days open per year: _____

e. Number of Customers per day: _____ Number of days open per year: _____

f. Bed / Breakfast Customers per day: _____ Number of days open per year: _____

g. Describe other water needs: _____

_____

_____

_____

_____

8. Source of water for the uses described above: *(If more than one source is utilized for parcel, describe which sources will supply which proposed uses)* _____

_____

_____

a. Is Municipal water available to parcel: ☐ Yes --- ☐ No

b. Is water available to parcel from an independent water district? ☐ Yes --- ☐ No

c. Are the uses described above proposed to be provided water by a municipality?

☐ Yes -- ☐ No

Name of provider: _____

d. Is water hauled: ☐ Yes --- ☐ No

e. Is there an existing permitted well?: ☐ Yes --- ☐ No

If yes, permit number: _____

f. Is there a Substitute Water Supply Plan? *(Substitute water supply plans provide water users a mechanism to replace out-of-priority depletions on an interim basis.)*
☐ Yes --- ☐ No

If yes, name of plan: _____

g. Is there an unregistered well? ☐ Yes --- ☐ No

h. Is there a Surface Spring? ☐ Yes --- ☐ No

If yes, Court Adjudication Number and Spring Name: _____

9. What is the Waste Water Method?
☒ Municipal
☐ Septic with Leach Field
☐ Closed Vault, Waste Water hauled to: _____

By signing this form, the Applicant, or the agent/representative acting with due authorization on behalf of the Applicant, hereby certifies that all information contained in the form and any attachments to the form, is true and correct to the best of Applicant's knowledge and belief.

Fremont County hereby advises Applicant that if any material information contained herein is determined to be misleading, inaccurate or false, the Board of Commissioners may take any and all reasonable and appropriate steps to declare actions of the Department regarding the Application to be null and void.

Signing this form is a declaration by the Applicant to conform to all plans, drawings, and commitments submitted with or contained within this form, provided that the same is in conformance with the Fremont County Zoning Resolution.

Freedom Solar	Freedom Solar	
Applicant Printed Name	Signature	Date
Property Owner Printed Name (If different from applicant)	Signature	Date

FREMONT COUNTY
FIRE PROTECTION PLAN
AND DISTRICT COMMENT FORM

The Fremont County Subdivision Regulations and Fremont County Zoning Resolution require a fire protection plan be submitted with many different types of applications, at the time of application submittal. In order to provide consistency in the information received, it shall be required that these plans be submitted on this form.

The Fremont County Department of Planning and Zoning (Department), Fremont County Planning Commission (Commission) and Fremont County Board of County Commissioners (Board) take into consideration the responses of the Applicant and the District during their respective review process.

Attachments can be made to this form to provide expanded narrative for any application item including supportive documentation or evidence for provided form item answers. Please indicate at the form item that there is an attachment and label it as an exhibit with the application item number, a period and the number of the attachment for that item (*as an example, the first attached document providing evidence in support of the answer given at application item number 4 would be marked* - Exhibit 4.1, *the fifth attached document supporting the narrative provided for application item 4 would be marked* - Exhibit 4.5). Exhibit numbers should be placed in either the lower right hand area or the upper right hand area of the exhibit.

If the subject property is not in a fire protection district, only applicants' information and map are required. A copy of the Colorado State Forest Service Wildfire Hazard Area Map with the subject property clearly and accurately located, shall be attached and marked as Exhibit A.

APPLICANT INFORMATION

1. Project Name Estes Rockets

2. Project Description The proposed project consists of construction of 480 KW ground Mounted solar system on approximate 1.6 acre site.

3. Type of application:

- ☐ Zone Change #1
- ☐ Zone Change #2 – Use Designation Plan
- ☐ Zone Change #2 – Final Development Plan
- ☐ Commercial Development Plan
- ☐ Commercial Development Modification
- ☐ Expansion of an existing Business or Industrial Use
- ☒ Special Review Use Permit
- ☐ Conditional Use Permit
- ☐ Temporary Use Permit
- ☐ Change of Use of Property
- ☐ Subdivision Preliminary Plan
- ☐ Minor Subdivision

3. The subject property is located at: 1295 H St. Penrose, CO 81240

Address and or General Location (*If general location only is used, it will be required that a legal description of the subject property be attached Marked as Exhibit 3.1*) ☐ An exhibit is attached.

4. Fire protection will be provided in what manner and with what resources?

5. The source of water for fire protection is:
   [X] --- Water District – Name of District: Division 2
   [ ] --- Well – Colorado Division of Water Resources Well Permit Number: _____
   Is the well approved for fire protection? [ ] Yes --- [ ] No Please explain: _____
   [ ] ---Cistern – What is the cistern capacity? _____ Gallons – What is the water source for filling the cistern? _____

6. What is the distance from the subject property to the nearest fire hydrant? 200 feet

7. What public roadways provide access to the subject property? HWY 50

8. How many accesses to public roadways will the subject property have? 1

9. Are the interior roadways existing and or proposed for the subject property adequate for fire vehicle access? [ ] Yes --- [ ] No Please explain by providing right-of-way and surface widths, length of roadway, surface types for all interior existing and proposed roadways and turning radii for cul-de-sacs. _____

10. What are the existing and or proposed interior roadway names? H.St & 11. St

11. Is the subject property located within a fire protection district? [X] Yes --- [ ] No
    If yes, please provide the district name: _____
    If the subject property is not located within a fire protection district please answer the following questions and the form will be considered completed for submittal. If the subject property is located within a fire protection district then answers to the following will not be required, however the remainder of the form shall be addressed by a representative of the fire protection district in which the subject property is located.

    a. What is the name of the fire protection district closest to the subject property? Florence Fire Protection District 2

    b. What is the distance from the subject property to the nearest fire protection district boundary? 1.4 miles

    c. Is it logical and feasible to annex the subject property to a fire protection district?
    [ ] Yes ----- [ ] No Please explain: _____

d. What types of fire protection improvements are proposed for the subject property and or structures to be housed on the property? Please explain:_____

_____

_____

_____

_____

By signing this Application, the Applicant, or the agent/representative acting with due authorization on behalf of the Applicant, hereby certifies that all information contained in the application and any attachments to the Application, is true and correct to the best of Applicant's knowledge and belief.

Applicant understands that any required private or public improvements imposed as a contingency for approval of the application may be required as a part of the approval process.

Fremont County hereby advises Applicant that if any material information contained herein is determined to be misleading, inaccurate or false, the Board of Commissioners may take any and all reasonable and appropriate steps to declare actions of the Board regarding the Application to be null and void.

Signing this Application is a declaration by the Applicant to conform to all plans, drawings, and commitments submitted with or contained within this Application, provided that the same is in conformance with the Fremont County Zoning Resolution.

Freedom Solar	Freedom Solar	
Applicant Printed Name	Signature	Date
Owner Printed Name	Signature	Date

FIRE PROTECTION AUTHORITY INFORMATION

1. The name of the fire protection authority is:_____

2. Name of contact person:_____

   Title: _____ Telephone:_____

3. The name and address of the responding fire station is:_____

   _____

   _____

4. The distance from the subject property, by public roadway, to the responding fire station is:_____

   _____

5. The estimated response time to the subject property is:_____

6. The location of the closest fire hydrant to the subject property is:_____

   _____

7. Is the existing hydrant size and location adequate for the existing neighborhood and the proposed development? ☐ Yes --- ☐ No Please explain:_____

   _____

   _____

8. Are the existing public roadways accessing the subject property adequate for fire vehicle access? ☐ Yes --- ☐ No Please explain:_____

   _____

   _____

   _____

9. Are the interior roadways existing and or proposed for the subject property adequate for fire vehicle access? ☐ Yes --- ☐ No Please explain:_____

   _____

   _____

   _____

10. Are the proposed fire protection measures adequate for any existing or proposed structures to be housed on the subject property? ☐ Yes --- ☐ No Please explain:_____

    _____

    _____

    _____

11. What are the wildfire hazard classifications for the subject property, as prepared by the Colorado State Forest Service?_____

12. Recommendations concerning fire protection in general, fire protection improvements, suggested road names, for this project are as follows: **NOTE:** Be sure to list type, size and location of improvements recommended (*i.e.; hydrants, water lines, cisterns, dry hydrants, roadway improvements, etc.*). **Please indicate whether recommendations or requirements are the result of codes or regulations, and provide supporting information which will assist the Planning Commission and the Board of County Commissioners to determine whether to adopt any or all of the recommendations as requirements of the permit.**

Signature and title of Authorized Fire Protection Representative **Date**

Choice Fixed Tilt Ground Mount - Direct Bolt

Structural Calculations

Estes Rockets Solar Project

OMCO SOLAR®
A DIVISION OF OMCO HOLDINGS

Project Address
1295 H St
Penrose, Colorado, 81240

Coordinates
(38.412497 ,-105.015378)

Prepared For
Freedom Solar Power
4801 FREIDRICH LN, STE 100
AUSTIN, TEXAS 78744

Contact Name: Josh Meade
Phone Number: -
Email: josh@freedomsolarpower.com

General Design Data and Code Information:

The design of the ground-mounted solar racking structures are governed by the 2016 California Building Code. Loads and load factors are determined in accordance with CBC 2016 and ASCE 7-10 Building Code & Standards adopted by the local authorities having jurisdictions. Factors of safety & resistances are determined by the applicable material design standards.

AISI S100-12 DESIGN STANDARD: North American Specification for the Design of Cold Formed Steel Structural Members 2012 EDITION.

Risk Category = I

Use or Occupancy of Building and Structures: Buildings and other structures that represent a low risk to human life in the event of failure.

Wind Design Speed =	100 MPH	[3sec wind gusts]
Wind Exposure Category =	C	

Base Ground Snow Load (P_g) =	35 PSF
Snow Importance Factor (I_e) =	0.8

External Pressure Coefficient: Varies per CPP Wind Tunnel Report - Project No. 9795

* Gust Effect Factor is incorporated into the pressure coefficients from CPP Report

Seismic Design Category =	D	
Site Class =	D	
Seismic Importance Factor (I_e) =	1	Per ASCE 7-10 Table 1.5-2

Module Information

Manufacturer		0	
Model		0	
Metric Dimensions	2216 mm	1045 mm	35 mm
Imperial Dimensions	87.24 in.	41.14 in.	1.38 in.
Weight	64.00 lbs		

Array Tilt Angle 30 Degrees

Snow Load

Thermal Factor C_t	1.0	
Importance Factor I	0.80	Per ASCE 7-10 Table 1.5-2
Exposure Factor C_e	1.0	
Roof Slope Factor C_s	0.73	Roof Slope Factor Cs Formula -2/111 x Tilt Angle + 126/99
Base Ground Snow Load (Pg) =	35.0 PSF	
Minimum flat roof snow load check	N/A	
p_f not less than following for angle less than 15		
If p_g = 20 or less min $p_f = (I)p_g$	N/A	
If p_g greater than 20 min $p_f = 20(I)$	0.0 PSF	
p_f = Flat roof snow load = $0.7C_eC_tIp_g$	19.6 PSF	
Final flat roof snow load	19.6 PSF	

Sloped Roof Snow Load		Beam Tributary Width	Beam Distributed Load
p_s = Sloped roof snow load = C_sp_f	14.4 PSF	43.62 in.	52.17 lb/ft

Module Dead Load

Module Length	87.24 in.
Module Width	41.14 in.
Module Weight	64.00 lbs
Beam Distributed Load	9.33 lb/ft

Wind Loading

Load Cases are specified by the wind tunnel report for analysis and design of various

- $GC_{N\text{-}Post\text{-}A}$ – Peak normal force on the high or low half of the post tributary area: for design of the posts/beams/braces loaded at the post.
- $GC_{N\text{-}Post\text{-}B}$ – Peak normal force on the post tributary area: for design of the posts/beams/braces loaded at the post.
- $GC_{N\text{-}Rail\text{-}Beam}$ – Peak normal force on the beam rail tributary area (spanning between posts): for design of the beam rails.
- $GC_{N\text{-}Rail\text{-}Module}$ – Peak normal force on the module rail tributary area (supporting individual modules): for design of the module rails.
- $GC_{N\text{-}Cantilever}$ – Peak normal force on the high or low half of the cantilever.

WIND TUNNEL LOAD CASES

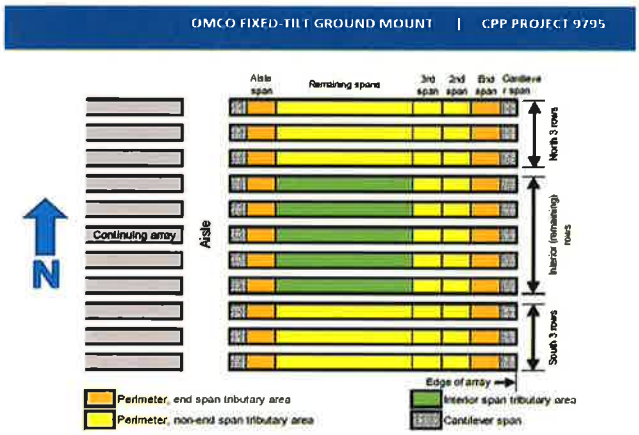


Figure 2: Zone map for rail and cantilever load cases

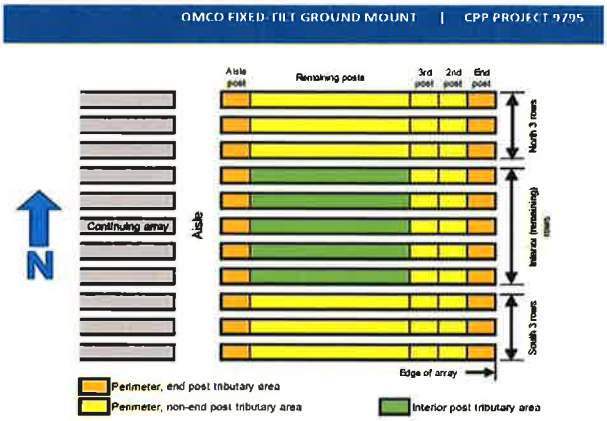
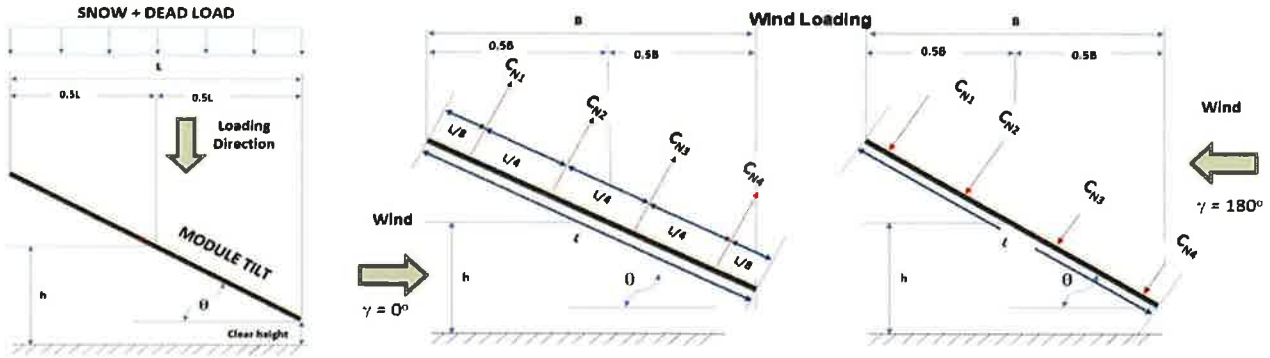


Figure 1: Zone map for post load cases



Wind loads are applied to two RISA files. One RISA file is for beam design and one file is for the tilt bracket, pile, and diagonal (TPD). External pressure coefficients vary based on array tilt angle, chord length, and pile spacing.

Summary of pressure coefficients for each table size, load case, and loading zone are shown in the following tables. Beam distributed loads are also calculated based on chord length and beam tributary width. For (TPD) analysis the beams are loaded with TPD coefficients and pressures for final TPD analysis and design.

Wind Loading

Velocity Pressure Calculation

Wind Speed	100 MPH
Exposure Category	C
Importance Factor	1
Exposure Coefficient	0.85
Topographic Factor	1
Directionality Factor	0.85

qz =Velocity Pressure = $0.00256K_zK_{zt}\ K_dV^2I$ (lb/ft2)
Constant 0.00256
V = Basic wind speed in mph
I = Importance Factor (i.e. different MRI)
K_z = Exposure Coefficient
K_{zt} = Topographical Factor
K_d = Wind Directionality Factor

qz (psf) = 18.496

Load Cases 2x5 TABLE															
Tilt	Chord	Post Spacing	Zone	Chord Divisions	$GC_{N\text{-}Rail\text{-}Beam}$		$GC_{N\text{-}Rail\text{-}Module}$		$GC_{N\text{-}Post}$				$GC_{N\text{-}Cantilever}$	
					(-)	(+)	(-)	(+)	Case A (-)	Case A (+)	Case B (-)	Case B (+)	(-)	(+)
30°	14.58	10 ft	END	GC_{N1}	-2.45	0.66	-2.91	1.28	-2.98	0.97	-2.92	1.02	-2.99	1.10
				GC_{N2}	-1.53	0.94	-2.21	2.01	-1.64	1.37	-1.64	1.43	-2.05	1.72
				GC_{N3}	-1.03	1.28	-1.75	2.80	-1.32	1.86	-1.42	1.85	-1.53	2.44
				GC_{N4}	-0.66	1.49	-1.25	2.62	-0.96	2.07	-1.02	2.04	-1.08	2.61
			PERIM	GC_{N1}	-1.57	0.49	-1.66	0.60	-1.86	0.51	-1.79	0.64	N/A	
				GC_{N2}	-1.58	0.76	-1.58	0.86	-1.69	0.78	-1.64	0.88		
				GC_{N3}	-0.93	1.12	-1.27	1.12	-0.98	1.09	-1.14	1.02		
				GC_{N4}	-0.46	1.21	-0.85	1.28	-0.55	1.26	-0.67	1.25		
			INTER	GC_{N1}	-0.99	0.36	-0.86	0.46	-1.08	0.28	-0.96	0.47		
				GC_{N2}	-0.71	0.52	-0.70	0.60	-0.75	0.39	-0.75	0.58		
				GC_{N3}	-0.41	0.59	-0.56	0.55	-0.47	0.46	-0.62	0.49		
				GC_{N4}	-0.27	0.36	-0.39	0.25	-0.32	0.55	-0.43	0.38		

5

Beam Loading - Beam Design (psf)

Beam Tributary Width			End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)	Cant (Uplift)	Cant (Down)
43.622	GC_{N1}	BEAM 1	-165.03	44.14	-105.51	33.08	-66.89	24.29	-201.34	74.03
	GC_{N2}	BEAM 2	-102.98	63.01	-105.94	50.80	-47.91	34.99	-138.01	115.54
	GC_{N3}	BEAM 3	-68.93	86.20	-62.40	74.98	-27.24	39.46	-102.74	163.85
	GC_{N4}	BEAM 4	-44.64	100.04	-31.08	81.64	-18.31	24.49	-72.55	175.54

Beam Loading - Post / Tilt Bracket / Diagonal Design (psf)

CASE A

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-200.61	65.09	-125.00	34.44	-72.81	18.89
GC_{N2}	BEAM 2	-110.21	92.05	-113.70	52.16	-50.64	26.46
GC_{N3}	BEAM 3	-88.52	124.87	-65.57	73.62	-31.34	31.15
GC_{N4}	BEAM 4	-64.36	139.01	-37.09	84.83	-21.49	37.09

CASE B

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-196.57	68.45	-120.54	43.08	-64.39	31.41
GC_{N2}	BEAM 2	-109.99	95.87	-110.55	59.06	-50.17	39.15
GC_{N3}	BEAM 3	-95.46	124.20	-76.54	68.60	-41.62	32.89
GC_{N4}	BEAM 4	-68.82	137.00	-44.96	83.92	-29.06	25.72

Load Cases 2x6 TABLE															
Tilt	Chord	Post Spacing	Zone	Chord Divisions	$GC_{N\text{-}Rail\text{-}Beam}$		$GC_{N\text{-}Rail\text{-}Module}$		$GC_{N\text{-}Post}$				$GC_{N\text{-}Cantilever}$	
					(-)	(+)	(-)	(+)	Case A (-)	Case A (+)	Case B (-)	Case B (+)	(-)	(+)
30°	14.58	12 ft	END	GC_{N1}	-2.33	0.63	-2.91	1.28	-2.94	0.94	-2.83	1.00	-2.99	1.10
				GC_{N2}	-1.54	0.92	-2.21	2.01	-1.61	1.32	-1.63	1.39	-2.05	1.72
				GC_{N3}	-1.02	1.24	-1.75	2.80	-1.28	1.79	-1.39	1.78	-1.53	2.44
				GC_{N4}	-0.66	1.44	-1.25	2.62	-0.93	2.00	-0.99	1.97	-1.08	2.61
			PERIM	GC_{N1}	-1.51	0.49	-1.66	0.60	-1.77	0.51	-1.71	0.62	N/A	
				GC_{N2}	-1.49	0.75	-1.58	0.86	-1.64	0.77	-1.59	0.86		
				GC_{N3}	-0.95	1.11	-1.27	1.12	-0.97	1.09	-1.15	1.03		
				GC_{N4}	-0.52	1.19	-0.85	1.28	-0.55	1.25	-0.70	1.24		
			INTER	GC_{N1}	-0.97	0.34	-0.86	0.46	-1.06	0.28	-0.95	0.45		
				GC_{N2}	-0.69	0.49	-0.70	0.60	-0.74	0.38	-0.73	0.56		
				GC_{N3}	-0.40	0.55	-0.56	0.55	-0.46	0.45	-0.61	0.48		
				GC_{N4}	-0.27	0.33	-0.39	0.25	-0.32	0.50	-0.42	0.35		

6

Beam Loading - Beam Design (psf)

Beam Tributary Width			End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)	Cant (Uplift)	Cant (Down)
43.622	GC_{N1}	BEAM 1	-156.85	42.25	-101.21	32.73	-65.04	22.91	-201.34	74.03
	GC_{N2}	BEAM 2	-103.21	61.73	-100.41	50.62	-46.55	32.81	-138.01	115.54
	GC_{N3}	BEAM 3	-68.53	83.46	-63.71	74.33	-27.02	36.87	-102.74	163.85
	GC_{N4}	BEAM 4	-44.09	97.04	-35.23	80.33	-18.22	22.39	-72.55	175.54

Beam Loading - Post / Tilt Bracket / Diagonal Design (psf)

CASE A

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-197.67	62.97	-119.10	34.26	-71.35	18.50
GC_{N2}	BEAM 2	-108.02	88.73	-110.51	52.07	-49.73	25.88
GC_{N3}	BEAM 3	-85.76	120.52	-65.51	73.16	-31.07	30.38
GC_{N4}	BEAM 4	-62.40	134.65	-36.82	84.37	-21.31	33.89

CASE B

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-190.59	67.06	-114.99	41.66	-63.68	30.33
GC_{N2}	BEAM 2	-109.72	93.28	-107.00	58.04	-49.13	37.91
GC_{N3}	BEAM 3	-93.47	119.76	-76.99	69.01	-40.77	31.99
GC_{N4}	BEAM 4	-66.83	132.64	-47.09	83.38	-28.40	23.25

Load Cases 2x7 TABLE															
Tilt	Chord	Post Spacing	Zone	Chord Divisions	$GC_{N\text{-}Rail\text{-}Beam}$		$GC_{N\text{-}Rail\text{-}Module}$		$GC_{N\text{-}Post}$				$GC_{N\text{-}Cantilever}$	
					(-)	(+)	(-)	(+)	Case A (-)	Case A (+)	Case B (-)	Case B (+)	(-)	(+)
30°	14.58	13.5 ft	END	GC_{N1}	-2.24	0.61	-2.91	1.28	-2.91	0.91	-2.77	0.98	-2.99	1.10
				GC_{N2}	-1.54	0.90	-2.21	2.01	-1.58	1.28	-1.63	1.36	-2.05	1.72
				GC_{N3}	-1.01	1.21	-1.75	2.80	-1.24	1.74	-1.37	1.73	-1.53	2.44
				GC_{N4}	-0.65	1.41	-1.25	2.62	-0.91	1.95	-0.97	1.92	-1.08	2.61
			PERIM	GC_{N1}	-1.31	0.47	-1.66	0.60	-1.51	0.50	-1.46	0.56	N/A	
				GC_{N2}	-1.25	0.75	-1.58	0.86	-1.50	0.77	-1.43	0.82		
				GC_{N3}	-1.01	1.08	-1.27	1.12	-0.97	1.07	-1.17	1.04		
				GC_{N4}	-0.71	1.14	-0.85	1.28	-0.54	1.23	-0.80	1.22		
			INTER	GC_{N1}	-0.88	0.28	-0.86	0.46	-1.00	0.26	-0.92	0.40		
				GC_{N2}	-0.63	0.39	-0.70	0.60	-0.70	0.36	-0.68	0.51		
				GC_{N3}	-0.39	0.43	-0.56	0.55	-0.45	0.42	-0.57	0.44		
				GC_{N4}	-0.27	0.24	-0.39	0.25	-0.31	0.36	-0.39	0.24		

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Beam Loading - Beam Design (psf)

Beam Tributary Width			End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)	Cant (Uplift)	Cant (Down)
43.622	GC_{N1}	BEAM 1	-150.72	40.84	-97.98	32.47	-63.65	21.88	-201.34	74.03
	GC_{N2}	BEAM 2	-103.39	60.77	-96.26	50.49	-45.53	31.18	-138.01	115.54
	GC_{N3}	BEAM 3	-68.23	81.40	-64.70	73.84	-26.86	34.92	-102.74	163.85
	GC_{N4}	BEAM 4	-43.67	94.79	-38.35	79.34	-18.16	20.81	-72.55	175.54

Beam Loading - Post / Tilt Bracket / Diagonal Design (psf)

CASE A

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-195.47	61.38	-114.67	34.12	-70.26	18.20
GC_{N2}	BEAM 2	-106.38	86.24	-108.11	52.00	-49.05	25.45
GC_{N3}	BEAM 3	-83.69	117.26	-65.47	72.82	-30.86	29.81
GC_{N4}	BEAM 4	-60.94	131.38	-36.61	84.03	-21.18	31.50

CASE B

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-186.10	66.02	-110.83	40.60	-63.15	29.53
GC_{N2}	BEAM 2	-109.51	91.33	-104.34	57.27	-48.35	36.97
GC_{N3}	BEAM 3	-91.97	116.43	-77.32	69.32	-40.13	31.32
GC_{N4}	BEAM 4	-65.34	129.37	-48.69	82.97	-27.90	21.39

Load Cases 2x8 TABLE															
Tilt	Chord	Post Spacing	Zone	Chord Divisions	$GC_{N\text{-}Rail\text{-}Beam}$		$GC_{N\text{-}Rail\text{-}Module}$		$GC_{N\text{-}Post}$				$GC_{N\text{-}Cantilever}$	
					(-)	(+)	(-)	(+)	Case A (-)	Case A (+)	Case B (-)	Case B (+)	(-)	(+)
30°	14.58	16 ft	END	GC_{N1}	-2.09	0.57	-2.91	1.28	-2.85	0.87	-2.66	0.96	-2.99	1.10
				GC_{N2}	-1.54	0.88	-2.21	2.01	-1.54	1.22	-1.62	1.31	-2.05	1.72
				GC_{N3}	-1.01	1.16	-1.75	2.80	-1.19	1.66	-1.33	1.65	-1.53	2.44
				GC_{N4}	-0.64	1.35	-1.25	2.62	-0.87	1.87	-0.93	1.84	-1.08	2.61
			PERIM	GC_{N1}	-1.38	0.48	-1.66	0.60	-1.60	0.50	-1.55	0.58	N/A	
				GC_{N2}	-1.33	0.75	-1.58	0.86	-1.55	0.77	-1.49	0.83		
				GC_{N3}	-0.99	1.09	-1.27	1.12	-0.97	1.07	-1.16	1.04		
				GC_{N4}	-0.65	1.16	-0.85	1.28	-0.54	1.24	-0.76	1.22		
			INTER	GC_{N1}	-0.91	0.30	-0.86	0.46	-1.02	0.26	-0.93	0.42		
				GC_{N2}	-0.65	0.42	-0.70	0.60	-0.71	0.37	-0.70	0.53		
				GC_{N3}	-0.40	0.47	-0.56	0.55	-0.45	0.43	-0.58	0.45		
				GC_{N4}	-0.27	0.27	-0.39	0.25	-0.31	0.41	-0.40	0.27		

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Beam Loading - Beam Design (psf)

Beam Tributary Calculation

Trib Length			End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)	Cant (Uplift)	Cant (Down)
43.622	GC_{N1}	BEAM 1	-140.49	38.48	-92.61	32.04	-61.34	20.16	-201.34	74.03
	GC_{N2}	BEAM 2	-103.69	59.17	-89.35	50.28	-43.83	28.45	-138.01	115.54
	GC_{N3}	BEAM 3	-67.73	77.97	-66.33	73.02	-26.58	31.69	-102.74	163.85
	GC_{N4}	BEAM 4	-42.97	91.04	-43.54	77.70	-18.05	18.18	-72.55	175.54

Beam Loading - Post / Tilt Bracket / Diagonal Design (psf)

CASE A

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-191.80	58.73	-107.29	33.90	-68.44	17.70
GC_{N2}	BEAM 2	-103.65	82.09	-104.12	51.89	-47.91	24.72
GC_{N3}	BEAM 3	-80.24	111.82	-65.40	72.25	-30.52	28.85
GC_{N4}	BEAM 4	-58.50	125.94	-36.27	83.46	-20.95	27.50

CASE B

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-178.62	64.28	-103.90	38.83	-62.26	28.18
GC_{N2}	BEAM 2	-109.17	88.09	-99.90	55.99	-47.04	35.41
GC_{N3}	BEAM 3	-89.49	110.87	-77.88	69.84	-39.06	30.19
GC_{N4}	BEAM 4	-62.85	123.92	-51.35	82.29	-27.06	18.29

Load Cases 2x9 TABLE														
Tilt	Chord	Post Spacing	Zone	Chord Divisions	$GC_{N\text{-}Rail\text{-}Beam}$		$GC_{N\text{-}Rail\text{-}Module}$		$GC_{N\text{-}Post}$				$GC_{N\text{-}Cantilever}$	
					(-)	(+)	(-)	(+)	Case A (-)	Case A (+)	Case B (-)	Case B (+)	(-)	(+)
30°	14.58	18 ft	END	GC_{N1}	-1.97	0.54	-2.91	1.28	-2.81	0.84	-2.57	0.94	-2.99	1.10
				GC_{N2}	-1.55	0.86	-2.21	2.01	-1.51	1.17	-1.62	1.27	-2.05	1.72
				GC_{N3}	-1.00	1.12	-1.75	2.80	-1.15	1.60	-1.30	1.58	-1.53	2.44
				GC_{N4}	-0.63	1.31	-1.25	2.62	-0.84	1.81	-0.91	1.78	-1.08	2.61
			PERIM	GC_{N1}	-1.31	0.47	-1.66	0.60	-1.51	0.50	-1.46	0.56	N/A	
				GC_{N2}	-1.25	0.75	-1.58	0.86	-1.50	0.77	-1.43	0.82		
				GC_{N3}	-1.01	1.08	-1.27	1.12	-0.97	1.07	-1.17	1.04		
				GC_{N4}	-0.71	1.14	-0.85	1.28	-0.54	1.23	-0.80	1.22		
			INTER	GC_{N1}	-0.88	0.28	-0.86	0.46	-1.00	0.26	-0.92	0.40		
				GC_{N2}	-0.63	0.39	-0.70	0.60	-0.70	0.36	-0.68	0.51		
				GC_{N3}	-0.39	0.43	-0.56	0.55	-0.45	0.42	-0.57	0.44		
				GC_{N4}	-0.27	0.24	-0.39	0.25	-0.31	0.36	-0.39	0.24		

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Beam Loading - Beam Design (psf)

Beam Tributary Width			End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)	Cant (Uplift)	Cant (Down)
43.622	GC_{N1}	BEAM 1	-132.32	36.59	-88.31	31.69	-59.48	18.78	-201.34	74.03
	GC_{N2}	BEAM 2	-103.92	57.89	-83.81	50.10	-42.47	26.28	-138.01	115.54
	GC_{N3}	BEAM 3	-67.33	75.23	-67.64	72.36	-26.36	29.10	-102.74	163.85
	GC_{N4}	BEAM 4	-42.42	88.04	-47.69	76.38	-17.96	16.07	-72.55	175.54

Beam Loading - Post / Tilt Bracket / Diagonal Design (psf)

CASE A

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-188.86	56.61	-101.39	33.72	-66.98	17.30
GC_{N2}	BEAM 2	-101.46	78.76	-100.93	51.80	-47.00	24.14
GC_{N3}	BEAM 3	-77.48	107.47	-65.34	71.79	-30.25	28.08
GC_{N4}	BEAM 4	-56.55	121.58	-36.00	83.01	-20.77	24.30

CASE B

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-172.64	62.88	-98.36	37.42	-61.55	27.11
GC_{N2}	BEAM 2	-108.89	85.49	-96.35	54.97	-46.00	34.16
GC_{N3}	BEAM 3	-87.50	106.43	-78.33	70.25	-38.20	29.29
GC_{N4}	BEAM 4	-60.86	119.56	-53.48	81.75	-26.39	15.82

Load Cases 2x10 TABLE														
Tilt	Chord	Post Spacing	Zone	Chord Divisions	$GC_{N\text{-}Rail\text{-}Beam}$		$GC_{N\text{-}Rail\text{-}Module}$		$GC_{N\text{-}Post}$				$GC_{N\text{-}Cantilever}$	
					(-)	(+)	(-)	(+)	Case A (-)	Case A (+)	Case B (-)	Case B (+)	(-)	(+)
30°	14.58	19 ft	END	GC_{N1}	-1.91	0.53	-2.91	1.28	-2.79	0.83	-2.52	0.92	-2.99	1.10
				GC_{N2}	-1.55	0.85	-2.21	2.01	-1.49	1.15	-1.62	1.25	-2.05	1.72
				GC_{N3}	-1.00	1.10	-1.75	2.80	-1.13	1.57	-1.29	1.55	-1.53	2.44
				GC_{N4}	-0.63	1.29	-1.25	2.62	-0.83	1.78	-0.89	1.75	-1.08	2.61
			PERIM	GC_{N1}	-1.28	0.47	-1.66	0.60	-1.46	0.50	-1.42	0.55	N/A	
				GC_{N2}	-1.21	0.74	-1.58	0.86	-1.48	0.77	-1.41	0.81		
				GC_{N3}	-1.02	1.07	-1.27	1.12	-0.97	1.06	-1.17	1.05		
				GC_{N4}	-0.74	1.13	-0.85	1.28	-0.53	1.23	-0.81	1.21		
			INTER	GC_{N1}	-0.87	0.27	-0.86	0.46	-0.99	0.25	-0.91	0.40		
				GC_{N2}	-0.62	0.37	-0.70	0.60	-0.69	0.35	-0.68	0.50		
				GC_{N3}	-0.39	0.41	-0.56	0.55	-0.45	0.41	-0.56	0.43		
				GC_{N4}	-0.27	0.22	-0.39	0.25	-0.31	0.34	-0.39	0.22		

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Beam Loading - Beam Design (psf)

Beam Tributary Width			End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)	Cant (Uplift)	Cant (Down)
43.622	GC_{N1}	BEAM 1	-128.23	35.65	-86.16	31.52	-58.56	18.09	-201.34	74.03
	GC_{N2}	BEAM 2	-104.04	57.25	-81.05	50.02	-41.78	25.19	-138.01	115.54
	GC_{N3}	BEAM 3	-67.13	73.86	-68.30	72.04	-26.25	27.80	-102.74	163.85
	GC_{N4}	BEAM 4	-42.14	86.54	-49.76	75.72	-17.92	15.02	-72.55	175.54

Beam Loading - Post / Tilt Bracket / Diagonal Design (psf)

CASE A

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-187.40	55.55	-98.44	33.62	-66.25	17.10
GC_{N2}	BEAM 2	-100.37	77.10	-99.34	51.75	-46.55	23.85
GC_{N3}	BEAM 3	-76.11	105.29	-65.32	71.57	-30.11	27.70
GC_{N4}	BEAM 4	-55.57	119.40	-35.86	82.78	-20.67	22.71

CASE B

		End (Uplift)	End (Down)	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-169.64	62.19	-95.59	36.71	-61.20	26.57
GC_{N2}	BEAM 2	-108.76	84.20	-94.57	54.45	-45.48	33.53
GC_{N3}	BEAM 3	-86.50	104.21	-78.55	70.46	-37.78	28.85
GC_{N4}	BEAM 4	-59.87	117.38	-54.55	81.48	-26.06	14.58

Load Cases 2x11 TABLE														
Tilt	Chord	Post Spacing	Zone	Chord Divisions	$GC_{N\text{-}Rail\text{-}Beam}$		$GC_{N\text{-}Rail\text{-}Module}$		$GC_{N\text{-}Post}$				$GC_{N\text{-}Cantilever}$	
					(-)	(+)	(-)	(+)	Case A (-)	Case A (+)	Case B (-)	Case B (+)	(-)	(+)
30°	14.58	21.17 ft	END	GC_{N1}	-1.92	0.53	-2.91	1.28	-2.79	0.83	-2.53	0.93	-2.99	1.10
				GC_{N2}	-1.55	0.85	-2.21	2.01	-1.50	1.15	-1.62	1.26	-2.05	1.72
				GC_{N3}	-1.00	1.10	-1.75	2.80	-1.14	1.57	-1.29	1.56	-1.53	2.44
				GC_{N4}	-0.63	1.29	-1.25	2.62	-0.83	1.78	-0.89	1.75	-1.08	2.61
			PERIM	GC_{N1}	-1.29	0.47	-1.66	0.60	-1.47	0.50	-1.43	0.55	N/A	
				GC_{N2}	-1.21	0.74	-1.58	0.86	-1.48	0.77	-1.41	0.81		
				GC_{N3}	-1.01	1.07	-1.27	1.12	-0.97	1.06	-1.17	1.05		
				GC_{N4}	-0.73	1.13	-0.85	1.28	-0.53	1.23	-0.81	1.21		
			INTER	GC_{N1}	-0.87	0.27	-0.86	0.46	-0.99	0.25	-0.91	0.40		
				GC_{N2}	-0.62	0.38	-0.70	0.60	-0.69	0.36	-0.68	0.50		
				GC_{N3}	-0.39	0.42	-0.56	0.55	-0.45	0.41	-0.56	0.43		
				GC_{N4}	-0.27	0.23	-0.39	0.25	-0.31	0.34	-0.39	0.22		

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Beam Loading - Beam Design (psf)

Beam Tributary Width			End (Uplift)	End (Down	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)	Cant (Uplift	Cant (Down)
43.622	GC_{N1}	BEAM 1	-128.91	35.80	-86.52	31.54	-58.71	18.20	-201.34	74.03
	GC_{N2}	BEAM 2	-104.02	57.36	-81.51	50.03	-41.90	25.37	-138.01	115.54
	GC_{N3}	BEAM 3	-67.17	74.09	-68.19	72.09	-26.27	28.02	-102.74	163.85
	GC_{N4}	BEAM 4	-42.19	86.79	-49.42	75.83	-17.92	15.20	-72.55	175.54

Beam Loading - Post / Tilt Bracket / Diagonal Design (psf)

CASE A

		End (Uplift)	End (Down	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-187.64	55.72	-98.93	33.64	-66.38	17.13
GC_{N2}	BEAM 2	-100.55	77.38	-99.60	51.76	-46.62	23.90
GC_{N3}	BEAM 3	-76.34	105.66	-65.32	71.60	-30.13	27.76
GC_{N4}	BEAM 4	-55.74	119.76	-35.88	82.82	-20.69	22.97

CASE B

		End (Uplift)	End (Down	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-170.14	62.30	-96.05	36.83	-61.25	26.66
GC_{N2}	BEAM 2	-108.78	84.41	-94.87	54.54	-45.57	33.64
GC_{N3}	BEAM 3	-86.67	104.58	-78.52	70.43	-37.85	28.92
GC_{N4}	BEAM 4	-60.03	117.74	-54.37	81.52	-26.11	14.79

Load Cases 2X12 TABLE														
Tilt	Chord	Post Spacing	Zone	Chord Divisions	$GC_{N\text{-}Rail\text{-}Beam}$		$GC_{N\text{-}Rail\text{-}Module}$		$GC_{N\text{-}Post}$				$GC_{N\text{-}Cantilever}$	
					(-)	(+)	(-)	(+)	Case A (-)	Case A (+)	Case B (-)	Case B (+)	(-)	(+)
30°	14.58	22.5 ft	END	GC_{N1}	-2.00	0.55	-2.91	1.28	-2.82	0.85	-2.59	0.94	-2.99	1.10
				GC_{N2}	-1.54	0.87	-2.21	2.01	-1.52	1.18	-1.62	1.28	-2.05	1.72
				GC_{N3}	-1.00	1.13	-1.75	2.80	-1.16	1.61	-1.31	1.60	-1.53	2.44
				GC_{N4}	-0.63	1.32	-1.25	2.62	-0.85	1.82	-0.91	1.79	-1.08	2.61
			PERIM	GC_{N1}	-1.33	0.47	-1.66	0.60	-1.53	0.50	-1.48	0.56	N/A	
				GC_{N2}	-1.27	0.75	-1.58	0.86	-1.51	0.77	-1.45	0.82		
				GC_{N3}	-1.00	1.08	-1.27	1.12	-0.97	1.07	-1.16	1.04		
				GC_{N4}	-0.69	1.14	-0.85	1.28	-0.54	1.24	-0.79	1.22		
			INTER	GC_{N1}	-0.89	0.28	-0.86	0.46	-1.00	0.26	-0.92	0.41		
				GC_{N2}	-0.64	0.40	-0.70	0.60	-0.70	0.36	-0.69	0.51		
				GC_{N3}	-0.39	0.44	-0.56	0.55	-0.45	0.42	-0.57	0.44		
				GC_{N4}	-0.27	0.25	-0.39	0.25	-0.31	0.37	-0.40	0.24		

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Beam Loading - Beam Design (psf)

Beam Tributary Width			End (Uplift)	End (Down	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)	Cant (Uplift	Cant (Down)
43.622	GC_{N1}	BEAM 1	-134.36	37.06	-89.38	31.78	-59.95	19.12	-201.34	74.03
	GC_{N2}	BEAM 2	-103.86	58.21	-85.20	50.15	-42.81	26.82	-138.01	115.54
	GC_{N3}	BEAM 3	-67.43	75.92	-67.32	72.53	-26.41	29.74	-102.74	163.85
	GC_{N4}	BEAM 4	-42.56	88.79	-46.65	76.71	-17.98	16.60	-72.55	175.54

Beam Loading - Post / Tilt Bracket / Diagonal Design (psf)

CASE A

		End (Uplift)	End (Down	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-189.60	57.14	-102.86	33.76	-67.35	17.40
GC_{N2}	BEAM 2	-102.01	79.59	-101.73	51.82	-47.23	24.28
GC_{N3}	BEAM 3	-78.17	108.56	-65.36	71.91	-30.32	28.27
GC_{N4}	BEAM 4	-57.04	122.67	-36.07	83.12	-20.81	25.10

CASE B

		End (Uplift)	End (Down	Per (Uplift)	Per (Down)	Int (Uplift)	Int (Down)
GC_{N1}	BEAM 1	-174.13	63.23	-99.75	37.77	-61.73	27.38
GC_{N2}	BEAM 2	-108.96	86.14	-97.23	55.22	-46.26	34.47
GC_{N3}	BEAM 3	-87.99	107.54	-78.22	70.15	-38.42	29.52
GC_{N4}	BEAM 4	-61.36	120.65	-52.95	81.88	-26.56	16.44

Seismic Design

Design Parameters	Latitude	Longitude	Ss	S1	Sds	Sd1
Data	38.412g	-105.015g	0.232g	0.065g	0.247g	0.105g

SHAPE	LENGTH	WEIGHT
7_63x4_5x1x145	158.000	229.28 lbs
2x2x092UDIAG	89.11	26.95 lbs
2x2x092UDIAG	68.780	20.80 lbs
4x3x1x055	144.16	54.71 lbs
Z6x3x055	296.540	235.19 lbs
4x2x092	9.38	7.69 lbs
4x2x092	14.380	11.79 lbs
L1x1x055	143.23	8.62 lbs
L1x1x055	149.30	0.00 lbs
Weight of Rack =		595.04 lbs
Rack Configuration (Max) =		2x7
Module Weight =		64.00 lbs
No. of Modules =		14
Weight of Modules =		896.00 lbs
Total Seismic Weight =		1491.04 lbs

Based on the site soil properties, the site shall be classified as Site CLASS A, B, C, D, E or F in accordance with Chapter 20.Where the soil properties are not known in sufficient detail to determine the site CLASS, Site CLASS D shall be used unless the AHJ or geotechnical data determines Site CLASS E or F soils are present at the site.

Base Shear V = CsW

	Cs, max = SD1/[T(R/Ie)]; for T < or = TL = 1.36
Cs = S_{DS}/(R/Ie) = 0.198	Cs, max = SD1*TL/[T2(R/Ie)]; for T > TL = 263.99
Ie = 1.00	Cs, max = 1.36
R = 1.25	Cs,min = 0.044SDSIe >0.01 = 0.01
	Cs, min = 0.01

For Structures located where S1 is equal to or greater than 0.6g:

T = Ta = $C_t h_n^x$ = 0.062	Cs,min = 0.5S1/(R/Ie) = 0.03	
Ct = 0.020	Cs,min = 0.01	V = CsW = 0.29
x = 0.750	USE Cs = 0.20	
hn = 4.50ft.	W = 1.49kips	
TL = 12	Horizontal Force at each Post = 0.15kips	
No. of Post: = 2	Horizontal Force at each Beam = 0.04kips	
No. of Beams: = 4		

Node Boundary Conditions

	Node Label	X [lb/in]	Y [lb/in]	Z [lb/in]	X Rot [k-in/rad]	Y Rot [k-in/rad]	Z Rot [k-in/rad]
1	2X7-2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	2X7-1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
3	2X9-2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
4	2X9-1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
5	2X8-2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
6	2X8-1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
7	2X10-2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
8	2X10-1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
9	2X6-2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
10	2X6-1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
11	2X5-2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
12	2X5-1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
13	2X11-1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
14	2X11-2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e^{5}°F^{-1}]	Density [k/ft^{3}]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A572 Gr.57	29000	11154	0.3	0.65	0.49	57	1.1	70	1.1
2	A1085	29000	11154	0.3	0.65	0.49	50	1.4	65	1.3
3	A653 GR 80	29000	11154	0.3	0.65	0.49	80	1.5	90	1.2

Cold Formed Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e^{5}°F^{-1}]	Density [k/ft^{3}]	Yield [ksi]	Fu [ksi]
1	A653 SS Gr57	29500	11346	0.3	0.65	0.49	57	70
2	A653 SS Gr50/1	29500	11346	0.3	0.65	0.49	50	65
3	A653 SS Gr80	29500	11346	0.3	0.65	0.49	80	90

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in^{2}]	Iyy [in^{4}]	Izz [in^{4}]	J [in^{4}]
1	L2X2	L2X2X092	None	None	A572 Gr.57	Typical	0.36	0.143	0.143	0.000984
2	L3X3	L3X3X092	None	None	A572 Gr.57	Typical	0.544	0.494	0.494	0.002
3	LB2X2	L2X2X055	None	None	A653 GR 80	Typical	0.217	0.088	0.088	0.000215

Cold Formed Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in^{2}]	Iyy [in^{4}]	Izz [in^{4}]	J [in^{4}]
1	145 PILE	7_63X4_5X_145-M	Column	CS	A653 SS Gr57	Typical	2.561	6.915	24.82	0.018
2	112 PILE	7_63X4_5X_112-M	Column	None	A653 SS Gr57	Typical	2.001	5.518	19.629	0.008
3	4X3 TILT	4X3X1X055-M	Beam	CS	A653 SS Gr80	Typical	0.636	0.868	1.739	0.0006412
4	4X2 TILT	4X2X_75X055-M	Beam	None	A653 SS Gr80	Typical	0.53	0.345	1.328	0.000534
5	6 CHOICE Z	Z6X3X055	Beam	None	A653 SS Gr80	Typical	0.666	1.199	3.95	0.000671
6	CONNECTOR	4X2X092-M	None	None	A653 SS Gr50/1	Typical	0.708	0.283	1.786	0.002
7	U3X2DIAG	3X2X092DIAG	None	None	A653 SS Gr57	Typical	0.629	0.262	0.943	0.002
8	U2X2DIAG	2X2X092DIAG_CFA	None	None	A653 SS Gr57	Typical	0.54	0.228	0.38	0.002

Hot Rolled Steel Design Parameters

	Label	Shape	Length [in]	Channel Conn.	a [in]	Function
1	DBL9-1	L2X2	66.217	N/A	N/A	Lateral
2	DBU10-2	L2X2	85.529	N/A	N/A	Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length [in]	Channel Conn.	a [in]	Function
3	DBL9-2	L2X2	66.217	N/A	N/A	Lateral
4	DBU9-1	L2X2	85.529	N/A	N/A	Lateral
5	DBU10-1	L2X2	85.529	N/A	N/A	Lateral
6	DBU9-2	L2X2	85.529	N/A	N/A	Lateral
7	DBL5-1	L2X2	66.217	N/A	N/A	Lateral
8	DBU5-1	L2X2	85.529	N/A	N/A	Lateral
9	DBU6-2	L2X2	85.529	N/A	N/A	Lateral
10	DBL6-2	L2X2	66.217	N/A	N/A	Lateral
11	DBL6-1	L2X2	66.217	N/A	N/A	Lateral
12	DBU6-1	L2X2	85.529	N/A	N/A	Lateral
13	DBL10-2	L2X2	66.217	N/A	N/A	Lateral
14	DBL10-1	L2X2	66.217	N/A	N/A	Lateral
15	DBL5-2	L2X2	66.217	N/A	N/A	Lateral
16	DBU5-2	L2X2	85.529	N/A	N/A	Lateral
17	DBU11-2	L2X2	85.529	N/A	N/A	Lateral
18	DBU11-1	L2X2	85.529	N/A	N/A	Lateral
19	DBL11-2	L2X2	66.217	N/A	N/A	Lateral
20	DBL11-1	L2X2	66.217	N/A	N/A	Lateral

Cold Formed Steel Design Parameters

	Label	Shape	Length [in]	Lb y-y [in]	Lcomp top [in]	Lcomp bot [in]	L-Torque [in]	y sway	z sway
1	B10-3	6 CHOICE Z	414.961	76	76	40	40		
2	B10-2	6 CHOICE Z	414.961	76	76	40	40		
3	B9-2	6 CHOICE Z	373.425	72	72	40	40		
4	B6-2	6 CHOICE Z	248.819	72	72	40	40		
5	B7-3	6 CHOICE Z	290.354	81	81	40	40		
6	B7-2	6 CHOICE Z	290.354	81	81	40	40		
7	B6-3	6 CHOICE Z	248.819	72	72	40	40		
8	B8-2	6 CHOICE Z	331.89	64	64	40	40		
9	B8-3	6 CHOICE Z	331.89	64	64	40	40		
10	B9-3	6 CHOICE Z	373.425	72	72	40	40		
11	B10-1	6 CHOICE Z	414.961	76	76	40	40		
12	B9-1	6 CHOICE Z	373.425	72	72	40	40		
13	B8-1	6 CHOICE Z	331.89	64	64	40	40		
14	B6-1	6 CHOICE Z	248.819	72	72	40	40		
15	B7-4	6 CHOICE Z	290.354	81	81	40	40		
16	B7-1	6 CHOICE Z	290.354	81	81	40	40		
17	B10-4	6 CHOICE Z	414.961	76	76	40	40		
18	B5-1	6 CHOICE Z	207.283	60	60	40	40		
19	B5-3	6 CHOICE Z	207.283	60	60	40	40		
20	B9-4	6 CHOICE Z	373.425	72	72	40	40		
21	B5-2	6 CHOICE Z	207.283	60	60	40	40		
22	B6-4	6 CHOICE Z	248.819	72	72	40	40		
23	B8-4	6 CHOICE Z	331.89	64	64	40	40		
24	B5-4	6 CHOICE Z	207.283	60	60	40	40		
25	T6-1	4X2 TILT	139.239	Segment			Segment		
26	T6-2	4X2 TILT	139.239	Segment			Segment		
27	P6-1	112 PILE	64.73		Lbyy				
28	P6-2	112 PILE	64.73		Lbyy				
29	DBL8-1	U2X2DIAG	66.217						
30	DBL8-2	U2X2DIAG	66.217						
31	DBU8-1	U2X2DIAG	85.529						
32	DBU8-2	U2X2DIAG	85.529						
33	P7-2	145 PILE	64.73		Lbyy				
34	CBL6-2	CONNECTOR	8						

Cold Formed Steel Design Parameters (Continued)

	Label	Shape	Length [in]	Lb y-y [in]	Lcomp top [in]	Lcomp bot [in]	L-Torque [in]	y sway	z sway
35	CBS5-3	CONNECTOR	5						
36	CBS5-1	CONNECTOR	5						
37	CBS5-2	CONNECTOR	5						
38	CBS5-4	CONNECTOR	5						
39	CBL5-3	CONNECTOR	8						
40	CBL5-4	CONNECTOR	8						
41	CBL5-2	CONNECTOR	8						
42	CBL5-1	CONNECTOR	8						
43	T5-1	4X2 TILT	139.239	Segment			Segment		
44	T5-2	4X2 TILT	139.239	Segment			Segment		
45	P5-1	112 PILE	64.73		Lbyy				
46	P5-2	112 PILE	64.73		Lbyy				
47	CBS6-3	CONNECTOR	5						
48	CBS6-1	CONNECTOR	5						
49	CBS6-2	CONNECTOR	5						
50	CBS6-4	CONNECTOR	5						
51	CBL6-3	CONNECTOR	8						
52	CBL6-4	CONNECTOR	8						
53	CBL6-1	CONNECTOR	8						
54	CBL9-3	CONNECTOR	8						
55	CBL10-4	CONNECTOR	8						
56	CBS7-1	CONNECTOR	5						
57	CBS7-2	CONNECTOR	5						
58	CBS7-4	CONNECTOR	5						
59	CBL7-3	CONNECTOR	8						
60	CBL7-4	CONNECTOR	8						
61	CBL7-2	CONNECTOR	8						
62	CBL7-1	CONNECTOR	8						
63	T10-1	4X2 TILT	139.239	Segment			Segment		
64	T10-2	4X2 TILT	139.239	Segment			Segment		
65	T9-1	4X2 TILT	139.239	Segment			Segment		
66	CBS7-3	CONNECTOR	5						
67	T9-2	4X2 TILT	139.239	Segment			Segment		
68	T8-1	4X3 TILT	139.239	Segment			Segment		
69	T7-1	4X3 TILT	139.239	Segment			Segment		
70	T7-2	4X3 TILT	139.239	Segment			Segment		
71	P9-1	112 PILE	64.73		Lbyy				
72	P9-2	112 PILE	64.73		Lbyy				
73	P10-1	112 PILE	64.73		Lbyy				
74	P10-2	112 PILE	64.73		Lbyy				
75	P8-2	112 PILE	64.73		Lbyy				
76	P8-1	112 PILE	64.73		Lbyy				
77	P7-1	145 PILE	64.73		Lbyy				
78	T8-2	4X3 TILT	139.239	Segment			Segment		
79	DBU7-1	U2X2DIAG	85.529						
80	DBL7-1	U2X2DIAG	66.217						
81	DBL7-2	U2X2DIAG	66.217						
82	CBL9-2	CONNECTOR	8						
83	CBL9-4	CONNECTOR	8						
84	CBL8-2	CONNECTOR	8						
85	CBL8-4	CONNECTOR	8						
86	CBL8-1	CONNECTOR	8						
87	CBL8-3	CONNECTOR	8						
88	CBL9-1	CONNECTOR	8						
89	CBL10-3	CONNECTOR	8						

Cold Formed Steel Design Parameters (Continued)

	Label	Shape	Length [in]	Lb y-y [in]	Lcomp top [in]	Lcomp bot [in]	L-Torque [in]	y sway	z sway
90	CBL10-1	CONNECTOR	8						
91	CBS8-2	CONNECTOR	5						
92	CBS8-4	CONNECTOR	5						
93	CBS8-1	CONNECTOR	5						
94	CBS8-3	CONNECTOR	5						
95	CBS9-1	CONNECTOR	5						
96	CBS9-3	CONNECTOR	5						
97	CBS9-4	CONNECTOR	5						
98	CBS9-2	CONNECTOR	5						
99	CBS10-4	CONNECTOR	5						
100	CBS10-2	CONNECTOR	5						
101	CBS10-3	CONNECTOR	5						
102	CBS10-1	CONNECTOR	5						
103	DBU7-2	U2X2DIAG	85.529						
104	CBL10-2	CONNECTOR	8						
105	B11-3	6 CHOICE Z	456.496	76	76	40	40		
106	B11-2	6 CHOICE Z	456.496	76	76	40	40		
107	B11-1	6 CHOICE Z	456.496	76	76	40	40		
108	B11-4	6 CHOICE Z	456.496	76	76	40	40		
109	P11-1	112 PILE	64.73		Lbyy				
110	CBL11-4	CONNECTOR	8						
111	T11-1	4X2 TILT	139.239	Segment			Segment		
112	T11-2	4X2 TILT	139.239	Segment			Segment		
113	P11-2	112 PILE	64.73		Lbyy				
114	CBL11-3	CONNECTOR	8						
115	CBL11-1	CONNECTOR	8						
116	CBS11-4	CONNECTOR	5						
117	CBS11-2	CONNECTOR	5						
118	CBS11-3	CONNECTOR	5						
119	CBS11-1	CONNECTOR	5						
120	CBL11-2	CONNECTOR	8						

Member Point Loads

No Data to Print...

Member Distributed Loads (BLC 1 : DEAD LOAD (MODULE + SELF WEIGHT))

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	B7-1	Y	-9.33	-9.33	0	%100
2	B7-2	Y	-9.33	-9.33	0	%100
3	B7-3	Y	-9.33	-9.33	0	%100
4	B7-4	Y	-9.33	-9.33	0	%100
5	B8-1	Y	-9.33	-9.33	0	%100
6	B8-2	Y	-9.33	-9.33	0	%100
7	B8-3	Y	-9.33	-9.33	0	%100
8	B8-4	Y	-9.33	-9.33	0	%100
9	B9-1	Y	-9.33	-9.33	0	%100
10	B9-2	Y	-9.33	-9.33	0	%100
11	B9-3	Y	-9.33	-9.33	0	%100
12	B9-4	Y	-9.33	-9.33	0	%100
13	B10-1	Y	-9.33	-9.33	0	%100
14	B10-2	Y	-9.33	-9.33	0	%100
15	B10-3	Y	-9.33	-9.33	0	%100
16	B10-4	Y	-9.33	-9.33	0	%100
17	B6-1	Y	-9.33	-9.33	0	%100

Member Distributed Loads (BLC 1 : DEAD LOAD (MODULE + SELF WEIGHT)) (Continued)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
18	B6-4	Y	-9.33	-9.33	0	%100
19	B6-2	Y	-9.33	-9.33	0	%100
20	B6-3	Y	-9.33	-9.33	0	%100
21	B5-1	Y	-9.33	-9.33	0	%100
22	B5-4	Y	-9.33	-9.33	0	%100
23	B5-2	Y	-9.33	-9.33	0	%100
24	B5-3	Y	-9.33	-9.33	0	%100
25	B11-1	Y	-9.33	-9.33	0	%100
26	B11-2	Y	-9.33	-9.33	0	%100
27	B11-3	Y	-9.33	-9.33	0	%100
28	B11-4	Y	-9.33	-9.33	0	%100

Member Distributed Loads (BLC 4 : WIND POS (+) POST A)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	B5-1	y	34.44	34.44	0	%50
2	B5-1	y	34.44	34.44	%50	%100
3	B5-2	y	52.16	52.16	0	%50
4	B5-2	y	52.16	52.16	%50	%100
5	B5-3	y	73.62	73.62	0	%50
6	B5-3	y	73.62	73.62	%50	%100
7	B5-4	y	84.83	84.83	0	%50
8	B5-4	y	84.83	84.83	%50	%100
9	B6-1	y	34.26	34.26	0	%50
10	B6-1	y	34.26	34.26	%50	%100
11	B6-2	y	52.07	52.07	0	%50
12	B6-2	y	52.07	52.07	%50	%100
13	B6-3	y	73.16	73.16	0	%50
14	B6-3	y	73.16	73.16	%50	%100
15	B6-4	y	84.37	84.37	0	%50
16	B6-4	y	84.37	84.37	%50	%100
17	B7-1	y	34.12	34.12	0	%50
18	B7-1	y	34.12	34.12	%50	%100
19	B7-2	y	52	52	0	%50
20	B7-2	y	52	52	%50	%100
21	B7-3	y	72.82	72.82	0	%50
22	B7-3	y	72.82	72.82	%50	%100
23	B7-4	y	84.03	84.03	0	%50
24	B7-4	y	84.03	84.03	%50	%100
25	B8-1	y	33.9	33.9	0	%50
26	B8-1	y	33.9	33.9	%50	%100
27	B8-2	y	51.89	51.89	0	%50
28	B8-2	y	51.89	51.89	%50	%100
29	B8-3	y	72.25	72.25	0	%50
30	B8-3	y	72.25	72.25	%50	%100
31	B8-4	y	83.46	83.46	0	%50
32	B8-4	y	83.46	83.46	%50	%100
33	B9-1	y	33.72	33.72	0	%50
34	B9-1	y	33.72	33.72	%50	%100
35	B9-2	y	51.8	51.8	0	%50
36	B9-2	y	51.8	51.8	%50	%100
37	B9-3	y	71.79	71.79	0	%50
38	B9-3	y	71.79	71.79	%50	%100
39	B9-4	y	83.01	83.01	0	%50
40	B9-4	y	83.01	83.01	%50	%100
41	B10-1	y	33.62	33.62	0	%50

Member Distributed Loads (BLC 4 : WIND POS (+) POST A) (Continued)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
42	B10-1	y	33.62	33.62	%50	%100
43	B10-2	y	51.75	51.75	0	%50
44	B10-2	y	51.75	51.75	%50	%100
45	B10-3	y	71.57	71.57	0	%50
46	B10-3	y	71.57	71.57	%50	%100
47	B10-4	y	82.78	82.78	0	%50
48	B10-4	y	82.78	82.78	%50	%100
49	B11-1	y	33.64	33.64	0	%50
50	B11-1	y	33.64	33.64	%50	%100
51	B11-2	y	51.76	51.76	0	%50
52	B11-2	y	51.76	51.76	%50	%100
53	B11-3	y	71.6	71.6	0	%50
54	B11-3	y	71.6	71.6	%50	%100
55	B11-4	y	82.82	82.82	0	%50
56	B11-4	y	82.82	82.82	%50	%100

Member Distributed Loads (BLC 5 : WIND NEG (-) POST A)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	B5-1	y	-125	-125	0	%50
2	B5-1	y	-125	-125	%50	%100
3	B5-2	y	-113.7	-113.7	0	%50
4	B5-2	y	-113.7	-113.7	%50	%100
5	B5-3	y	-65.57	-65.57	0	%50
6	B5-3	y	-65.57	-65.57	%50	%100
7	B5-4	y	-37.09	-37.09	0	%50
8	B5-4	y	-37.09	-37.09	%50	%100
9	B6-1	y	-119.1	-119.1	0	%50
10	B6-1	y	-119.1	-119.1	%50	%100
11	B6-2	y	-110.51	-110.51	0	%50
12	B6-2	y	-110.51	-110.51	%50	%100
13	B6-3	y	-65.51	-65.51	0	%50
14	B6-3	y	-65.51	-65.51	%50	%100
15	B6-4	y	-36.82	-36.82	0	%50
16	B6-4	y	-36.82	-36.82	%50	%100
17	B7-1	y	-114.67	-114.67	0	%50
18	B7-1	y	-114.67	-114.67	%50	%100
19	B7-2	y	-108.11	-108.11	0	%50
20	B7-2	y	-108.11	-108.11	%50	%100
21	B7-3	y	-65.47	-65.47	0	%50
22	B7-3	y	-65.47	-65.47	%50	%100
23	B7-4	y	-36.61	-36.61	0	%50
24	B7-4	y	-36.61	-36.61	%50	%100
25	B8-1	y	-107.29	-107.29	0	%50
26	B8-1	y	-107.29	-107.29	%50	%100
27	B8-2	y	-104.12	-104.12	0	%50
28	B8-2	y	-104.12	-104.12	%50	%100
29	B8-3	y	-65.4	-65.4	0	%50
30	B8-3	y	-65.4	-65.4	%50	%100
31	B8-4	y	-36.27	-36.27	0	%50
32	B8-4	y	-36.27	-36.27	%50	%100
33	B9-1	y	-101.39	-101.39	0	%50
34	B9-1	y	-101.39	-101.39	%50	%100
35	B9-2	y	-100.93	-100.93	0	%50
36	B9-2	y	-100.93	-100.93	%50	%100
37	B9-3	y	-65.34	-65.34	0	%50

Member Distributed Loads (BLC 5 : WIND NEG (-) POST A) (Continued)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
38	B9-3	y	-65.34	-65.34	%50	%100
39	B9-4	y	-36	-36	0	%50
40	B9-4	y	-36	-36	%50	%100
41	B10-1	y	-98.44	-98.44	0	%50
42	B10-1	y	-98.44	-98.44	%50	%100
43	B10-2	y	-99.34	-99.34	0	%50
44	B10-2	y	-99.34	-99.34	%50	%100
45	B10-3	y	-65.32	-65.32	0	%50
46	B10-3	y	-65.32	-65.32	%50	%100
47	B10-4	y	-35.86	-35.86	0	%50
48	B10-4	y	-35.86	-35.86	%50	%100
49	B11-1	y	-98.93	-98.93	0	%50
50	B11-1	y	-98.93	-98.93	%50	%100
51	B11-2	y	-99.6	-99.6	0	%50
52	B11-2	y	-99.6	-99.6	%50	%100
53	B11-3	y	-65.32	-65.32	0	%50
54	B11-3	y	-65.32	-65.32	%50	%100
55	B11-4	y	-35.88	-35.88	0	%50
56	B11-4	y	-35.88	-35.88	%50	%100

Member Distributed Loads (BLC 6 : WIND POS (+) POST B)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	B5-1	y	43.08	43.08	0	%50
2	B5-1	y	43.08	43.08	%50	%100
3	B5-2	y	59.06	59.06	0	%50
4	B5-2	y	59.06	59.06	%50	%100
5	B5-3	y	68.6	68.6	0	%50
6	B5-3	y	68.6	68.6	%50	%100
7	B5-4	y	83.92	83.92	0	%50
8	B5-4	y	83.92	83.92	%50	%100
9	B6-1	y	41.66	41.66	0	%50
10	B6-1	y	41.66	41.66	%50	%100
11	B6-2	y	58.04	58.04	0	%50
12	B6-2	y	58.04	58.04	%50	%100
13	B6-3	y	69.01	69.01	0	%50
14	B6-3	y	69.01	69.01	%50	%100
15	B6-4	y	83.38	83.38	0	%50
16	B6-4	y	83.38	83.38	%50	%100
17	B7-1	y	40.6	40.6	0	%50
18	B7-1	y	40.6	40.6	%50	%100
19	B7-2	y	57.27	57.27	0	%50
20	B7-2	y	57.27	57.27	%50	%100
21	B7-3	y	69.32	69.32	0	%50
22	B7-3	y	69.32	69.32	%50	%100
23	B7-4	y	82.97	82.97	0	%50
24	B7-4	y	82.97	82.97	%50	%100
25	B8-1	y	38.83	38.83	0	%50
26	B8-1	y	38.83	38.83	%50	%100
27	B8-2	y	55.99	55.99	0	%50
28	B8-2	y	55.99	55.99	%50	%100
29	B8-3	y	69.84	69.84	0	%50
30	B8-3	y	69.84	69.84	%50	%100
31	B8-4	y	82.29	82.29	0	%50
32	B8-4	y	82.29	82.29	%50	%100
33	B9-1	y	37.42	37.42	0	%50

Member Distributed Loads (BLC 6 : WIND POS (+) POST B) (Continued)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
34	B9-1	y	37.42	37.42	%50	%100
35	B9-2	y	54.97	54.97	0	%50
36	B9-2	y	54.97	54.97	%50	%100
37	B9-3	y	70.25	70.25	0	%50
38	B9-3	y	70.25	70.25	%50	%100
39	B9-4	y	81.75	81.75	0	%50
40	B9-4	y	81.75	81.75	%50	%100
41	B10-1	y	36.71	36.71	0	%50
42	B10-1	y	36.71	36.71	%50	%100
43	B10-2	y	54.45	54.45	0	%50
44	B10-2	y	54.45	54.45	%50	%100
45	B10-3	y	70.46	70.46	0	%50
46	B10-3	y	70.46	70.46	%50	%100
47	B10-4	y	81.48	81.48	0	%50
48	B10-4	y	81.48	81.48	%50	%100
49	B11-1	y	36.83	36.83	0	%50
50	B11-1	y	36.83	36.83	%50	%100
51	B11-2	y	54.54	54.54	0	%50
52	B11-2	y	54.54	54.54	%50	%100
53	B11-3	y	70.43	70.43	0	%50
54	B11-3	y	70.43	70.43	%50	%100
55	B11-4	y	81.52	81.52	0	%50
56	B11-4	y	81.52	81.52	%50	%100

Member Distributed Loads (BLC 7 : WIND NEG (-) POST B)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	B5-1	y	-120.54	-120.54	0	%50
2	B5-1	y	-120.54	-120.54	%50	%100
3	B5-2	y	-110.55	-110.55	0	%50
4	B5-2	y	-110.55	-110.55	%50	%100
5	B5-3	y	-76.54	-76.54	0	%50
6	B5-3	y	-76.54	-76.54	%50	%100
7	B5-4	y	-44.96	-44.96	0	%50
8	B5-4	y	-44.96	-44.96	%50	%100
9	B6-1	y	-114.99	-114.99	0	%50
10	B6-1	y	-114.99	-114.99	%50	%100
11	B6-2	y	-107	-107	0	%50
12	B6-2	y	-107	-107	%50	%100
13	B6-3	y	-76.99	-76.99	0	%50
14	B6-3	y	-76.99	-76.99	%50	%100
15	B6-4	y	-47.09	-47.09	0	%50
16	B6-4	y	-47.09	-47.09	%50	%100
17	B7-1	y	-110.83	-110.83	0	%50
18	B7-1	y	-110.83	-110.83	%50	%100
19	B7-2	y	-104.34	-104.34	0	%50
20	B7-2	y	-104.34	-104.34	%50	%100
21	B7-3	y	-77.32	-77.32	0	%50
22	B7-3	y	-77.32	-77.32	%50	%100
23	B7-4	y	-48.69	-48.69	0	%50
24	B7-4	y	-48.69	-48.69	%50	%100
25	B8-1	y	-103.9	-103.9	0	%50
26	B8-1	y	-103.9	-103.9	%50	%100
27	B8-2	y	-99.9	-99.9	0	%50
28	B8-2	y	-99.9	-99.9	%50	%100
29	B8-3	y	-77.88	-77.88	0	%50

Member Distributed Loads (BLC 7 : WIND NEG (-) POST B) (Continued)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
30	B8-3	y	-77.88	-77.88	%50	%100
31	B8-4	y	-51.35	-51.35	0	%50
32	B8-4	y	-51.35	-51.35	%50	%100
33	B9-1	y	-98.36	-98.36	0	%50
34	B9-1	y	-98.36	-98.36	%50	%100
35	B9-2	y	-96.35	-96.35	0	%50
36	B9-2	y	-96.35	-96.35	%50	%100
37	B9-3	y	-78.33	-78.33	0	%50
38	B9-3	y	-78.33	-78.33	%50	%100
39	B9-4	y	-53.48	-53.48	0	%50
40	B9-4	y	-53.48	-53.48	%50	%100
41	B10-1	y	-95.59	-95.59	0	%50
42	B10-1	y	-95.59	-95.59	%50	%100
43	B10-2	y	-94.57	-94.57	0	%50
44	B10-2	y	-94.57	-94.57	%50	%100
45	B10-3	y	-78.55	-78.55	0	%50
46	B10-3	y	-78.55	-78.55	%50	%100
47	B10-4	y	-54.55	-54.55	0	%50
48	B10-4	y	-54.55	-54.55	%50	%100
49	B11-1	y	-96.05	-96.05	0	%50
50	B11-1	y	-96.05	-96.05	%50	%100
51	B11-2	y	-94.87	-94.87	0	%50
52	B11-2	y	-94.87	-94.87	%50	%100
53	B11-3	y	-78.52	-78.52	0	%50
54	B11-3	y	-78.52	-78.52	%50	%100
55	B11-4	y	-54.37	-54.37	0	%50
56	B11-4	y	-54.37	-54.37	%50	%100

Member Distributed Loads (BLC 8 : SNOW)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
1	B5-1	Y	-52.17	-52.17	0	%50
2	B5-1	Y	-52.17	-52.17	%50	%100
3	B5-2	Y	-52.17	-52.17	0	%50
4	B5-2	Y	-52.17	-52.17	%50	%100
5	B5-3	Y	-52.17	-52.17	0	%50
6	B5-3	Y	-52.17	-52.17	%50	%100
7	B5-4	Y	-52.17	-52.17	0	%50
8	B5-4	Y	-52.17	-52.17	%50	%100
9	B6-1	Y	-52.17	-52.17	0	%50
10	B6-1	Y	-52.17	-52.17	%50	%100
11	B6-2	Y	-52.17	-52.17	0	%50
12	B6-2	Y	-52.17	-52.17	%50	%100
13	B6-3	Y	-52.17	-52.17	0	%50
14	B6-3	Y	-52.17	-52.17	%50	%100
15	B6-4	Y	-52.17	-52.17	0	%50
16	B6-4	Y	-52.17	-52.17	%50	%100
17	B7-1	Y	-52.17	-52.17	0	%50
18	B7-1	Y	-52.17	-52.17	%50	%100
19	B7-2	Y	-52.17	-52.17	0	%50
20	B7-2	Y	-52.17	-52.17	%50	%100
21	B7-3	Y	-52.17	-52.17	0	%50
22	B7-3	Y	-52.17	-52.17	%50	%100
23	B7-4	Y	-52.17	-52.17	0	%50
24	B7-4	Y	-52.17	-52.17	%50	%100
25	B8-1	Y	-52.17	-52.17	0	%50

Member Distributed Loads (BLC 8 : SNOW) (Continued)

	Member Label	Direction	Start Magnitude [lb/ft, F, psf, lb-ft/in]	End Magnitude [lb/ft, F, psf, lb-ft/in]	Start Location [(in, %)]	End Location [(in, %)]
26	B8-1	Y	-52.17	-52.17	%50	%100
27	B8-2	Y	-52.17	-52.17	0	%50
28	B8-2	Y	-52.17	-52.17	%50	%100
29	B8-3	Y	-52.17	-52.17	0	%50
30	B8-3	Y	-52.17	-52.17	%50	%100
31	B8-4	Y	-52.17	-52.17	0	%50
32	B8-4	Y	-52.17	-52.17	%50	%100
33	B9-1	Y	-52.17	-52.17	0	%50
34	B9-1	Y	-52.17	-52.17	%50	%100
35	B9-2	Y	-52.17	-52.17	0	%50
36	B9-2	Y	-52.17	-52.17	%50	%100
37	B9-3	Y	-52.17	-52.17	0	%50
38	B9-3	Y	-52.17	-52.17	%50	%100
39	B9-4	Y	-52.17	-52.17	0	%50
40	B9-4	Y	-52.17	-52.17	%50	%100
41	B10-1	Y	-52.17	-52.17	0	%50
42	B10-1	Y	-52.17	-52.17	%50	%100
43	B10-2	Y	-52.17	-52.17	0	%50
44	B10-2	Y	-52.17	-52.17	%50	%100
45	B10-3	Y	-52.17	-52.17	0	%50
46	B10-3	Y	-52.17	-52.17	%50	%100
47	B10-4	Y	-52.17	-52.17	0	%50
48	B10-4	Y	-52.17	-52.17	%50	%100
49	B11-1	Y	-52.17	-52.17	0	%50
50	B11-1	Y	-52.17	-52.17	%50	%100
51	B11-2	Y	-52.17	-52.17	0	%50
52	B11-2	Y	-52.17	-52.17	%50	%100
53	B11-3	Y	-52.17	-52.17	0	%50
54	B11-3	Y	-52.17	-52.17	%50	%100
55	B11-4	Y	-52.17	-52.17	0	%50
56	B11-4	Y	-52.17	-52.17	%50	%100

Basic Load Cases

	BLC Description	Category	Y Gravity	Nodal	Distributed
1	DEAD LOAD (MODULE + SELF WEIGHT)	DL	-1		28
2	SEISMIC - Z	EL		1	
3	SEISMIC - X	EL			
4	WIND POS (+) POST A	WL			56
5	WIND NEG (-) POST A	WL			56
6	WIND POS (+) POST B	WL			56
7	WIND NEG (-) POST B	WL			56
8	SNOW	SL			56

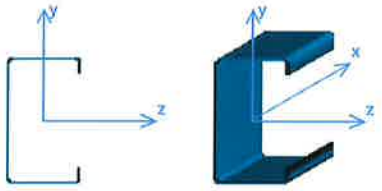
Load Combination Design

	Description	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
1	DEAD ONLY	Yes	Yes	Yes						
2	Dead + Snow	Yes	Yes	Yes						
3	Dead + 0.6 Wind Post-A (+)	Yes	Yes	Yes						
4	Dead + 0.6 Wind Post-B (+)	Yes	Yes	Yes						
5	Dead + 0.7EZ	Yes	Yes	Yes						
6	Dead + 0.7EX	Yes	Yes	Yes						
7	Dead + 0.75 (0.6) Wind + 0.75 Snow Post-A (+)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	Dead + 0.75 (0.6) Wind + 0.75 Snow Post-B (+)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Load Combination Design (Continued)

	Description	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
9	Dead + 0.75 (0.7) EZ + 0.75 Snow (+)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	Dead + 0.75 (0.7) EX + 0.75 Snow (+)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	0.6 Dead + 0.6 Wind Post-A (-)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	0.6 Dead + 0.6 Wind Post-B (-)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	0.6Dead + 0.7EZ		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14	0.6Dead + 0.7EX		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Detail Report: P7-1 **Unity Check:** 0.55 (LC 11) **Load Combination:** Envelope



Input Data:

Shape:	7_63X4_5X_145-M	I Node:	2X7P-T 1
Member Type:	Column	J Node:	2X7-1
Length (in):	64.73	I Release:	Fixed
Material Type:	Cold Formed Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

Material:	A653 SS Gr57	Nu:	0.3	F_y (ksi):	57
E (ksi):	29500	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	F_u (ksi):	70
G (ksi):	11346	Density (k/ft^3):	0.49		

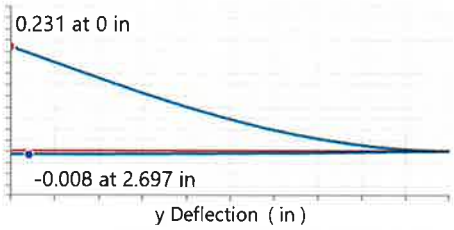
Shape Properties:

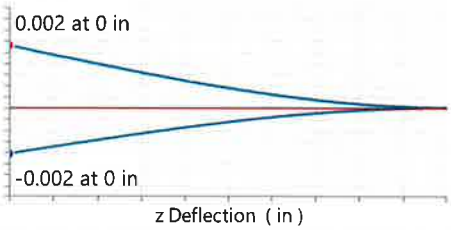
D (in):	7.63	J (in^4):	0.018	x_0 (in):	-3.612
B (in):	4.5	C_w (in^6):	86.118	$S_{e,z}$ (in^3):	N/A
t (in):	0.145	r_o (in):	5.044	$S_{f,z}$ (in^3):	N/A
R (in):	0.27	X_c (in):	1.485	$S_{c,z}$ (in^3):	N/A
d (in):	1	m (in):	2.127	$S_{c,y}$ (in^3):	N/A
I_{yy} (in^4):	6.915	j (in):	5.09	$S_{e,y}$ (in^3):	N/A
I_{zz} (in^4):	24.82	r_z (in):	N/A	$S_{f,y}$ (in^3):	N/A
Area (in^2):	2.561	r_y (in):	N/A		

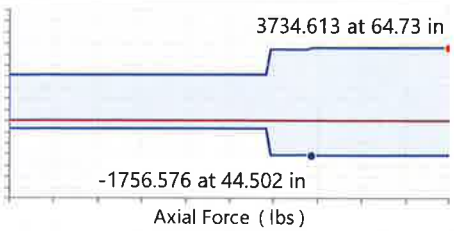
Design Properties:

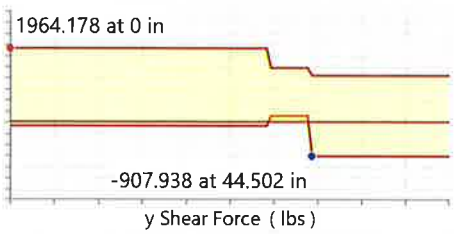
$L_{b\ y-y}$ (in):	N/A	K_{y-y}:	1	Max Defl Ratio:	L/280
$L_{b\ z-z}$ (in):	N/A	K_{z-z}:	1	Max Defl Location:	0
$L_{comp\ top}$ (in):	Lbyy	R:	N/A	Span:	N/A
$L_{comp\ bot}$ (in):	N/A	y sway:	No		
C_b:	1.497	z sway:	No		
$C_{m\ y-y}$:	N/A	a (in):	N/A		
$C_{m\ z-z}$:	N/A				

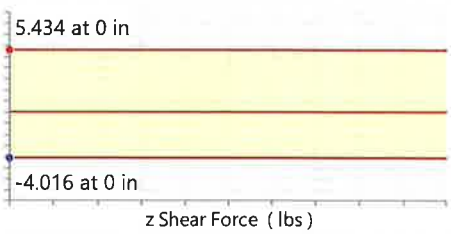
Diagrams:

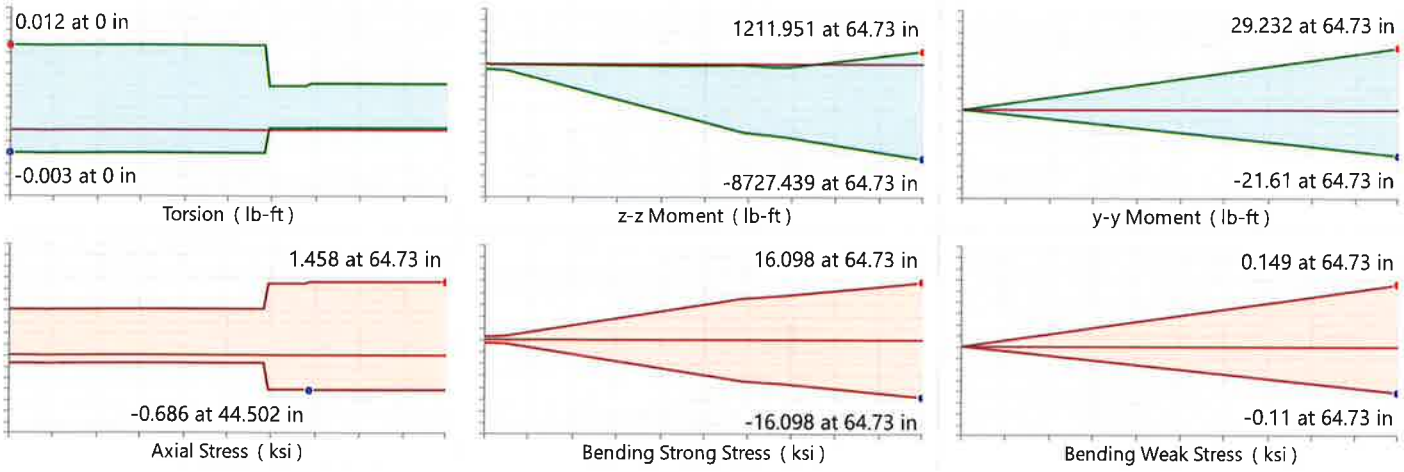










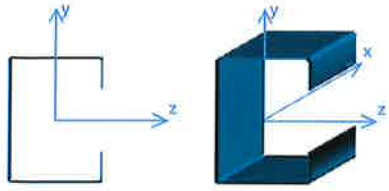


AISI S100-12: ASD Code Check

Max Bending Loc:	64.73 in	Cm (y-y):	0.599	Ae (Fy):	2.001 in^2
Equation:	C3.3.1-1	Cm (z-z):	0.603	Ae (Fn):	2.216 in^2
Gov Φ Equation:	C3.1.4	Cb:	1.497	Iy eff:	6.563 in^4
R (D6.1.1)	Not Used	KL/r (y-y):	39.392	Sy eff (L):	4.111 in^3
Max Shear Loc:	37.759 in	KL/r (z-z):		Sy eff (R):	2.261 in^3
Max Defl Ratio:	L/280	L Comp Flange:	64.73 in	Iz eff:	22.581 in^4
		L Torque:	64.73 in	Sz eff (T):	5.605 in^3
				Sz eff (B):	6.27 in^3

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	11	-	-	-	-
Applied Loading - Shear + Torsion	11	-	-	-	-
Axial Tension Analysis		-	87411.375 lb	-	-
Flexural Analysis (Strong Axis)		-	15943.187 lb-ft	-	-
Flexural Analysis (Weak Axis)		-	6429.584 lb-ft	-	-
Shear Analysis (Major Axis y)		-	21075.75 lb	0.093	Pass
Shear Analysis (Minor Axis z)		-	22749.412 lb	-	-
Bending & Axial Interaction Check (UC Bending Max)		-	-	0.55	Pass

Detail Report: T7-1 **Unity Check:** 0.529 (LC 7) **Load Combination:** Envelope



Input Data:

Shape:	4X3X1X055-M	I Node:	2X7T-CBL 2
Member Type:	Beam	J Node:	2X7T-CBL 1
Length (in):	139.239	I Release:	Fixed
Material Type:	Cold Formed Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

Material:	A653 SS Gr80	Nu:	0.3	F_y (ksi):	80
E (ksi):	29500	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	F_u (ksi):	90
G (ksi):	11346	Density (k/ft^3):	0.49		

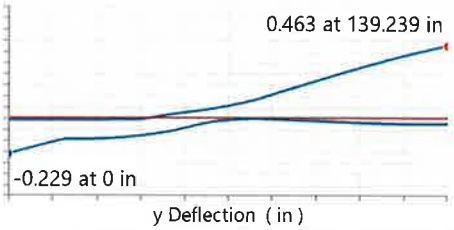
Shape Properties:

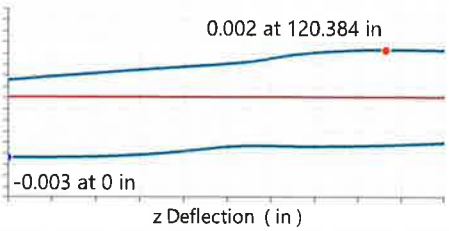
D (in):	4	J (in^4):	0.0006412	x_0 (in):	-2.887
B (in):	3	C_w (in^6):	4.347	$S_{e,z}$ (in^3):	N/A
t (in):	0.055	r_o (in):	3.526	$S_{f,z}$ (in^3):	N/A
R (in):	0.1	X_c (in):	1.218	$S_{c,z}$ (in^3):	N/A
d (in):	1	m (in):	1.669	$S_{c,y}$ (in^3):	N/A
I_{yy} (in^4):	0.868	j (in):	3.316	$S_{e,y}$ (in^3):	N/A
I_{zz} (in^4):	1.739	r_z (in):	N/A	$S_{f,y}$ (in^3):	N/A
Area (in^2):	0.636	r_y (in):	N/A		

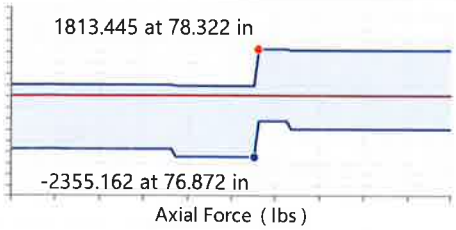
Design Properties:

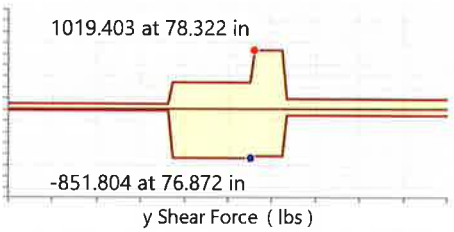
$L_{b\ y-y}$ (in):	Segment	K_{y-y}:	1	Max Defl Ratio:	L/1690
$L_{b\ z-z}$ (in):	N/A	K_{z-z}:	1	Max Defl Location:	34.81
$L_{comp\ top}$ (in):	N/A	R:	N/A	Span:	1
$L_{comp\ bot}$ (in):	N/A	y sway:	No		
C_b:	1.997	z sway:	No		
$C_{m\ y-y}$:	N/A	a (in):	N/A		
$C_{m\ z-z}$:	N/A				

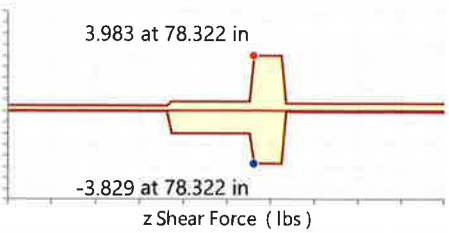
Diagrams:

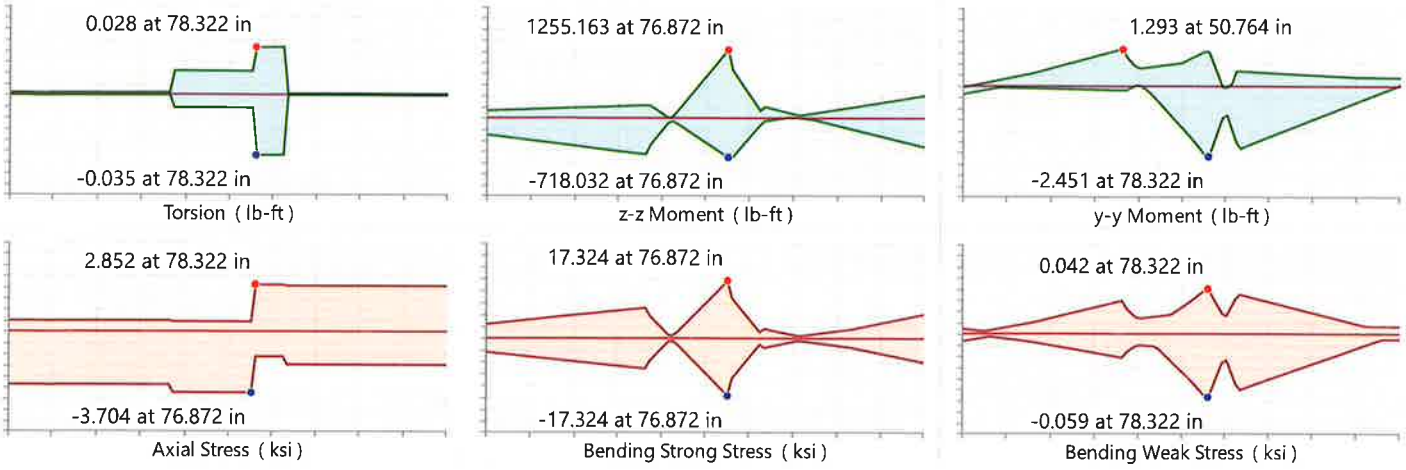










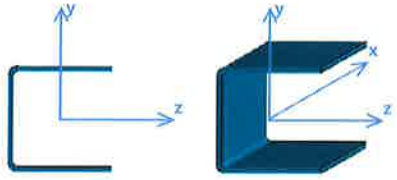


AISI S100-12: ASD Code Check

Max Bending Loc:	76.872 in	Cm (y-y):	0.6	Ae (Fy):	0.374 in^2
Equation:	C3.3.1-1	Cm (z-z):	0.85	Ae (Fn):	0.514 in^2
Gov Φ Equation:	C3.1.2	Cb:	1.997	Iy eff:	0.685 in^4
R (D6.1.1)	Not Used	KL/r (y-y):	22.802	Sy eff (L):	0.462 in^3
Max Shear Loc:	78.322 in	KL/r (z-z):		Sy eff (R):	0.451 in^3
Max Defl Ratio:	L/1690	L Comp Flange:	139.239 in	Iz eff:	1.454 in^4
Location:	34.81 in	L Torque:	26.647 in	Sz eff (T):	0.825 in^3
Span:	1			Sz eff (B):	0.65 in^3

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	7	-	-	-	-
Applied Loading - Shear + Torsion	8	-	-	-	-
Axial Tension Analysis		-	30460.4 lb	-	-
Flexural Analysis (Strong Axis)		-	2593.815 lb-ft	-	-
Flexural Analysis (Weak Axis)		-	1801.399 lb-ft	-	-
Shear Analysis (Major Axis y)		-	4012.196 lb	0.256	Pass
Shear Analysis (Minor Axis z)		-	8054.03 lb	-	-
Bending & Axial Interaction Check (UC Bending Max)		-	-	0.529	Pass

Detail Report: DBU7-1 **Unity Check:** 0.674 (LC 8) **Load Combination:** Envelope



Input Data:

Shape:	2X2X092DIAG_CFA	I Node:	2X7DBU-CBL 1
Member Type:	None	J Node:	2X7P-DBU 1
Length (in):	85.529	I Release:	BenPIN
Material Type:	Cold Formed Steel	J Release:	BenPIN
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

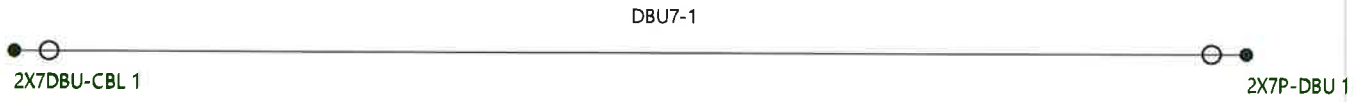
Material:	A653 SS Gr57	Nu:	0.3	F_y (ksi):	57
E (ksi):	29500	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	F_u (ksi):	70
G (ksi):	11346	Density (k/ft^3):	0.49		

Shape Properties:

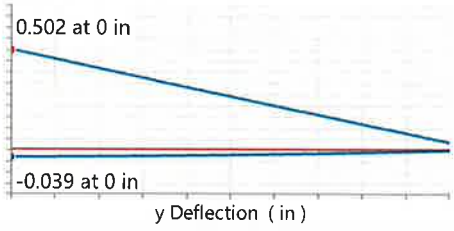
D (in):	2	C_w (in^6):	0.152	x_0 (in):	-1.511
B (in):	2	r_o (in):	1.846	$S_{e,z}$ (in^3):	N/A
t (in):	0.095	X_c (in):	0.671	$S_{f,z}$ (in^3):	N/A
R (in):	0.096	m (in):	0.84	$S_{c,z}$ (in^3):	N/A
I_{yy} (in^4):	0.228	j (in):	1.795	$S_{e,y}$ (in^3):	N/A
I_{zz} (in^4):	0.38	r_z (in):	N/A	$S_{f,y}$ (in^3):	N/A
Area (in^2):	0.54	r_y (in):	N/A	$S_{c,y}$ (in^3):	N/A
J (in^4):	0.002				

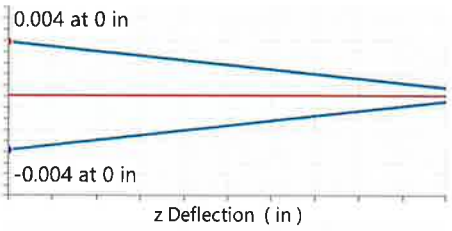
Design Properties:

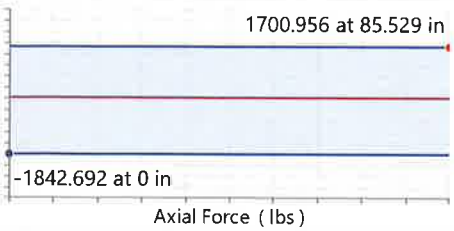
$L_{b\ y-y}$ (in):	N/A	K_{y-y}:	1	Max Defl Ratio:	L/10000
$L_{b\ z-z}$ (in):	N/A	K_{z-z}:	1	Max Defl Location:	0
$L_{comp\ top}$ (in):	N/A	R:	N/A	Span:	N/A
$L_{comp\ bot}$ (in):	N/A	y sway:	No		
C_b:	1.136	z sway:	No		
$C_{m\ y-y}$:	N/A	a (in):	N/A		
$C_{m\ z-z}$:	N/A				

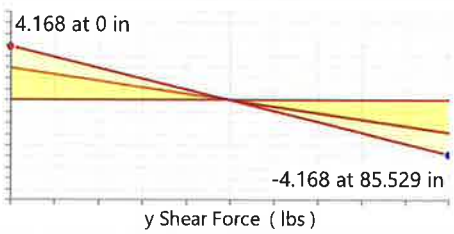


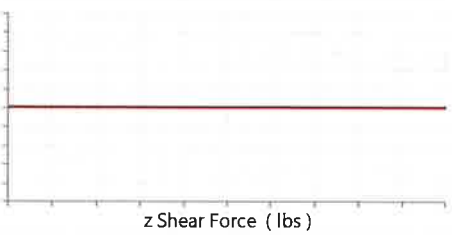
Diagrams:

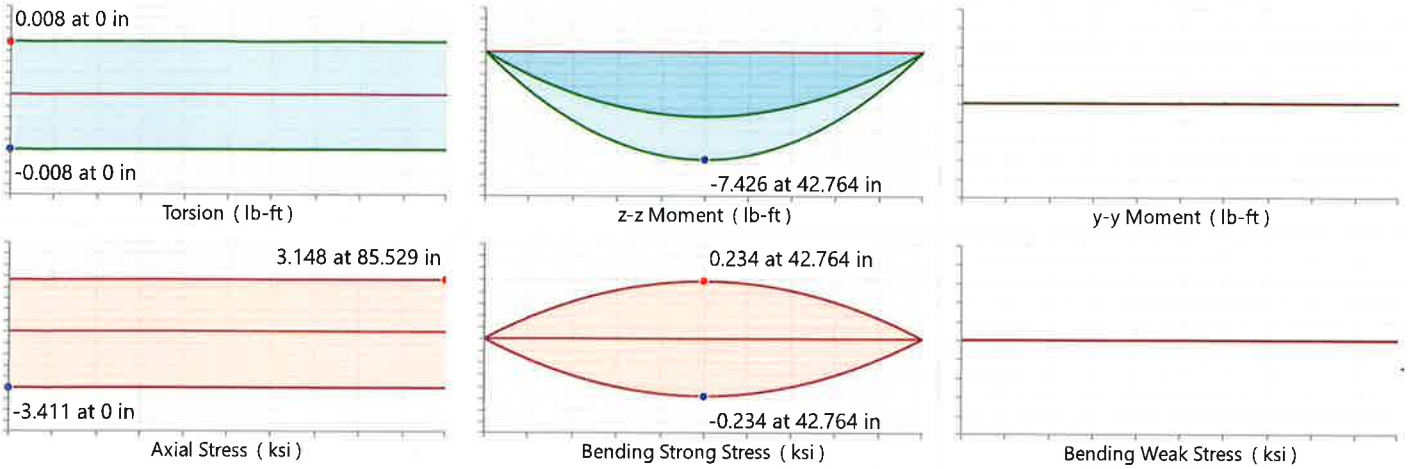










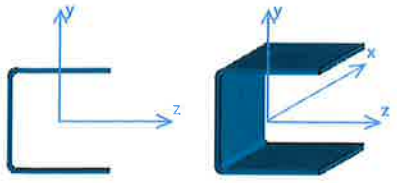


AISI S100-12: ASD Code Check

Max Bending Loc:	45.437 in	Cm (y-y):	0.6	Ae (Fy):	0.411 in^2
Equation:	C5.2.1-1	Cm (z-z):	1	Ae (Fn):	0.54 in^2
Gov Φ Equation:	C3.1.2	Cb:	1.136	Iy eff:	0.228 in^4
R (D6.1.1)	Not Used	KL/r (y-y):	131.586	Sy eff (L):	0.318 in^3
Max Shear Loc:	85.529 in	KL/r (z-z):		Sy eff (R):	0.178 in^3
Max Defl Ratio:	L/10000	L Comp Flange:	85.529 in	Iz eff:	0.33 in^4
		L Torque:	85.529 in	Sz eff (T):	0.301 in^3
				Sz eff (B):	0.366 in^3

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	8	-	-	-	-
Applied Loading - Shear + Torsion	8	-	-	-	-
Axial Tension Analysis		-	18439.594 lb	-	-
Flexural Analysis (Strong Axis)		-	613.507 lb-ft	-	-
Flexural Analysis (Weak Axis)		-	303.862 lb-ft	-	-
Shear Analysis (Major Axis y)		-	3285.551 lb	0.001	Pass
Shear Analysis (Minor Axis z)		-	7346.801 lb	-	-
Bending & Axial Interaction Check (UC Bending Max)		-	-	0.674	Pass

Detail Report: DBL7-1 **Unity Check:** 0.635 (LC 7) **Load Combination:** Envelope



Input Data:

Shape:	2X2X092DIAG_CFA	I Node:	2X7DBL-CBL 1
Member Type:	None	J Node:	2X7P-DBL 1
Length (in):	66.217	I Release:	BenPIN
Material Type:	Cold Formed Steel	J Release:	BenPIN
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

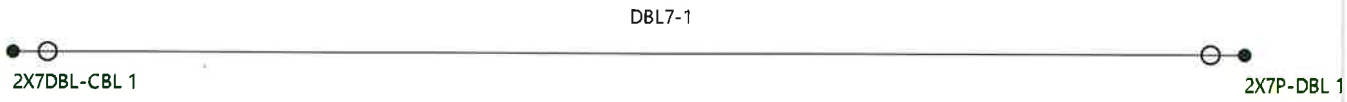
Material:	A653 SS Gr57	Nu:	0.3	F_y (ksi):	57
E (ksi):	29500	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	F_u (ksi):	70
G (ksi):	11346	Density (k/ft^3):	0.49		

Shape Properties:

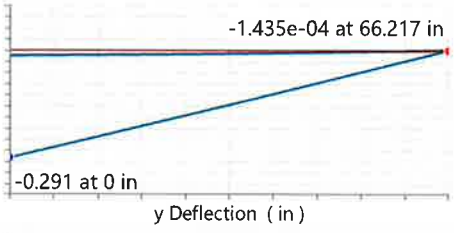
D (in):	2	C_w (in^6):	0.152	x_0 (in):	-1.511
B (in):	2	r_o (in):	1.846	$S_{e,z}$ (in^3):	N/A
t (in):	0.095	X_c (in):	0.671	$S_{f,z}$ (in^3):	N/A
R (in):	0.096	m (in):	0.84	$S_{c,z}$ (in^3):	N/A
I_{yy} (in^4):	0.228	j (in):	1.795	$S_{e,y}$ (in^3):	N/A
I_{zz} (in^4):	0.38	r_z (in):	N/A	$S_{f,y}$ (in^3):	N/A
Area (in^2):	0.54	r_y (in):	N/A	$S_{c,y}$ (in^3):	N/A
J (in^4):	0.002				

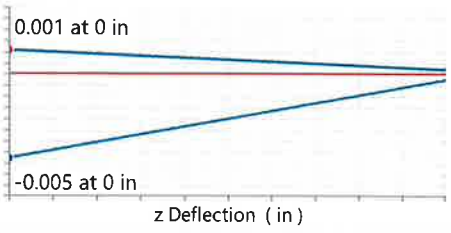
Design Properties:

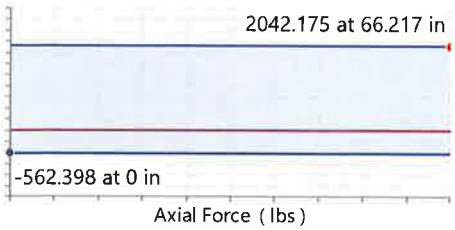
$L_{b\ y-y}$ (in):	N/A	K_{y-y}:	1	Max Defl Ratio:	L/10000
$L_{b\ z-z}$ (in):	N/A	K_{z-z}:	1	Max Defl Location:	0
$L_{comp\ top}$ (in):	N/A	R:	N/A	Span:	N/A
$L_{comp\ bot}$ (in):	N/A	y sway:	No		
C_b:	1.136	z sway:	No		
$C_{m\ y-y}$:	N/A	a (in):	N/A		
$C_{m\ z-z}$:	N/A				

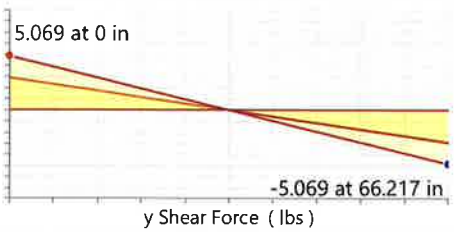


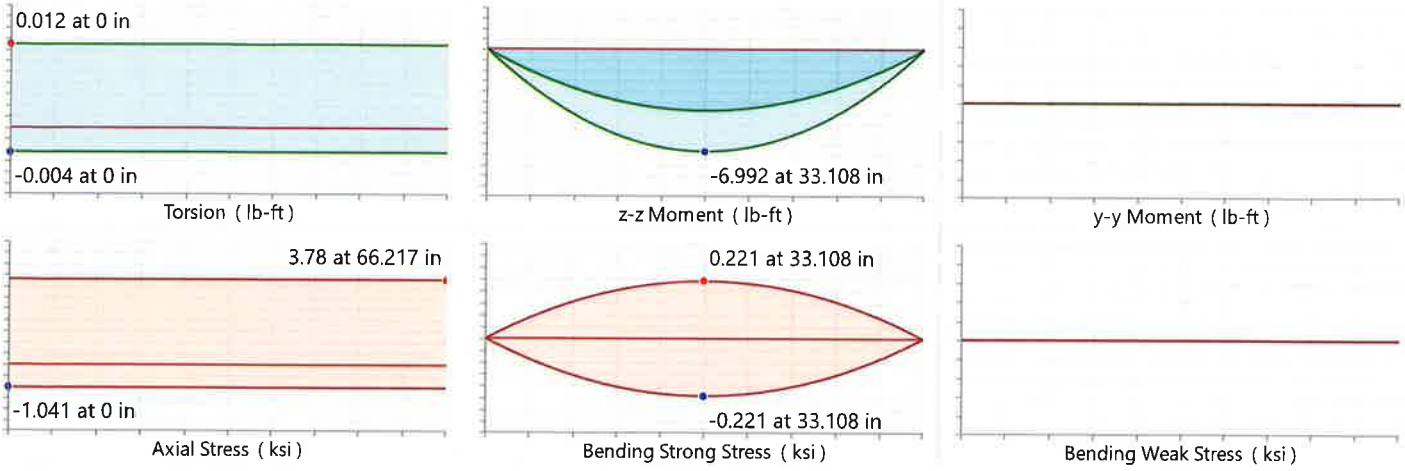
Diagrams:









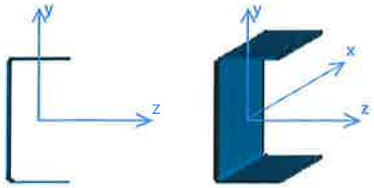


AISI S100-12: ASD Code Check

Max Bending Loc:	33.108 in	Cm (y-y):	0.6	Ae (Fy):	0.411 in^2
Equation:	C5.2.1-1	Cm (z-z):	1	Ae (Fn):	0.54 in^2
Gov Φ Equation:	C3.1.2	Cb:	1.136	Iy eff:	0.228 in^4
R (D6.1.1)	Not Used	KL/r (y-y):	101.875	Sy eff (L):	0.318 in^3
Max Shear Loc:	66.217 in	KL/r (z-z):		Sy eff (R):	0.178 in^3
Max Defl Ratio:	L/10000	L Comp Flange:	66.217 in	Iz eff:	0.323 in^4
		L Torque:	66.217 in	Sz eff (T):	0.291 in^3
				Sz eff (B):	0.363 in^3

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	7	-	-	-	-
Applied Loading - Shear + Torsion	7	-	-	-	-
Axial Tension Analysis		-	18439.594 lb	-	-
Flexural Analysis (Strong Axis)		-	684.258 lb-ft	-	-
Flexural Analysis (Weak Axis)		-	346.876 lb-ft	-	-
Shear Analysis (Major Axis y)		-	3285.551 lb	0.002	Pass
Shear Analysis (Minor Axis z)		-	7346.801 lb	-	-
Bending & Axial Interaction Check (UC Bending Max)		-	-	0.635	Pass

Detail Report: CBL7-1 **Unity Check:** 0.373 (LC 11) **Load Combination:** Envelope



Input Data:

Shape:	4X2X092-M	I Node:	2X7RB1-CBL 1
Member Type:	None	J Node:	2X7DBU-CBL 1
Length (in):	8	I Release:	Fixed
Material Type:	Cold Formed Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

Material:	A653 SS Gr50/1	Nu:	0.3	F_y (ksi):	50
E (ksi):	29500	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	F_u (ksi):	65
G (ksi):	11346	Density (k/ft^3):	0.49		

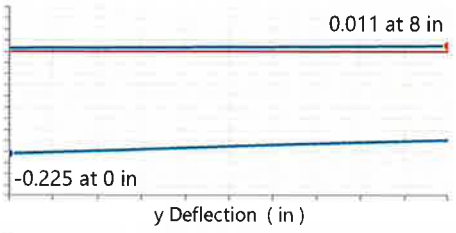
Shape Properties:

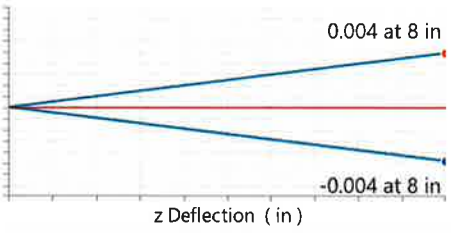
D (in):	4	C_w (in^6):	0.764	x_0 (in):	-1.23
B (in):	2	r_o (in):	2.106	$S_{e,z}$ (in^3):	N/A
t (in):	0.092	X_c (in):	0.497	$S_{f,z}$ (in^3):	N/A
R (in):	0.13	m (in):	0.733	$S_{c,z}$ (in^3):	N/A
I_{yy} (in^4):	0.283	j (in):	2.276	$S_{e,y}$ (in^3):	N/A
I_{zz} (in^4):	1.786	r_z (in):	N/A	$S_{f,y}$ (in^3):	N/A
Area (in^2):	0.708	r_y (in):	N/A	$S_{c,y}$ (in^3):	N/A
J (in^4):	0.002				

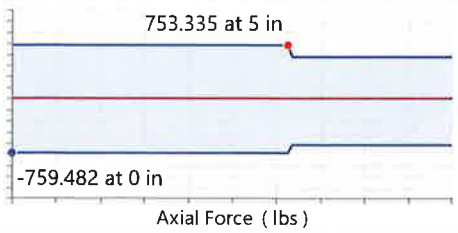
Design Properties:

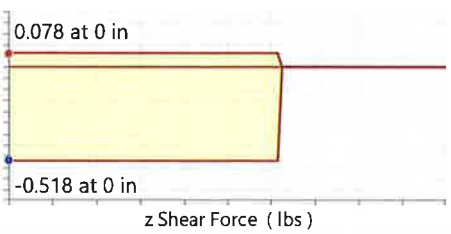
$L_{b\ y-y}$ (in):	N/A	K_{y-y}:	1	Max Defl Ratio:	L/6308
$L_{b\ z-z}$ (in):	N/A	K_{z-z}:	1	Max Defl Location:	0
$L_{comp\ top}$ (in):	N/A	R:	N/A	Span:	N/A
$L_{comp\ bot}$ (in):	N/A	y sway:	No		
C_b:	2.671	z sway:	No		
$C_{m\ y-y}$:	N/A	a (in):	N/A		
$C_{m\ z-z}$:	N/A				

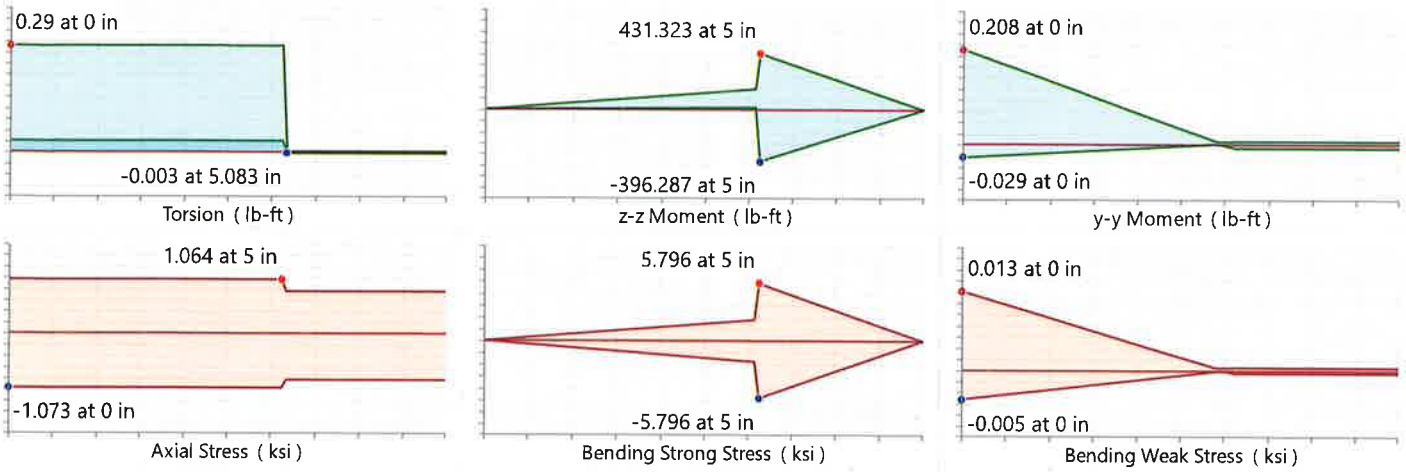
Diagrams:









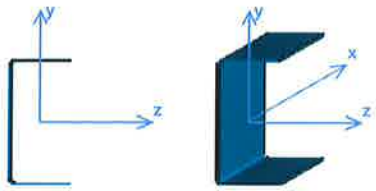


AISI S100-12: ASD Code Check

Max Bending Loc:	5 in	Cm (y-y):	0.6	Ae (Fy):	0.554 in^2
Equation:	C3.3.1-1	Cm (z-z):	0.85	Ae (Fn):	0.557 in^2
Gov Φ Equation:	C3.1.1	Cb:	2.671	Iy eff:	0.282 in^4
R (D6.1.1)	Not Used	KL/r (y-y):	12.654	Sy eff (L):	0.518 in^3
Max Shear Loc:	5 in	KL/r (z-z):		Sy eff (R):	0.194 in^3
Max Defl Ratio:	L/6308	L Comp Flange:	8 in	Iz eff:	1.537 in^4
		L Torque:	8 in	Sz eff (T):	0.841 in^3
				Sz eff (B):	0.707 in^3

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	11	-	-	-	-
Applied Loading - Shear + Torsion	11	-	-	-	-
Axial Tension Analysis		-	21197.605 lb	-	-
Flexural Analysis (Strong Axis)		-	1763.989 lb-ft	-	-
Flexural Analysis (Weak Axis)		-	483.861 lb-ft	-	-
Shear Analysis (Major Axis y)		-	6134.1 lb	0.282	Pass
Shear Analysis (Minor Axis z)		-	6134.1 lb	-	-
Bending & Axial Interaction Check (UC Bending Max)		-	-	0.373	Pass

Detail Report: CBS7-1 **Unity Check:** 0.135 (LC 2) **Load Combination:** Envelope



Input Data:

Shape:	4X2X092-M	I Node:	2X7RB2-CBS 1
Member Type:	None	J Node:	2X7T-CBS 1
Length (in):	5	I Release:	Fixed
Material Type:	Cold Formed Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

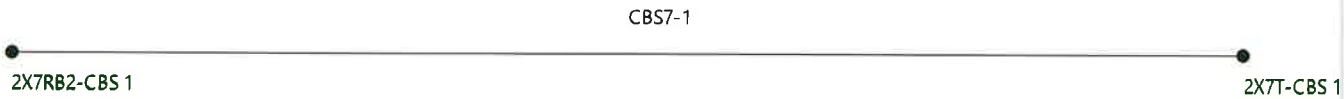
Material:	A653 SS Gr50/1	Nu:	0.3	F_y (ksi):	50
E (ksi):	29500	Therm. Coeff. ($1e^5°F^{-1}$):	0.65	F_u (ksi):	65
G (ksi):	11346	Density (k/ft^3):	0.49		

Shape Properties:

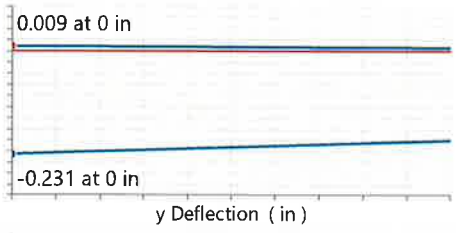
D (in):	4	C_w (in^6):	0.764	x_0 (in):	-1.23
B (in):	2	r_o (in):	2.106	$S_{e,z}$ (in^3):	N/A
t (in):	0.092	X_c (in):	0.497	$S_{f,z}$ (in^3):	N/A
R (in):	0.13	m (in):	0.733	$S_{c,z}$ (in^3):	N/A
I_{yy} (in^4):	0.283	j (in):	2.276	$S_{e,y}$ (in^3):	N/A
I_{zz} (in^4):	1.786	r_z (in):	N/A	$S_{f,y}$ (in^3):	N/A
Area (in^2):	0.708	r_y (in):	N/A	$S_{c,y}$ (in^3):	N/A
J (in^4):	0.002				

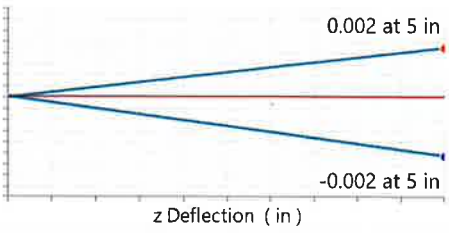
Design Properties:

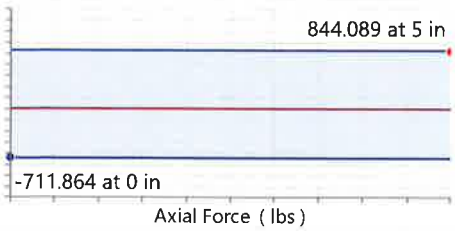
$L_{b\ y-y}$ (in):	N/A	K_{y-y}:	1	Max Defl Ratio:	L/10000
$L_{b\ z-z}$ (in):	N/A	K_{z-z}:	1	Max Defl Location:	0
$L_{comp\ top}$ (in):	N/A	R:	N/A	Span:	N/A
$L_{comp\ bot}$ (in):	N/A	y sway:	No		
C_b:	1.667	z sway:	No		
$C_{m\ y-y}$:	N/A	a (in):	N/A		
$C_{m\ z-z}$:	N/A				

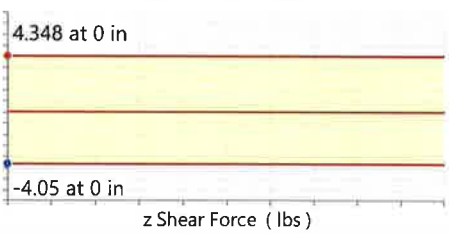


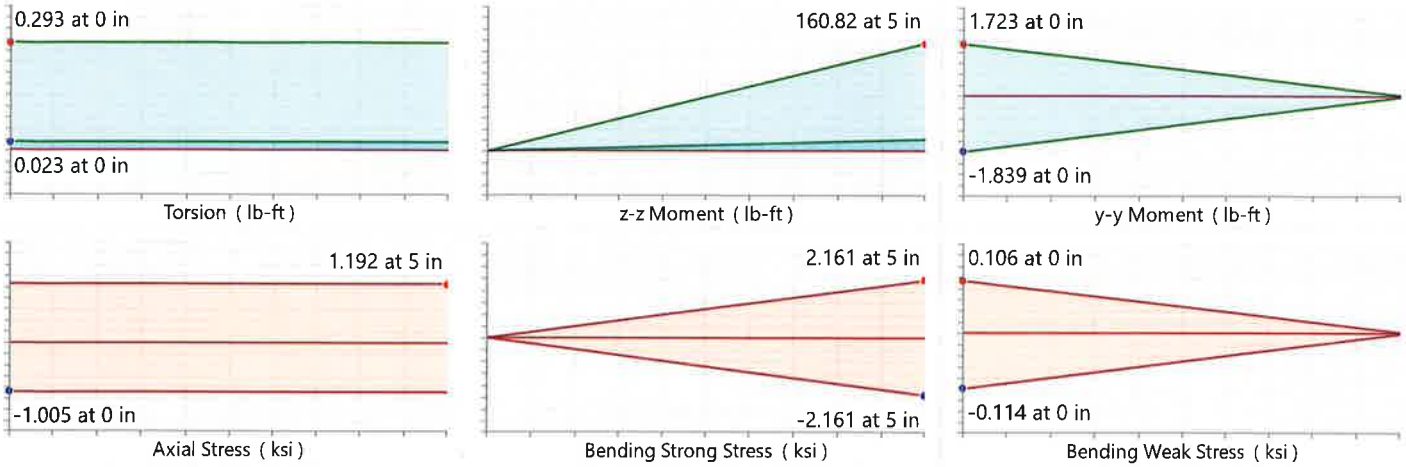
Diagrams:









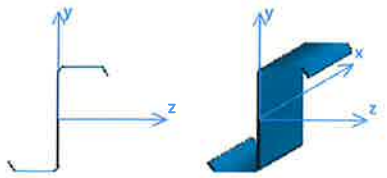


AISI S100-12: ASD Code Check

Max Bending Loc:	5 in	Cm (y-y):	0.608	Ae (Fy):	0.554 in^2
Equation:	C5.2.1-2	Cm (z-z):	0.85	Ae (Fn):	0.555 in^2
Gov Φ Equation:	C3.1.1	Cb:	1.667	Iy eff:	0.165 in^4
R (D6.1.1)	Not Used	KL/r (y-y):	7.908	Sy eff (L):	0.398 in^3
Max Shear Loc:	5 in	KL/r (z-z):		Sy eff (R):	0.104 in^3
Max Defl Ratio:	L/10000	L Comp Flange:	5 in	Iz eff:	1.537 in^4
		L Torque:	5 in	Sz eff (T):	0.841 in^3
				Sz eff (B):	0.707 in^3

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	2	-	-	-	-
Applied Loading - Shear + Torsion	2	-	-	-	-
Axial Tension Analysis		-	21197.605 lb	-	-
Flexural Analysis (Strong Axis)		-	1763.989 lb-ft	-	-
Flexural Analysis (Weak Axis)		-	260.623 lb-ft	-	-
Shear Analysis (Major Axis y)		-	6134.1 lb	0.07	**Pass**
Shear Analysis (Minor Axis z)		-	6134.1 lb	-	-
Bending & Axial Interaction Check (UC Bending Max)		-	-	0.135	**Pass**

Detail Report: CEC7 **Unity Check:** 0.964 (LC 4) **Load Combination:** Envelope



Input Data:

Shape:	Z6X3X055	I Node:	CEC7-1
Member Type:	Beam	J Node:	CEC7-2
Length (in):	290.354	I Release:	Fixed
Material Type:	Cold Formed Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

Material:	A653 SS Gr80	Nu:	0.3	F_y (ksi):	80
E (ksi):	29500	Therm. Coeff. ($1e^{5}°F^{-1}$):	0.65	F_u (ksi):	90
G (ksi):	11346	Density (k/ft^3):	0.49		

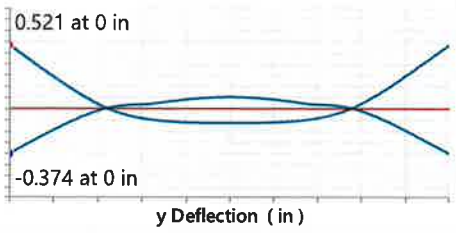
Shape Properties:

D (in):	6	Area (in^2):	0.666	r_z (in):	N/A
B (in):	2.55	J (in^4):	0.000671	r_y (in):	N/A
t (in):	0.055	C_w (in^6):	6.491	x_0 (in):	0
R (in):	0.25	r_o (in):	2.781	$S_{e,z}$ (in^3):	N/A
d (in):	0.676	r_{min} (in):	0.784	S_{fz} (in^3):	N/A
Gamma (deg):	53.973	I_{y2} (in^4):	4.74	$S_{e,y}$ (in^3):	N/A
I_{yy} (in^4):	1.199	I_{z2} (in^4):	0.409	$S_{c,z}$ (in^3):	N/A
I_{zz} (in^4):	3.95	Theta (deg):	64.717		

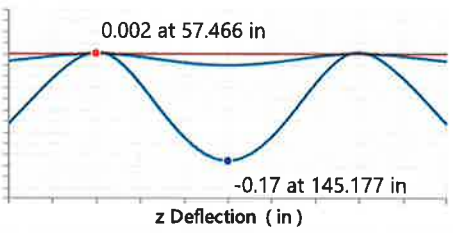
Design Properties:

$L_{b\ y-y}$ (in):	Segment	K_{y-y}:	1	Max Defl Ratio:	L/246
$L_{b\ z-z}$ (in):	N/A	K_{z-z}:	1	Max Defl Location:	0
$L_{comp\ top}$ (in):	40	R:	N/A	Span:	1
$L_{comp\ bot}$ (in):	Segment	y sway:	No		
C_b:	1	z sway:	No		
$C_{m\ y-y}$:	N/A	a (in):	N/A		
$C_{m\ z-z}$:	N/A				

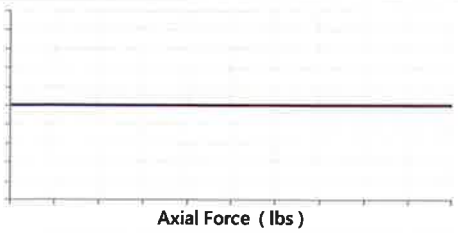
Diagrams:

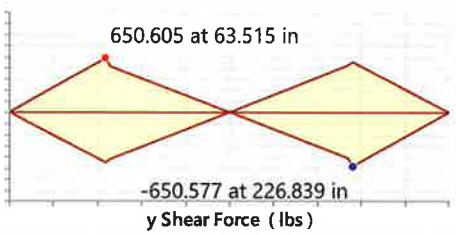


y Deflection (in)

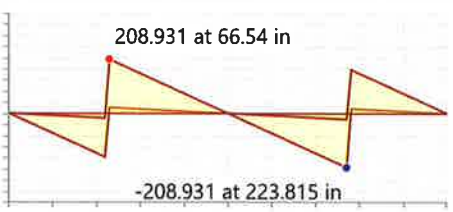


z Deflection (in)

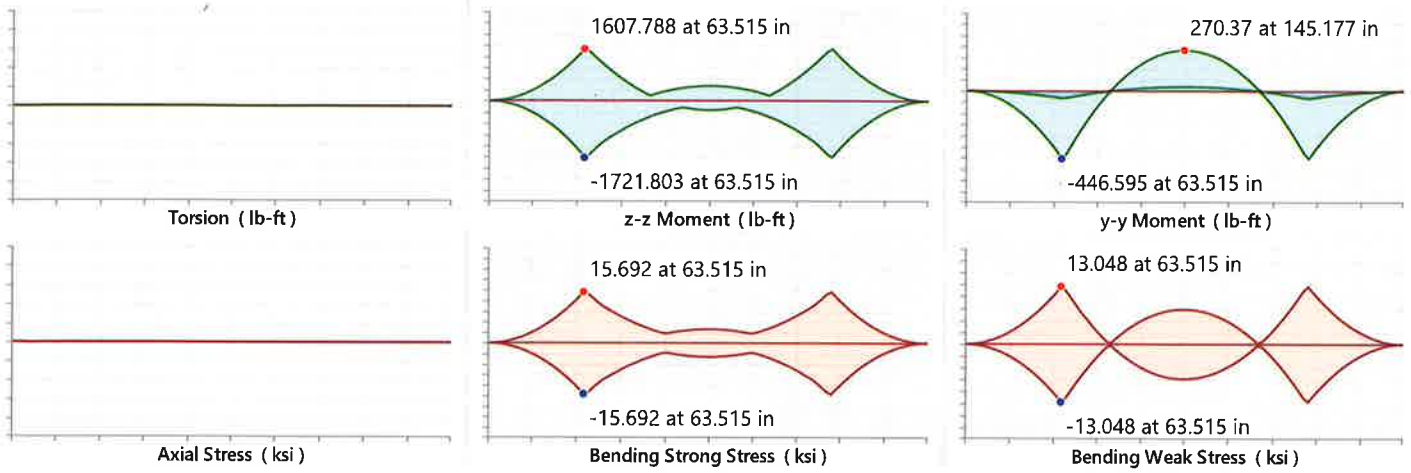

Axial Force (lbs)



y Shear Force (lbs)



z Shear Force (lbs)



AISI S100-12: ASD Code Check

Max Bending Loc:	63.515 in	Cm (y-y):	0.85	Ae (Fy):	0.341 in^2
Equation:	C5.2.1-2	Cm (z-z):	0.85	Ae (Fn):	0.666 in^2
Gov Φ Equation:	C3.1.4	Cb:	1	Iy eff:	0.782 in^4
R (D6.1.1)	Not Used	KL/r (y-y):	81.835	Sy eff (L):	0.25 in^3
Max Shear Loc:	63.515 in	KL/r (z-z):		Sy eff (R):	0.288 in^3
Max Defl Ratio:	L/246	L Comp Flange:	40 in	Iz eff:	3.95 in^4
Location:	0 in	L Torque:	64.177 in	Sz eff (T):	1.317 in^3
Span:	1			Sz eff (B):	1.317 in^3

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	4	-	-	-	-
Applied Loading - Shear + Torsion	4	-	-	-	-
Axial Tension Analysis		-	31887.855 lb	-	-
Flexural Analysis (Strong Axis)		-	2830.982 lb-ft	-	-
Flexural Analysis (Weak Axis)		-	997.896 lb-ft	-	-
Shear Analysis (Major Axis y)		-	2746.754 lb	0.237	Pass
Shear Analysis (Minor Axis z)		-	6895.966 lb	-	-
Bending & Axial Interaction Check (UC Bending Max)		-	-	0.964	Pass

Bolted Connections Code Checks Per AISI E3 Summary

No.	Connection Checks	e/d	d		e	Bolt Size	t:	Fy	Fu
1	Diagonal to Post w/ M12	2.99	0.67 in.	17 mm	2.00 in.	M12	0.09 in.	50 ksi	60 ksi
2	Connector Bracket to Rack Beam w/ M8s	2.62	0.35 in.	9 mm	0.93 in.	M8	0.06 in.	80 ksi	90 ksi
3	Diagonal to Connector Bracket w/ M12	3.27	0.53 in.	13 mm	1.73 in.	M12	0.09 in.	50 ksi	60 ksi
4	Tilt to Post connection w/ M10s	6.85	0.44 in.	11 mm	3.00 in.	M10	0.06 in.	80 ksi	90 ksi
5	Tilt to Connector Short w/ M8s	0.92	0.35 in.	9 mm	0.33 in.	M8	0.06 in.	80 ksi	90 ksi
6	Tilt to Connector Long w/ M8s	0.92	0.35 in.	9 mm	0.33 in.	M8	0.06 in.	80 ksi	90 ksi

Note: Where e/d <2.126 SHEAR TEARING GOVERNS

Sheet Bearing (Type II) mode of failure **RB 80 ksi**

Note: If e/d >2.125, then Bearing mode of Failure governs

Area : = 0.6 in.^2
Thickness, in.: = 0.055 in.
Bolt Diameter, in. := 0.315 in.
d/t : = 5.7
Modification Factor:= 0.9
Tensile strength of sheet : = 90.00 ksi
Bolt Diameter, in. := 0.315 in.
Bearing Factor, C : = 3.0

Bearing Factor, strength [resistance]

Pn = CmfdtFu (kips) : = 4.2 kips
ASD Safety Factor := 2.5
Number of Bolts : = 2
Capacity := 3.4 kips
Demand := 3.2 kips
Connection: = OK

Shear Tearing (Type I) mode of failure

Section Profile: = **Tilt to Connector Short w/ M8s**
Area : = 0.4 in.^2

$P_t = 2e*t*T_{ult}$ <<< T_{ult} = Ultimate shear stress

Pt = $1.2e*t*s_{ult}$:= 8.91 kips
s_{ult} = Ultimate tensile stress := 90.00 ksi
Thickness of thinnest part connected, t:= 0.055 in.
e = edge distance >= 1.5d : = 1.50 in.
Bolt diameter (mm) := 8 mm

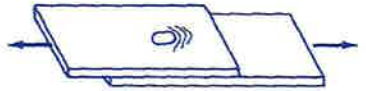
Bolt diameter (in) := 0.31 in.
Hole diameter (mm) := 9 mm
Hole diameter (in) := 0.35 in.
ASD Safety Factor := 2.22
LRFD Resistance Factor := 0.75
LSD Resistance Factor := 0.65
Using ASD methods allowable bearing strength := **4.0 kips**
α =[$1.2*e/d_{hole}$] := 5.1
Capacity := **8.0 kips**
Demand := **3.2 kips**
Connection: = **OK**

Major Diameter	Thread Size	Tensile Area	Class 8.8			Class 9.8			Class 10.9			Class 12.9		
			Proof	Yield	Tensile	Proof	Yield	Tensile	Proof	Yield	Tensile	Proof	Yield	Tensile
		mm^2	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)	(kN)
M6	M6-1.0	20.125	12.1	13.3	16.7	13.0	14.4	18.2	16.7	18.9	21.0	19.6	22.2	24.6
M8	M8-1.25	36.611	22.0	24.2	30.3	23.7	26.3	33.1	30.3	34.3	38.1	35.6	40.4	44.7
	M8-1.0	39.169	23.5	25.9	32.4	25.4	28.1	35.4	32.4	36.7	40.8	38.1	43.2	47.8
M9	M9-1.0	51.048	30.6	33.8	42.2	33.1	36.6	46.1	42.2	47.9	53.1	49.6	56.3	62.3
M10	M10-1.5	57.994	34.8	38.4	48.0	37.6	41.6	52.4	48.0	54.4	60.4	56.4	64.0	70.8
	M10-1.25	61.202	36.7	40.5	50.6	39.7	43.9	55.3	50.6	57.4	63.7	59.5	67.5	74.7
M11	M11-2.0	65.382	39.2	43.3	54.1	42.4	46.9	59.1	54.1	61.3	68.1	63.6	72.1	79.8
	M11-1.5	72.277	43.4	47.8	59.8	46.8	51.8	65.3	59.8	67.8	75.2	70.3	79.7	88.2
M12	M12-1.75	84.272	50.6	55.8	69.7	54.6	60.4	76.1	69.7	79.0	87.7	81.9	93.0	102.8
	M12-1.5	88.131	52.9	58.3	72.9	57.1	63.2	79.6	72.9	82.6	91.8	85.7	97.2	107.6
	M12-1.25	92.076	55.2	60.9	76.2	59.7	66.0	83.2	76.2	86.3	95.9	89.5	101.6	112.4
M14	M14-2.0	115.447	69.3	76.4	95.5	74.8	82.8	104.3	95.5	108.3	120.2	112.2	127.4	140.9
	M14-1.5	124.552	74.7	82.4	103.1	80.7	89.3	112.5	103.1	116.8	129.7	121.1	137.4	152.0
M16	M16-2.0	156.677	94.0	103.7	129.6	101.5	112.3	141.5	129.6	146.9	163.1	152.3	172.8	191.2
	M16-1.5	167.255	100.3	110.7	138.4	108.4	119.9	151.1	138.4	156.8	174.1	162.6	184.5	204.1
M18	M18-1.5	216.242	129.7	143.1	178.9	140.1	155.1	195.3	178.9	202.8	225.1	210.2	238.6	263.9
M20	M20-2.5	244.808	146.8	162.0	202.5	158.7	175.5	221.1	202.5	229.6	254.9	238.0	270.1	298.8
	M20-1.5	271.513	162.9	179.7	224.6	176.0	194.7	245.2	224.6	254.6	282.7	264.0	299.5	331.3
M22	M22-2.5	303.415	182.0	200.8	251.0	196.6	217.6	274.0	251.0	284.5	315.9	295.0	334.7	370.3
	M22-1.5	333.066	199.8	220.5	275.6	215.9	238.8	300.8	275.6	312.3	346.8	323.8	367.4	406.5
M24	M24-3.0	352.524	211.5	233.3	291.7	228.5	252.8	318.4	291.7	330.6	367.0	342.7	388.9	430.2
	M24-2.0	384.431	230.6	254.5	318.1	249.2	275.7	347.2	318.1	360.5	400.2	373.7	424.1	469.1

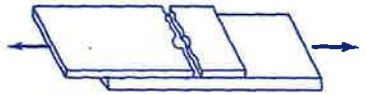
Bolted Connections Code Checks Per AISI E3 Summary

No.	Demand	Capacity	Governing Mode of Failure
1	2.2 kips	3.46 kips	BEARING GOVERNS
2	0.6 kips	3.37 kips	BEARING GOVERNS
3	2.2 kips	3.46 kips	BEARING GOVERNS
4	3.0 kips	3.45 kips	BEARING GOVERNS
5	3.2 kips	3.37 kips	SHEAR TEARING GOVERNS
6	3.1 kips	3.37 kips	SHEAR TEARING GOVERNS

a) Longitudinal shear failure of sheat



b) Bearing failure of sheet



c) Tensile failure of sheet,

d) Shear failure of bolt

Metric (SI) System Thread Tensile Stress Area (As)

Nom Dia. (mm)	Coarse Thread		Fine Thread	
	Thread Pitch (mm)	Tensile Stress Area (mm sq.)	Thread Pitch (mm)	Tensile Stress Area (mm sq.)
3	0.5	5.03		
3.5	0.6	6.78		
4	0.7	8.78		
5	0.8	14.2		
6	1	20.1		
7	1	28.9		
8	1.25	36.6	1	39.2
10	1.5	58.0	1.25	61.2
12	1.75	84.3	1.25	92.1
14	2	115	1.5	125
16	2	157	1.5	167
18	2.5	192	1.5	216
20	2.5	245	1.5	272
22	2.5	303	1.5	333
24	3	353	2	384
27	3	459	2	496
30	3.5	561	2	621
33	3.5	694	2	761
36	4	817	3	865
39	4	976	3	1030

The tensile stress area is calculated as follows:

$$As = 0.7854\ [D - (0.9743P)]^2$$

where

As = stress area (mm sq.)
D = nominal bolt size (mm)
P = thread pitch (mm)

Nom Dia. (mm)	Thread Pitch (mm)	As (mm sq.)	A sq. in.	F^b_u F^b_u	Shear Strength (Fnv)	$P_n = F'_{nt} A_b$ $P_n = F'_{nt} A_b$	ASD Safety Factor	ASD Shear strength
8	1.25	36.1	0.056	116 ksi	46.41 ksi	2.60 kips	2	1.30 kips
10	1.5	57.3	0.089	116 ksi	46.41 ksi	4.12 kips	2	2.06 kips
12	1.75	83.2	0.129	116 ksi	46.41 ksi	5.99 kips	2	2.99 kips
14	2	114.1	0.177	116 ksi	46.41 ksi	8.21 kips	2	4.10 kips
16	2	155.1	0.240	116 ksi	46.41 ksi	11.16 kips	2	5.58 kips

COMPONENTS	SPECIFICATIONS
POST	C-CHANNEL, G235, Grade 57 ROLL FORMED STEEL (Profile size will be specified to specific jobsite requirements)
TILT	C-CHANNEL, G90, Grade 80 ROLL FORMED STEEL (Profile size will be specified to specific jobsite requirements)
DIAGONAL	U-CHANNEL G50, Grade 57 (Profile size will be specified to specific jobsite requirements)
BEAM RACK	Z-CHANNEL, G90, Grade 80 ROLL FORMED STEEL (Profile size will be specified to specific jobsite requirements)
CONNECTOR BRACKETS	U-CHANNEL, G90, Grade 50 ROLL FORMED STEEL (Profile size will be specified to specific jobsite requirements)
LATERAL BRACE	ANGLE PROFILE, G90, Grade 50 STEEL (Profile size will be specified to specific jobsite
HARDWARE	**SPECIFICATIONS**
M8-1.25 X 50, Hex Head Bolt	DIN933 CLASS 8.8 (F1941 Fe/ZN 15AT Zinc Coating)
M8-1.25 X 30 Serrated Flange, Hex Head Bolt	DIN933 CLASS 8.8 (F1941 Fe/ZN 15AT Zinc Coating)
M12-1.75 X 25 HEX HEAD BOLT	DIN933/931 Class 8.8 (F1941 Fe/ZN 15AT Zinc Coating)
M10-1.5 X 25 HEX HEAD BOLT	DIN933/931 Class 8.8 (F1941 Fe/ZN 15AT Zinc Coating)
M8, M10, M12 FLAT WASHER	DIN125A (F1941 Fe-Zn-15AT Zinc Coating)
M10, M12 HEX NUT	DIN934 Class 8 (F1941 Fe-Zn-15AT Zinc Coating)
TORQUE REQUIREMENTS	
M8 BOLT	12 ft-lb
M10 HARDWARE	36 ft-lb
M12 HARDWARE	53 ft-lb

Member Thickness	Members
7_63x4_5x1x_112/145	POST (D) See drawings
U2x2_092	UPPER DIAG
L2x2_092	LOWER DIAG
4x2x75x055	TILT
Z6x3x1x055	BEAM
4x2x092	CONNECTOR (SHORT)
4x2x092	CONNECTOR (LONG)
L2x2_092 Lateral Brace	BEAM BRACE

U.S./Metric Conversion Equivalents

Quantity	To Convert	Into	Multiply By	To Convert	Into	Multiply By
Length	inch (in.) feet (ft)	millimeter(mm) millimeter(mm)	25.4 304.8	mm mm	inch feet	0.03937 0.00328
Area	square inch (sq.in)	square millimeter (sq. mm)	645.16	sq. mm	sq. in.	0.00155
Volume	gallon cubic inch cubic foot	liter cubic centimeter cubic meter	3.785 16.3871 0.0283	liter	gal	0.2642
Force	pound (lb.)	Newton(N)	4.448	N	lb.	0.2248
Pressure	pound/sq.in(psi)	Pascal(Pa) Mega Pascal(MPa)	6895 0.006895	MPa	psi	145.1
Torque	inch pound(in-lb) foot pound(ft-lb)	Newton meter(N m) Newton meter(N m)	0.113 1.356	N m N m	in-lb ft-lb	8.851 0.738

Other common conversions: $1N = 1\ kg\ m/s^2$: $1Pa = 1N/m^2$: $1MPa = 1N/mm^2$

Example: to convert length to mm, multiply inches by 25.4

END						
2X7-2	max	1643.841	12	4455.925	8	4.276
2X7-2	min	-1463.2	4	-2450.2	12	-6.734
2X7-1	max	1643.841	12	4455.925	8	6.734
2X7-1	min	-1463.2	4	-2450.2	12	-4.276
PERIMETER						
2X7-2	max	1238.289	12	3734.613	8	4.016
2X7-2	min	-907.938	4	-1747.76	12	-5.434
2X7-1	max	1238.289	12	3734.613	8	5.434
2X7-1	min	-907.938	4	-1747.76	12	-4.016

12	23.001	12	0	14	2391.714	4
8	-36.225	8	-0.01	3	-12640.8	11
8	36.225	8	0.01	3	2391.714	4
12	-23.001	12	0	13	-12640.8	11

12	21.61	12	0	14	1211.951	4
8	-29.232	8	-0.007	7	-8727.44	11
8	29.232	8	0.007	7	1211.951	4
12	-21.61	12	0	13	-8727.44	11

an uplift force due to the adfreeze stress developed around the surface area of the pile. The amount of upward force depends on the following:

- The thickness of ice lenses formed in the seasonal frozen ground
- The bond between the steel pile surface and the frozen ground
- The surface area of the steel pile in the seasonally frozen ground

Adfreeze on pile foundations may be significant. If the anchorage of the foundations and the deadweight of the pile are not sufficient to resist these upward forces, adfreeze load can cause uplift to structures. However, due to groundwater not being encountered in

the soil borings, the potential for development of an ice lens and subsequent frost heave is considered negligible. We therefore recommend frost heave loads on driven piles not be considered in design of the driven piles supporting the PV array panels for the axial forces for this project. However, due to strength losses from freeze thaw cycles the project site would experience, we recommend neglecting the upper 1 foot of soil when determining axial capacity and reducing the p-multiplier of this soil layer for lateral analysis.

Axial Capacity Recommendations

The axial uplift capacity of driven piles may be estimated based on skin friction developed along the perimeter of the pile, while the compression capacity may be estimated using the skin friction and end bearing. When determining embedment depths, the perimeter of a wide flange beam should be taken as twice the sum of the flange width and section depth. The upper 1 foot of soil for each pile should be neglected in the axial capacity analyses.

The ultimate axial capacity of driven steel piles may be calculated using skin friction and end bearing values as presented in the following tables:

Pile Embedment Depth (ft)	Ultimate Uplift and Compression Skin Friction, q_s (psf)[1, 2]	Ultimate End Bearing, $Q_{ult(end)}$ (lbs)[2, 3]
1 - 7	250	1,200
7 - 20	800	3,000

1. The upper 1 foot of soil should be neglected when determining the skin friction capacity of the pile due to freeze/thaw effects.
2. The parameters provided in this table are only applicable to piles embedded at least 5 feet below the ground surface
3. End bearing applicable to W6x9 pile size.

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client
Freedom Solar LLC

Project
Estes Rockets Solar

Sample Submitted By: Terracon (23) **Date Received:** 11/30/2023 **Lab No.:** 23-0610

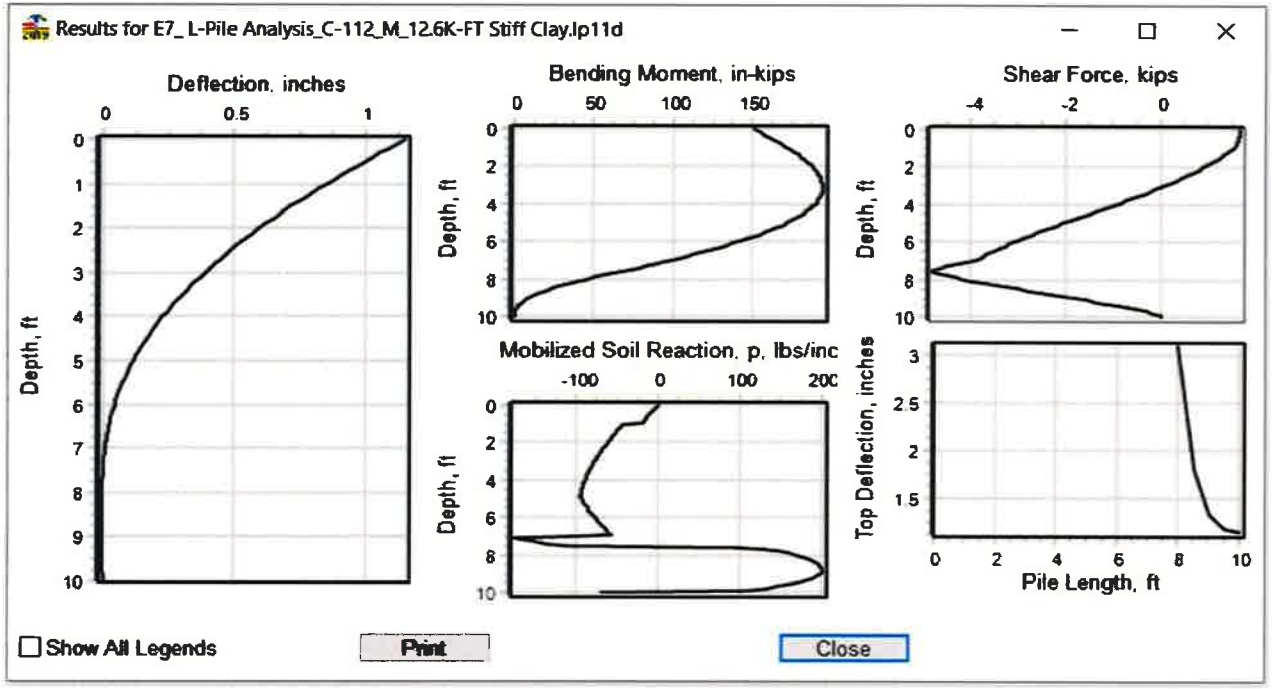
Results of Corrosion Analysis

Sample Number	--	--	--
Sample Location	B-1	B-2	B-3
Sample Depth (ft.)	0 - 5	0 - 5	0 - 5
pH Analysis, ASTM D4972	8.50	8.55	8.49
Water Soluble Sulfate (SO4), ASTM D516 (mg/kg)	46	68	68
Chlorides, ASTM D512, (mg/kg)	125	137	162
Saturated Minimum Resistivity, ASTM G-57, (ohm cm)	1843	2328	1940

Pile Reactions & Foundation Evaluation Report

End														MZ	Embedment	Design
Node		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft	LC	MZ [lb-ft]	LC	[lb-in]	Depth	Governs
2X7-2	max	1644	12	4456	8	4	12	23	12	0	14	2392	4			
2X7-2	min	-1463	4	-2450	12	-7	8	-36	8	-0.01	3	-12641	11	-151690	**9.00 ft.**	Lateral
2X7-1	max	1644	12	4456	8	7	8	36	8	0.01	3	2392	4			
2X7-1	min	-1463	4	-2450	12	-4	12	-23	12	0	13	-12641	11	-151690	**9.00 ft.**	Lateral

Perimeter														MZ	Embedment	Design
Node		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft	LC	MZ [lb-ft]	LC	[lb-in]	Depth	Governs
2X7-2	max	1238	12	3735	8	4	12	22	12	0	14	1212	4			
2X7-2	min	-908	4	-1748	12	-5	8	-29	8	-0.007	7	-8727	11	-104729	**8.00 ft.**	Lateral
2X7-1	max	1238	12	3735	8	5	8	29	8	0.007	7	1212	4			
2X7-1	min	-908	4	-1748	12	-4	12	-22	12	0	13	-8727	11	-104729	**8.00 ft.**	Lateral



E7_ L-Pile Analysis_C-112_M_12.6K-FT Stiff Clay - Notepad

File Edit Format View Help

Output Summary for Load Case No. 1:

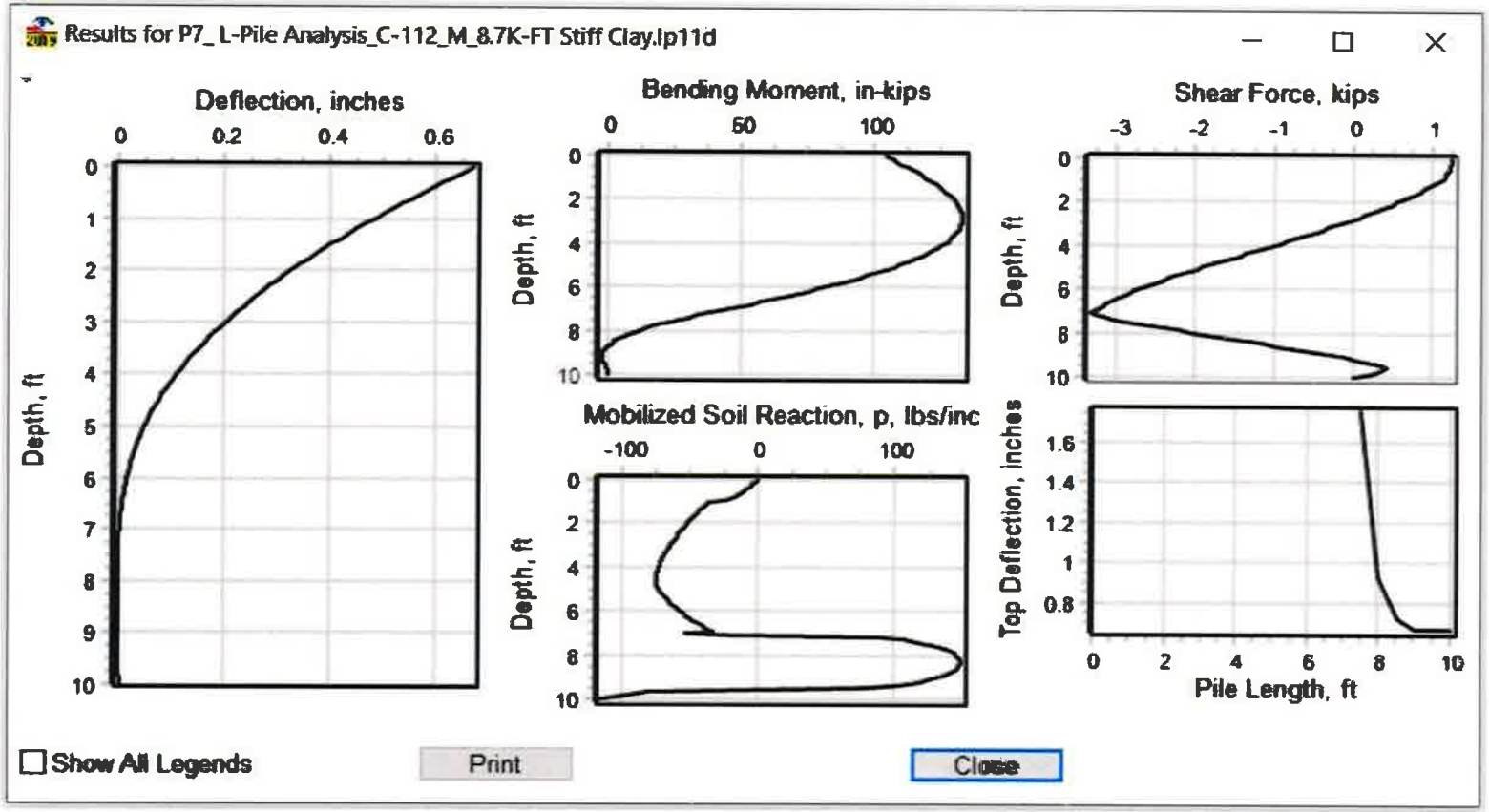
Pile-head deflection	=	1.14882417	inches
Computed slope at pile head	=	-0.02641026	radians
Maximum bending moment	=	194572.	inch-lbs
Maximum shear force	=	-4824.	lbs
Depth of maximum bending moment	=	3.10000000	feet below pile head
Depth of maximum shear force	=	7.60000000	feet below pile head
Number of iterations	=	31	
Number of zero deflection points	=	2	

Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear	=	1644.	lbs
Moment	=	151690.	in-lbs
Axial Load	=	4456.	lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
10.00000	1.14882417	194572.	-4824.
9.50000	1.17427767	194815.	-5072.
9.00000	1.33541279	194611.	-5515.
8.50000	1.80638734	193442.	-5624.
8.00000	3.09710645	194096.	-5909.


Results for P7_ L-Pile Analysis_C-112_M_8.7K-FT Stiff Clay.lp11d
Deflection, inches
0
0.2
0.4
0.6
Depth, ft
0
1
2
3
4
5
6
7
8
9
10
Bending Moment, in-kips
0
50
100
Depth, ft
0
2
4
6
8
10
Shear Force, kips
-3
-2
-1
0
1
Depth, ft
0
2
4
6
8
10
Mobilized Soil Reaction, p, lbs/inc
-100
0
100
Depth, ft
0
2
4
6
8
10
Top Deflection, inches
1.6
1.4
1.2
1
0.8
0
2
4
6
8
10
Pile Length, ft
Show All Legends
Print
Close

Output Summary for Load Case No. 1:

Pile-head deflection	=	0.66937511	inches
Computed slope at pile head	=	-0.01669663	radians
Maximum bending moment	=	133486.	inch-lbs
Maximum shear force	=	-3327.	lbs
Depth of maximum bending moment	=	2.80000000	feet below pile head
Depth of maximum shear force	=	7.10000000	feet below pile head
Number of iterations	=	27	
Number of zero deflection points	=	2	

Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear	=	1238.	lbs
Moment	=	104729.	in-lbs
Axial Load	=	3735.	lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
10.00000	0.66937511	133486.	-3327.
9.50000	0.67036092	133560.	-3309.
9.00000	0.67327256	133610.	-3347.
8.50000	0.72710549	133540.	-3613.
8.00000	0.92964500	133103.	-3865.
7.50000	1.75811198	132774.	-3994.

Driven Pile Design-PD *Given:* *Frost Heave Check* *Zone 1: PLT -1* **Estes Rockets**

Description	Value
C -Pile Depth :=	7.63 in.
C -Pile Width :=	4.50 in.
Perimeter :=	24.25 in.

GW =	NONE	BLG

Adfreeze Bond Value : = 0 psf 0 psf

Frost Depth : = 1.00 ft. Bare soil - No snow cover

Adfreeze Uplift Demand = 0 lbs

Wind uplift Demand = -2,450 lbs E7

Depth of Layer (ft)	Layer	Layer		γ	Friction	Cohesion	Unit Skin Friction		Pile	Kht	Skin Friction	
	Top	Bottom		pcf	Angle	Cu (psf)	Top	Bottom	Perimeter		fs	Qs
Frost	0.0 ft.	1.0 ft.	1.00 ft.	110	NA	750 psf						
1'-7'	1.0 ft.	7.0 ft.	6.00 ft.	115 pcf	NA	750 psf	250 psf	250 psf	2.02 ft.	1.00	250 psf	3,031 lbs
7'-20'	7.0 ft.	7.5 ft.	0.50 ft.	125 pcf	NA	3,000 psf	800 psf	800 psf	2.02 ft.	1.00	800 psf	808 lbs

Pile Below Grade (embedment to resist frost heave) > 7.50 ft. 3,840 lbs

FS = -1.6 Wind

Wind uplift Demand = -1,748 lbs P7

Depth of Layer (ft)	Layer	Layer		γ	Friction	Cohesion	Unit Skin Friction		Pile	Kht	Skin Friction	
	Top	Bottom		pcf	Angle	Cu (psf)	Top	Bottom	Perimeter		fs	Qs
Frost	0.0 ft.	1.0 ft.	1.00 ft.	110	NA	750 psf						
1'-7'	1.0 ft.	7.0 ft.	6.00 ft.	115 pcf	NA	750 psf	250 psf	250 psf	2.02 ft.	1.00	250 psf	3,031 lbs
7'-20'	7.0 ft.	7.0 ft.	0.00 ft.	125 pcf	NA	3,000 psf	800 psf	800 psf	2.02 ft.	1.00	800 psf	0 lbs

Pile Below Grade (embedment to resist frost heave) > 7.00 ft. 3,031 lbs

FS = -1.7 Wind

Estes Rockets Solar

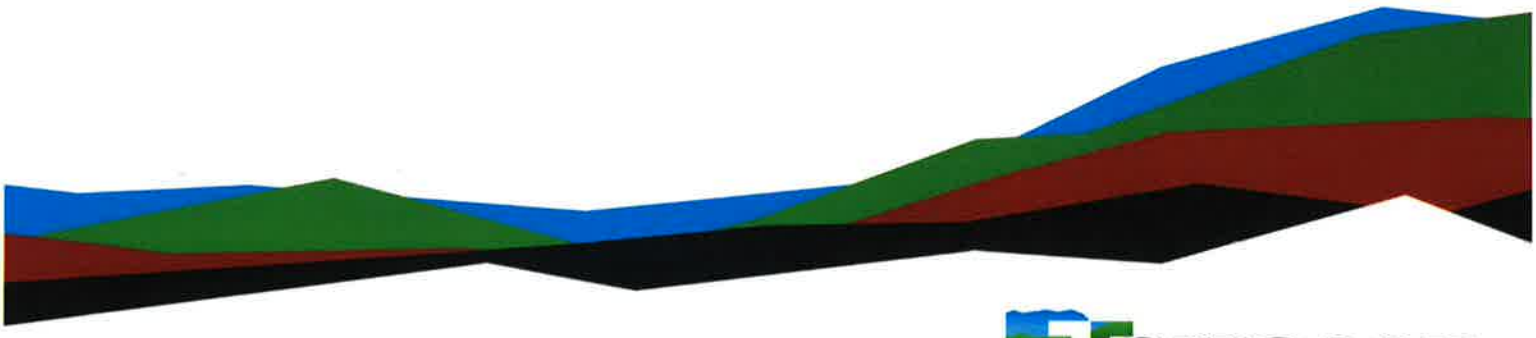
Design Level Geotechnical Engineering Report

1295 H Street

February 13, 2024 | Terracon Project No. 23235067

Prepared for:

Freedom Solar, LLC
4801 Freidrich Lane, Suite 100
Austin, Texas 78744



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February 13, 2024

Freedom Solar, LLC
4801 Freidrich Lane, Suite 100
Austin, Texas 78744

Attn: Peter Barrera
P: (702) 466-4087
E: pbarrera@freedomsolarpower.com

Re: Design Level Geotechnical Engineering Report
Estes Rockets Solar
1295 H Street
Penrose, Colorado
Terracon Project No. 23235067

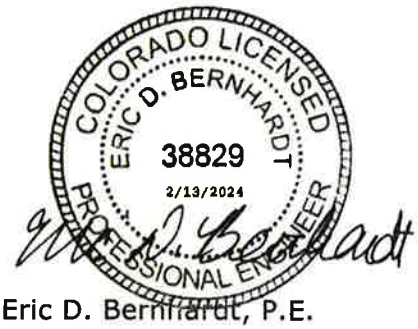
Mr. Barrera:

We have completed the scope of Design Level Geotechnical Engineering services for the project referenced above in general accordance with Terracon Proposal No. P23235067 dated July 19, 2023. This report presents the findings of the subsurface exploration, laboratory testing, engineering analyses and geotechnical engineering recommendations with regard to the design and construction of the proposed solar facility.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon



Nick M. Novotny, P.G., C.E.G.
Geotechnical Group Manager

Eric D. Bernhardt, P.E.
Regional Geotechnical Manager

SME Review by: Rachel C. Pott, P.E.

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Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

Refer to each individual Attachment for a listing of contents.

Geohazards

Item	Overview Statement [2]
Pile Drivability	We anticipate difficulties will be encountered during excavation and pile driving for the majority of the site as hard to very hard soils and/or shallow claystone/shale bedrock may cause pile refusal for piles embedded deeper than about 7 feet.
Shallow Bedrock	Shallow bedrock was encountered at each of the boring locations at about 7 feet below existing site grades.
Frost Potential	The soils above the bedrock are frost susceptible.
Shallow Groundwater	Groundwater was not encountered at the site at any time during our field exploration.
Liquefaction	Liquefaction is not a concern at the site.
Karst	Karst is not a concern at this site.

1. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed solar power facility to be located at 1295 H Street in Penrose, Colorado. The purpose of these services was to provide information and design-level geotechnical engineering recommendations relative to the proposed solar development.

The geotechnical engineering Scope of Services for this project included soil borings, geotechnical laboratory testing, laboratory thermal resistivity testing, laboratory corrosion testing, and geotechnical analysis and reporting. Electrical resistivity testing was originally included in our scope of work, but at your request, this service has been removed. Additional details can be found in the **Exploration and Testing Procedures** section of this report.

Project Description

Topic [1]	Overview Statement [2]
Information Provided	An email request for proposal was provided by Peter Barrera on June 8, 2023. The request included a pdf with the proposed site for the solar array. ▪ Estes Rockets – Proposed Site.pdf
Project Description	We understand the proposed project consists of the construction of a 480-kW ground mounted solar system on an approximate 1.6 acre site.
Proposed Structures	The proposed project will include the construction of ground-mounted solar panels on steel racks, preferably founded on driven W-Section steel beams (W6x9 or similar).
Finished Grade Elevation	Not provided; however, we anticipate finished grade will be within a couple feet of existing grade.
Maximum Loads	We have estimated the following foundation loads for the project: Panel array racking system: ▪ PV Module Downward: 1 – 7 kips ▪ PV Module Uplift: 0.5 – 3 kips ▪ PV Module Lateral: 1 – 2 kips ▪ PV Module Moment: 0.1 - 30 kip-ft.

Topic [1]	Overview Statement [2]
Grading/Slopes	Grading and/or site plans were not provided at this stage of the project. However, we anticipat the site work involves cuts and fills within +/- 2 feet of existing grade. Localized high and low areas may require greater depths/heights of cut and/or fill; however, a site grading plan has not been developed at this time.
Access Roads	We anticipate unpaved access roads are planned for the site to support operational (i.e., post construction) traffic which we understand to be: ▪ Array Access Roads: 250 ESALs ▪ Design Life = 30 years ▪ Allowable Rut Depth = 2 inches ▪ Design Serviceability Loss = 2.0 ▪ Vehicle Tire Pressure = 80 psi We understand it is acceptable for the access roads to require ongoing maintenance throughout their design life.

Terracon should be notified if any of the above information is inconsistent with the planned construction, as modifications to our recommendations may be necessary.

Site Conditions

The following description of the site conditions is derived from our site visit in association with the field exploration.

Item	Description
Parcel Information	The approximately 1.6-acre project site is located at 1295 H Street in Penrose, Colorado. Latitude/Longitude 38.41559° N/105.01618° W See **Site Location**
Existing Improvements	The project site consists of undeveloped agricultural land.
Current Ground Cover	Based on review of available aerial imagery and recent site visits, ground cover consists of an agricultural field.
Existing Topography	The site slopes downwards towards the southeast with an elevation difference of about 10 feet.

Geotechnical Characterization

Exploration Results

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Subsurface Profile

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Native Clay**	Native lean clay with varying amounts of sand; medium stiff to hard
2	**Bedrock**	Bedrock consisting of claystone and shale; hard to very hard

Groundwater

The borings were advanced using a solid-stem auger drilling technique that allows short-term groundwater observations to be made while drilling. Groundwater was not encountered in any test borings at the time of our field exploration to the maximum depths explored of about 20 feet. These observations represent groundwater conditions at the time of the field exploration and may not be indictive of conditions at other times or at other locations. Groundwater conditions can change with varying seasonal and weather conditions and other factors. Long-term groundwater monitoring was outside the scope of services for this project.

Bedrock

Bedrock was encountered at each boring location at depths ranging from about 7 to 7.5 feet below grade surface (bgs). A summary of the depth to bedrock encountered in each borings provided in the following table.

Boring No.	Depth to Bedrock (feet-bgs)
B-1	7
B-2	7
B-3	7.5

Laboratory Thermal Resistivity

At the tie time this report was prepared, the thermal resistivity testing for this project was still in process. We will provide the results of the thermal resistivity testing in a revised geotechnical report for this project.

Laboratory Corrosion Testing

The table below lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary

Boring	Sample Depth (feet)	Soluble Sulfate (ppm)	Soluble Chloride (ppm)	Electrical Resistivity (Ω-cm)[1]	pH
B-1	0-5	46	125	1,843	8.50
B-2	0-5	68	137	2,328	8.55
B-3	0-5	68	162	1,940	8.49

1. Resistivity determined on saturated samples.

Results of water-soluble sulfate testing indicate that samples of the on-site soils have an exposure class of S0 when classified in accordance with the American Concrete Institute (ACI) Design Manual. The results of the testing indicate ASTM Type I portland cement is suitable for project concrete in contact with on-site soils. Concrete should be designed in accordance with the provisions of the ACI Design Manual.

Results of soluble sulfate testing can be classified in accordance with ACI 318 – Building Code Requirements for Structural Concrete. Numerous sources are available to characterize corrosion potential to buried metals using the parameters above. Section 10.7.5 of the AASHTO LRFD Bridge Manual, 8th Edition, 2017, states the following soil or site conditions should be considered as indicative of potential deterioration or corrosion situation for steel piles:

- Soil electrical resistivity less than 2,000 ohm-cm
- Ph less than 5.5
- Ph between 5.5 and 8.5 with high organic content
- Sulfate concentration greater than 1,000 ppm (mg/kg)

These test results are provided to assist in determining the type and degree of corrosion protection that may be required. We recommend a NACE certified corrosion professional be retained to analyze the need for corrosion protection and to design appropriate protective measures, if required.

Imported fill materials may have significantly different properties than the site materials noted above and should be evaluated if expected to be in contact with metals used for construction.

Field Electrical Resistivity Testing

At your request, the field electrical resistivity testing was removed from our scope of work for this project.

Seismic Site Class

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil and bedrock properties observed at the site and as described on the exploration logs and results, our professional opinion is for that a **Seismic Site Classification of C** be considered for the project. The deepest subsurface explorations at this site were extended to a maximum depth of 20 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

Contributory Risk Components

Item	Description
Soil Conditions	Subsurface conditions consist of alluvial soil deposits (lean clay with sand, sandy lean clay). These soils are moisture-sensitive and can impact earthwork and site access during the wet and cold seasons.
Access	Existing roads are passible, but wet and soft surface conditions (due to precipitation and run-off) in undeveloped areas can pose access issues for vehicles. Surface drainage areas have no or limited crossings.
Grading	We anticipate minimal grading will be completed. We expect localized areas of unsuitable conditions will be encountered prior to placing fill and within the subgrade for roadways and shallow foundations that are planned, especially if allowed to become wetted. Special considerations such as stabilization, construction of temporary haul roads, chemical treatment, or drying of subgrades may be utilized to facilitate compaction and traffic for construction vehicles.
Anticipated Pile Drivability	Based on the results of our soil borings and our experience with the geology of the project site, we anticipate difficulties will be encountered during excavation and pile driving for the majority of the site. Hard to very hard soils and/or shallow shale/claystone bedrock may cause pile refusal for piles embedded deeper than 7 feet.
Groundwater	Groundwater was not encountered in explorations at the site to the maximum depths explored of 20 feet.
Site Drainage	Site surfaces should be properly sloped during construction to prevent ponding and concentration of surface water at the site. Final grading should be completed to ensure proper site drainage throughout the life of the facility.
Corrosion Hazard	The results of our laboratory soil testing are expected to assist a qualified engineer to design corrosion protection for the production piles and other project elements such as steel.

Item	Description
Excavation Hazards	Based on the results of our soil borings and our experience with the geology of the project site, we do not expect difficult excavation conditions will be encountered during construction at shallow depths; however, heavy duty excavation equipment may be needed for excavations into the claystone/shale bedrock encountered at a depth of about 7 feet. Excavations could require bracing, sloping, and/or other means to create safe and stable working conditions.
General Construction Considerations	The near-surface soils could become unstable with typical earthwork and construction traffic, especially after precipitation events. Effective drainage should be implemented early in the construction sequence and maintained after construction to reduce potential issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the wetter months, an increased risk for possible undercutting and replacement of unstable subgrade will exist. Heavy equipment traffic directly on bearing surfaces should be avoided. The use of track-mounted or remotely operated equipment, such as a backhoe or dozer, would be beneficial to perform excavations and reduce subgrade disturbance of unstable subgrade conditions develop, stabilization measures will need to be employed to improve subgrade support. Temporary haul roads may be needed to protect subgrades form disturbance from construction traffic.
Slope Hazards	The project site development areas have a downwards slop towards the southeast with an elevation difference of about 10 feet. Minimal cut/fill is expected; however, development near slopes of 2:1 (H:V) or steeper should have a minimum setback equal to the slope height.
Liquefaction	Subsurface soils encountered in our test borings are not susceptible to liquefaction.
Expansive Soils	Based on the results of the laboratory testing and our experience in the area, the native clay soils have nil to low expansive potential. Based on our experience in the area the claystone/shale bedrock are considered to have low to high expansive potential.

Item	Description
Karst Risk	Mapped geologic formations at the site do not exhibit karst features; the karst risk at this site is considered negligible.

Solar Panel Racking System Foundations

Geotechnical Considerations

We understand the main foundation component in the array area will be driven pile foundations for support of solar arrays; however, some lightly loaded inverter structures are typically required across the site. In general, small, lightly loaded, inverter structures may be supported on driven piles or isolated mat/slab foundation systems.

Geotechnical engineering recommendations for pile foundation systems on this project are described in the following sections. Based on the blow counts from the borings, we would expect the PV panels to be supported by direct drive embedment piles.

The recommendations contained in this report are based on the results of field testing and our current understanding of the proposed project. If other means or methods of array installation and support are proposed, we should be contacted to review design and/or conduct Pile Load Testing utilizing the same modified means/methods of installation.

Driven pile axial and lateral recommendations presented below may also be applied to other structures (i.e., inverters and embedded poles) supported on driven piles. Other structures supported on driven piles similar to the solar panels may require piles to be driven to greater depths in order to achieve the required axial capacities.

It should be noted that pile load testing was not performed for this project. However, due to the size of the proposed array, the recommendations presented in this report for the solar panel racking system foundations are considered to be design level. If the design team would like to take a more aggressive approach to the embedment depths for the solar panel racking system foundations, pile load testing could be implemented to provide a lower factor of safety for the design of these foundation elements.

Adfreeze Stress and Depth Which Adfreeze Applies

It is Terracon's professional opinion that the near-surface overburden soils encountered in the borings drilled at this site are frost susceptible. In cold weather climates, design to resist frost heave forces exerted on foundations is often a significant factor in the

foundation design. Specifically, pile lengths will need to be long enough to counteract potential heave forces in the seasonal frost zone.

As the frost penetrates deeper into the soil and the ground swells due to freezing, a portion of the soil profile and ground surface will rise due to frost heaving. The upward displacement is due to freezing water contained in the soil voids along with the formation of ice lenses in the soil. The freezing material grips the steel pile and exerts an uplift force due to the adfreeze stress developed around the surface area of the pile. The amount of upward force depends on the following:

- The thickness of ice lenses formed in the seasonal frozen ground
- The bond between the steel pile surface and the frozen ground
- The surface area of the steel pile in the seasonally frozen ground

Adfreeze on pile foundations may be significant. If the anchorage of the foundations and the deadweight of the pile are not sufficient to resist these upward forces, adfreeze load can cause uplift to structures. However, due to groundwater not being encountered in the soil borings, the potential for development of an ice lens and subsequent frost heave is considered negligible. We therefore recommend frost heave loads on driven piles not be considered in design of the driven piles supporting the PV array panels for the axial forces for this project. However, due to strength losses from freeze thaw cycles the project site would experience, we recommend neglecting the upper 1 foot of soil when determining axial capacity and reducing the p-multiplier of this soil layer for lateral analysis.

Axial Capacity Recommendations

The axial uplift capacity of driven piles may be estimated based on skin friction developed along the perimeter of the pile, while the compression capacity may be estimated using the skin friction and end bearing. When determining embedment depths, the perimeter of a wide flange beam should be taken as twice the sum of the flange width and section depth. The upper 1 foot of soil for each pile should be neglected in the axial capacity analyses.

The ultimate axial capacity of driven steel piles may be calculated using skin friction and end bearing values as presented in the following tables:

Pile Embedment Depth (ft)	Ultimate Uplift and Compression Skin Friction, q_s (psf)[1,2]	Ultimate End Bearing, $Q_{ult(end)}$ (lbs)[2,3]
1 - 7	250	1,200
7 - 20	800	3,000

1. The upper 1 foot of soil should be neglected when determining the skin friction

capacity of the pile due to freeze/thaw effects.

2. The parameters provided in this table are only applicable to piles embedded at least 5 feet below the ground surface.
3. End bearing applicable to W6x9 pile size.

The above values are to be used in the following equations to obtain the ultimate uplift or compression load capacity of a pile:

$$Q_{ult\ (compressive)} = q_t \times A + \Sigma(H_i \times P \times q_{si})$$

$$Q_{ult\ (uplift)} = \Sigma(H_i \times P \times q_{si})$$

Q_{ult} = Ultimate uplift or compression capacity of post (lbs.)
$Q_{ult\ (end)}$ = Ultimate end bearing capacity per table above (lbs.)
H = Depth of embedment of pile (ft.)
P = Perimeter area/ft of pile (e.g., W6x9 = 1.64 sf/ft.)
q_s = Skin friction per depth per table above (psf)
q_t = Unit toe-bearing resistance per table above (psf)
A = Cross-sectional area of pile (e.g., W6x9 = 0.161 sf)

The skin friction is appropriate for uplift and compressive loading and represents ultimate values. A factor of safety of 2 should be applied to the skin friction values. The end bearing pressure is also an ultimate value and should have a factor of safety of 3 applied for design. If a pile load test program is performed to refine the applicable geotechnical parameters, a factor of safety on the order of 1.5 could then be used for design based on parameters developed from the pile load test program.

Piles should have a minimum center-to-center spacing of at least five times their largest cross-sectional dimension to prevent reduction in the axial capacities due to group effects.

The recommended geotechnical design parameters in the table above are based on average conditions encountered in our borings. If pile load testing is performed, design values will likely vary.

Lateral Capacity Recommendations

The parameters in the following table can be used for the analysis of the lateral capacity of driven steel piles in support of solar panel arrays.

LPILE Soil Parameters

Depth Interval (ft)	LPILE Soil Type	Effective Unit Weight, γ' (pcf)	Cohesion (psf)	Soil Modulus, k (pci)	P-Multiplier
0 to 1	Lean clay w/o free water	110	750	Default	0.7
1 to 7	Lean clay w/o free water	115	750	Default	1.0
7 to 20	Lean clay w/o free water	125	5,000	Default	1.0

1. The parameters provided in this table are only applicable to piles embedded at least 5 feet below the ground surface.

The above-indicated parameters have no factor of safety and may be used to analyze suitability of the proposed section and serviceability requirements. These parameters are based on correlations with SPT results, published values, and our experience with similar soil types. Existing *p-y* models typically under-predict the lateral capacity of shallow driven piles. Therefore, the *P*-multiplier is most likely higher but would need to be confirmed based on the results of site-specific load test results.

Construction Considerations

Based on the field exploration and laboratory testing, it is our opinion that the soils on the site are suitable for direct pile drive installation into native soils. We do not expect pre-drilling will be required unless pile lengths exceed about 7 feet and extend into the bedrock.

A geotechnical engineer should be engaged to make periodic observations of pile driving operations during construction. Each pile should be observed and checked for buckling, crimping and alignment in addition to recording penetration resistance, depth of embedment, and general pile driving operations.

Mat/Slab Foundations for Support of Inverters

General

We understand the main foundation component in the array area will include driven pile foundations for support of solar arrays; however, some lightly loaded inverter structures are typically required across the site. In general, inverter structures may be supported on driven piles or isolated mat/slab foundation systems.

Medium stiff to very stiff clay soils were encountered near the surface and will require improvement prior to foundation construction. Based on the anticipated magnitude of loading for the inverters, over-excavation and recompaction as discussed in the **Earthwork** section of this report should provide adequate improvement for shallow foundation support of these structures.

The following sections present design recommendations and construction considerations for shallow foundation support of inverters.

Frost Considerations

The soils on this site are frost susceptible, and small amounts of water can affect the performance of the slabs on-grade. Exterior slabs should be anticipated to heave during winter months. If frost action needs to be eliminated in critical areas, we recommend the use of non-frost susceptible (NFS) fill or structural slabs.

Mat/Slab Foundation Design Recommendations

Description	Mat
Net allowable bearing pressure [1]	2,000 psf
Modulus of subgrade reaction for slab-on-grade design (K_{v1})	125 pounds per square inch per in (psi/in.) for point loading conditions
Bearing material	Minimum 2 feet of new engineered fill
Maximum dimensions	20 feet x 20 feet
Minimum embedment below finished grade [2]	30 inches
Approximate total movement [3]	About 1 inch or less
Estimated differential movement	About ½ to ¾ of total movement
Ultimate coefficient of sliding friction [4]	0.35

Description	Mat

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the foundation base elevation. It assumes any unsuitable soils, if encountered, will be replaced with compacted engineered fill.
2. Required for the allowable bearing pressure, erosion protection and to reduce the effects of seasonal moisture variations in the subgrade soils.
3. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the foundation, the thickness of compacted fill, and the quality of the earthwork operations. foundations should be proportioned to relatively constant dead-load pressure in order to reduce differential movement between adjacent foundations.
4. Sliding friction along the base of the foundations will not develop where net uplift conditions exist.

The allowable foundation bearing pressures apply to dead loads plus design live load conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

The subgrade modulus (K_v) for the mat is affected by the size of the mat foundation and would vary according to the following equation:

$$K_v = K_{v1}*(1/B) \text{ (Clays)}$$

Where: K_v is the modulus for the size footing being analyzed
B is the width of the mat foundation.

Foundation excavations should be observed by the Geotechnical Engineer. If the soil conditions encountered differ significantly from those presented in this report, Terracon should be contacted to provide additional evaluation and supplemental recommendations.

Earthwork Recommendations

General

The site work conditions will be largely dependent on the weather conditions and the contractor's means and methods in controlling surface drainage and protecting the subgrade. The near-surface clay soils encountered in the borings may pump or become unstable during construction, especially after precipitation events. Site preparation where inverter mat foundations will be installed should include clearing and grubbing, installation of a site drainage system (where necessary), subgrade preparation, proof rolling, and over-excavation as necessary. Site preparation is not necessary in the PV

Array field or where inverters will be supported on driven piles except to improve site drainage where necessary.

Site Drainage

The site should be graded to shed water and avoid ponding over the subgrade for mat/slab foundations and roadway areas. However, temporary ponding in the array areas that are to receive driven steel piles is acceptable.

Site Preparation

Strip and remove existing vegetation, debris, and other deleterious materials from proposed access road areas and any proposed mat foundations supporting inverters. Stripping depths based on the widely spaced borings are estimated to be about 4 to 6 inches but could vary considerably between our boring locations and across the site. We recommend actual stripping depths be evaluated during construction to aid in preventing removal of excess material. Any large vegetation should be cleared from the site at the location of mat foundations supporting inverters and roadway areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction in array panel, inverter, and access road areas.

Following stripping and prior to the placement of new engineered fill in areas below design grade and in rough graded cut areas, subgrades should be proofrolled to help delineate unstable soil zones.

Unstable areas identified by proofrolling or by test probes should be undercut to expose stable material and backfilled with engineered fill or stabilized using geotextiles.

Prior to placement of fill in areas below design grade and after completion of rough grading in cut areas of the site, the exposed subgrade should be scarified, moisture conditioned, and compacted to the density and water content ranges recommended in this report.

Material Types

Fill for this project should consist of engineered fill. Engineered fill is fill that meets the criteria presented in this report and has been properly documented.

Engineered fill should meet the following material property requirements:

Fill Type [1,2]	USCS Classification	Acceptable location for placement
On-site clay soils	CL	On-site clay soils are considered suitable for reuse as engineered fill below foundations and roadway areas, and as general fill for this project
Processed claystone or shale bedrock [3]	N/A	The on-site claystone and shale bedrock is considered suitable for engineered fill below foundation and roadway areas.
Imported soils	Varies	Imported soils meeting the gradation presented herein can be considered acceptable for use as engineered fill beneath foundations, slabs and pavements.

1. Engineered fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation.
2. Care should be taken during the fill placement process to avoid zones of dis-similar fill. Improvements constructed over varying fill types are at a higher risk of differential movement compared to improvements over a uniform fill zone.
3. On-site claystone and/or shale bedrock materials should be staged separately from excavated soils and processed to a soil-like consistency with a maximum particle size of 3 inches.

Imported soils and on-site materials for engineered fill (if required) should meet the following material property requirements:

Gradation	Percent finer by weight (ASTM C136)
3"	100
No. 4 Sieve	30-100
No. 200 Sieve	15-70

- Liquid Limit..... 30 (max.)
- Plasticity Index..... 15 (max.)
- Maximum Expansive Potential (%)..... 1.0*

  *Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at optimum water content. The sample is confined under a 200-psf surcharge and submerged.

Compaction Requirements

Engineered fill should be placed and compacted in horizontal lifts, using equipment and

procedures that will produce recommended moisture contents and densities throughout the lift.

Item	Description
Fill lift thickness	8-inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6-inches in loose thickness when hand-guided equipment (i.e. jumping jack, plate compactor) is used
Compaction requirements [1,2]	Minimum of 95% of the material's standard Proctor maximum dry density (ASTM D698).
Moisture content cohesive soils (clay soils) [3]	0 to +4% of the optimum moisture content.

1. We recommend engineered fill be tested for water content and compaction during placement. Should the results of the in-place density tests indicate the specified water or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified water and compaction requirements are achieved.
2. Water levels should be maintained low enough to allow for satisfactory compaction to be achieved without the compacted fill material pumping when proofrolled.
3. Moisture conditioned clay soils should not be allowed to dry out. A loss of moisture within these materials could result in an increase in the materials expansive potential. Subsequent wetting of these materials could result in undesirable movement.

Utility Trenches

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. Excavations should be backfilled with engineered or native fills in accordance with this report and be compacted in accordance with recommendations in this report.

Earthwork Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

Surface water infiltrating into excavations could affect overexcavation efforts, especially for overexcavation and replacement of lower strength soils. A temporary dewatering system consisting of shallow trenches leading to sumps with pumps may be necessary to achieve the recommended depth of overexcavation depending on surface water runoff conditions at the time of construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Access Roads

General Pavement Comments

Roadway designs are provided for the traffic conditions and pavement life conditions as noted in the **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Roadway designs noted in this section are contingent upon the site being prepared as recommended in the **Earthwork** section. Additionally, our recommendations are based on *Chapter 4 Low-Volume Road Design* found in AASHTO 1993.

Subgrade Preparation

At most project sites, the site grading is accomplished relatively early in the construction phase. Fills are typically placed and compacted in a uniform manner. However, as construction proceeds, the subgrade may be disturbed due to construction traffic,

desiccation, or rainfall. As a result, the aggregate-surfaced roadway or parking area subgrade may not be suitable for construction and corrective action will be required. The subgrade should be carefully evaluated at the time of construction for signs of disturbance or instability. We recommend the subgrade be thoroughly proofrolled with a loaded tandem-axle dump truck prior to final grading. All aggregate-surfaced roadway or parking subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the aggregate surfacing.

Native Soil Subgrades

The native soil design CBR value was based on the results of the laboratory CBR test which found a CBR value of about 3.5. We recommend using a value of 3.5 for the design.

Design Parameters

We understand unpaved access roads are planned throughout the site. The unpaved road sections for post-construction use have been developed under the following assumptions:

Aggregate Roadway Design Parameters		
Parameter	**Design Value**	**Comments**
Traffic Loading	Array Area = 250 ESALs[1]	Assumed
Design Life	30 years	Assumed
Design CBR	3.5	Based on lab testing
Resilient Modulus	6,000 psi (frozen)	Correlated from CBR results
	1,500 psi (saturated)	
	1,500 psi (wet)	
	3,000 psi (dry) standard	
Aggregate Base Elastic Modulus	20,000 psi	Assumed
Allowable Rut Depth	2 inches	Assumed

Aggregate Roadway Design Parameters		
Parameter	**Design Value**	**Comments**
Design Serviceability Loss	2.0	Assumed
Vehicle Tire Pressure	80 psi	Assumed

1. ESAL = 18-kip Equivalent Single Axle Load

Access Road Sections

As a minimum, we recommend the following options for unpaved access roads:

Typical Unpaved Road Section – Post Construction Traffic			
ESALs	**Base Course Thickness**	**Subbase Type**	**Area**
250	6	Compacted Native Soil	Array Areas

1. Base materials should meet ≥98% of maximum dry density as determined by ASTM D698. Terracon does not believe treating subgrade soils with chemicals or geogrid stabilization will be needed due to existing road subgrade conditions.

We would consider the above option applicable in areas that are expected to have light passenger truck maintenance vehicles but should be suitable to support fire truck access (i.e. array area roads).

Note that there will be a need for an ongoing maintenance program. Ruts that develop should be filled with additional aggregate base rather than by re-grading. Also, the unpaved roadway would need to be constructed with adequate drainage to prevent the ponding of water which would contribute to additional ongoing maintenance.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the

Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly effect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

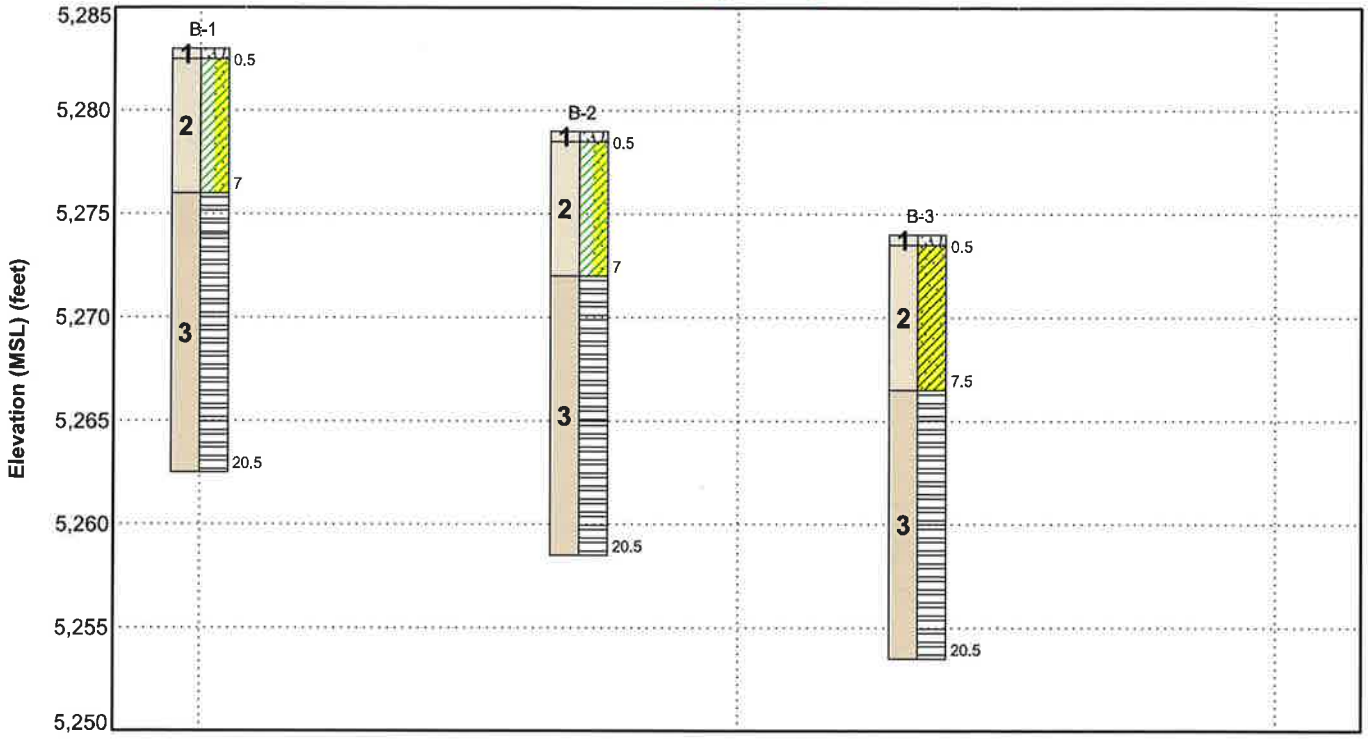
Figures

Contents:

Estes Rockets Solar
1295 H Street | Penrose, Colorado
Terracon Project No. 23235067

Terracon
4172 Center Park Dr
Colorado Springs, CO

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Topsoil**	Topsoil; about 6 inches
2	**Native Clay**	Native lean clay with varying amounts of sand; medium stiff to hard
3	**Bedrock**	Bedrock consisting of claystone and shale; hard to very hard

LEGEND

Topsoil
Sandy Lean Clay
Lean Clay with Sand
Shale

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

The following table provides a summary of our geotechnical exploration completed in the array area.

Number of Explorations	Type of Exploration	Depth
3	Soil Boring	20 feet

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about +/- 10 feet) and referencing existing site features. Ground surface elevations at each boring location was estimated using Google Earth. If ground surface elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted, rotary drill rig using continuousflight augers (solid-stem. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. Ring-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure; however, blow counts are typically recorded for 6-inch intervals for a total of 12 inches of penetration. Bulk samples of auger cuttings were also obtained from the upper approximately 5 feet of each boring. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

We also observed the boreholes while drilling and at the completion of drilling for the presence of groundwater. Groundwater was not observed at these times in the boreholes.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

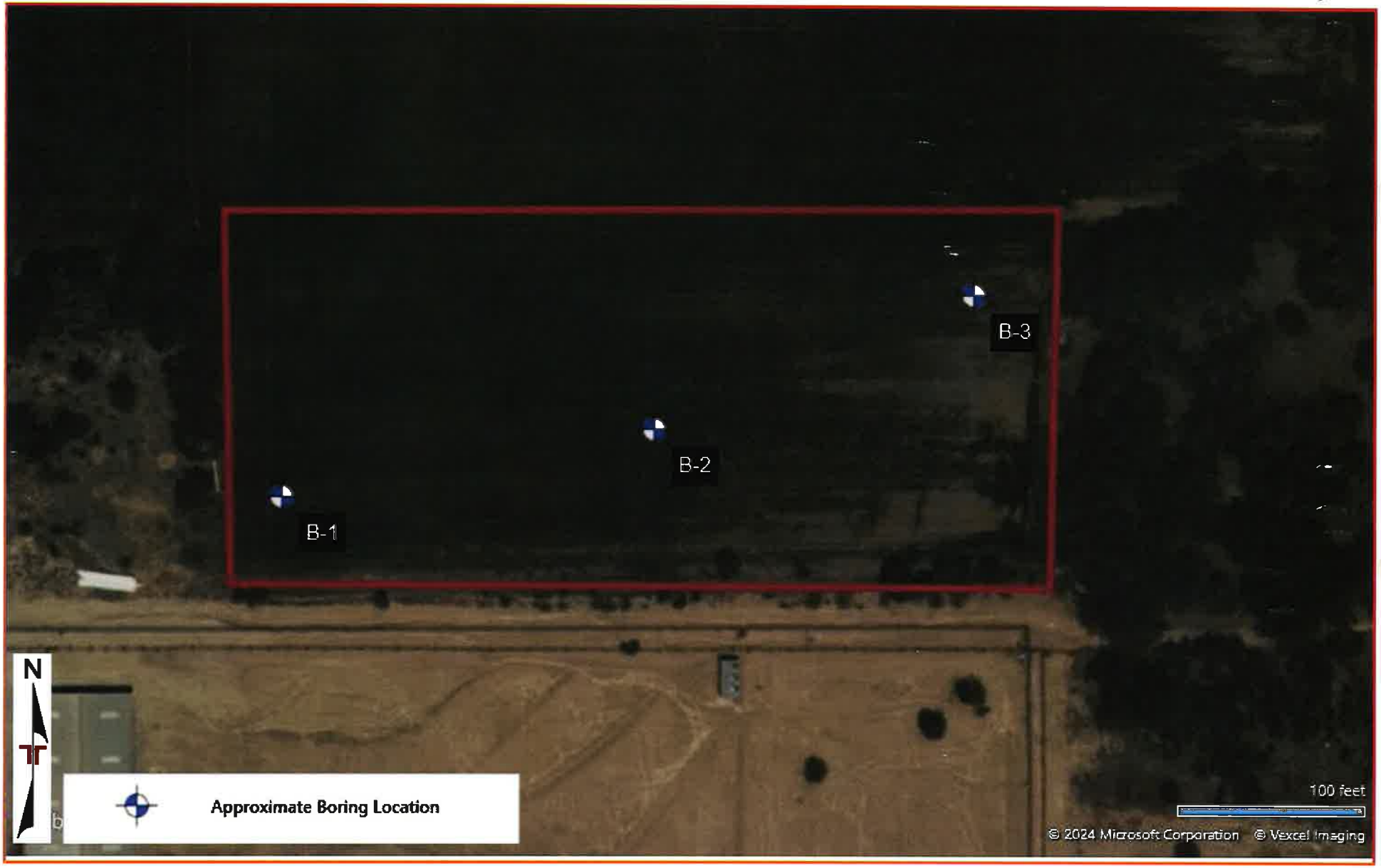
Site Location and Exploration Plan

Contents:

Site Layout
Exploration Location Plan with Aerial Image

Site Location

Exploration Plan with Aerial Image



Exploration and Laboratory Results

Contents:

Note: All attachments are one page unless noted above.

Estes Rockets Solar
1295 H Street | Penrose, Colorado
Terracon Project No. 23235067

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4172 Center Park Dr
Colorado Springs, CO

Boring Log No. B-1

Location: See Exploration Plan

Latitude: 38.4155° Longitude: -105.0169°

Model Layer	Graphic Log	Depth (Ft.)	Elevation: 5283 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	SWELL (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, about 6 inches 5282.5									
2			**LEAN CLAY WITH SAND (CL)**, brown to gray, medium stiff to very stiff				3-5	-0.1 @ 500 psf	13.7	111	32-18-14	76
				5			7-21		9.7	117		
		7.0	5276									
3			**CLAYSTONE**, brown to gray, hard				50/5"		12.4	100		
		9.0	5274									
			SHALE, gray, very hard	10			50/0"					
				15			50/1"					
				20			50/3"					
		20.5	5262.5									
			Boring Terminated at 20.5 Feet									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Elevations were obtained from Google Earth.

Water Level Observations

None encountered while drilling

Advancement Method

4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method

Boring backfilled with auger cuttings upon completion.

Drill Rig
CME-75

Hammer Type
Automatic

Driller
Terracon - Fort Collins

Logged by
JP

Boring Started
11-16-2023

Boring Completed
11-16-2023

Estes Rockets Solar
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Terracon Project No. 23235067

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Log No. B-2

Location: See Exploration Plan
Latitude: 38.4156° Longitude: -105.0162°

Model Layer	Depth (Ft.)	Elevation: 5279 (Ft.) +/-	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.5	**TOPSOIL**, about 6 inches — 5278.5				
2	7.0	**LEAN CLAY WITH SAND (CL)**, with sand, brown to light brown, medium stiff — 5272	2-3	15.2	33-20-13	71
			4-4	14.3		
3	14.0	**CLAYSTONE**, light brown to gray, hard to very hard — 5265	50/6"		36-19-17	65
			24-50/6"			
	20.5	**SHALE**, light brown to gray, very hard — 5258.5	50/6"			
			50/3"			
		Boring Terminated at 20.5 Feet				

Depth (Ft.) 5 10 15 20

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes
Elevation Reference: Elevations were obtained from Google Earth.

Water Level Observations
None encountered while drilling

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
CME-75

Hammer Type
Automatic

Driller
Terracon - Fort Collins

Logged by
JP

Boring Started
11-16-2023

Boring Completed
11-16-2023

Estes Rockets Solar
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Terracon Project No. 23235067

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Log No. B-3

Location: See Exploration Plan

Latitude: 38.4158° Longitude: -105.0156°

Model Layer	Graphic Log	Depth (Ft.)	Elevation: 5274 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	SWELL (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, about 6 inches 5273.5									
2			**SANDY LEAN CLAY (CL)**, brown, medium stiff to hard				3-3		15.6	98	31-20-11	67
				5			3-5		15.7			
		7.5	5266.5									
3			**CLAYSTONE**, brown to gray, very hard				19-50/4"		9.4			
				10			50/4"					
		14.0	5260									
			SHALE, light brown, very hard	15			50/4"					
				20			50/3"					
		20.5	5253.5									
			Boring Terminated at 20.5 Feet									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Elevations were obtained from Google Earth.

Water Level Observations
None encountered while drilling

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
CME-75

Hammer Type
Automatic

Driller
Terracon - Fort Collins

Logged by
JP

Boring Started
11-16-2023

Boring Completed
11-16-2023

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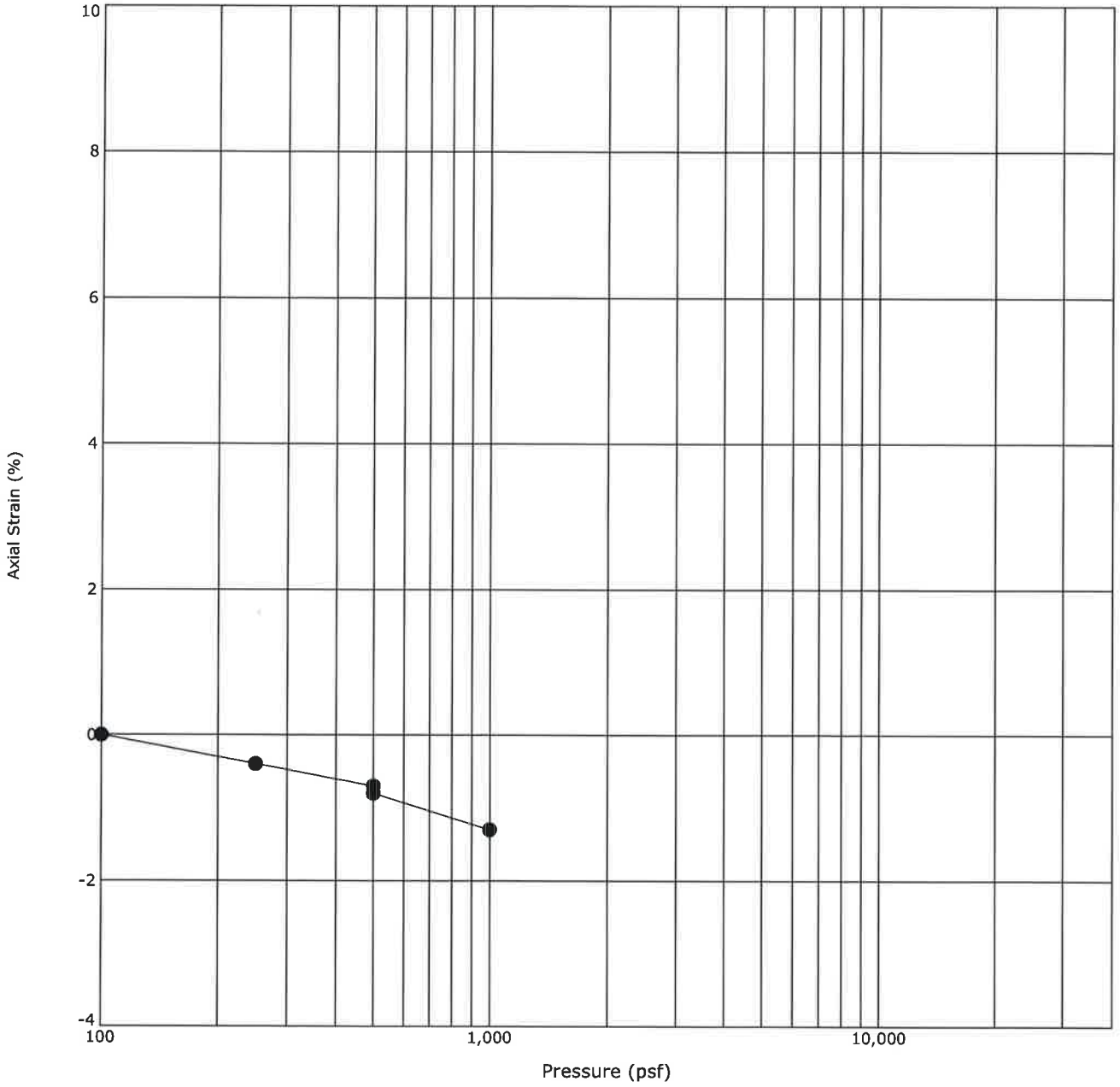
Swell Consolidation Test



Boring ID	Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
● B-1	2 - 3		CL	111	13.7

Notes: Sample exhibited 0.1 percent compression upon wetting under an applied pressure of 500psf

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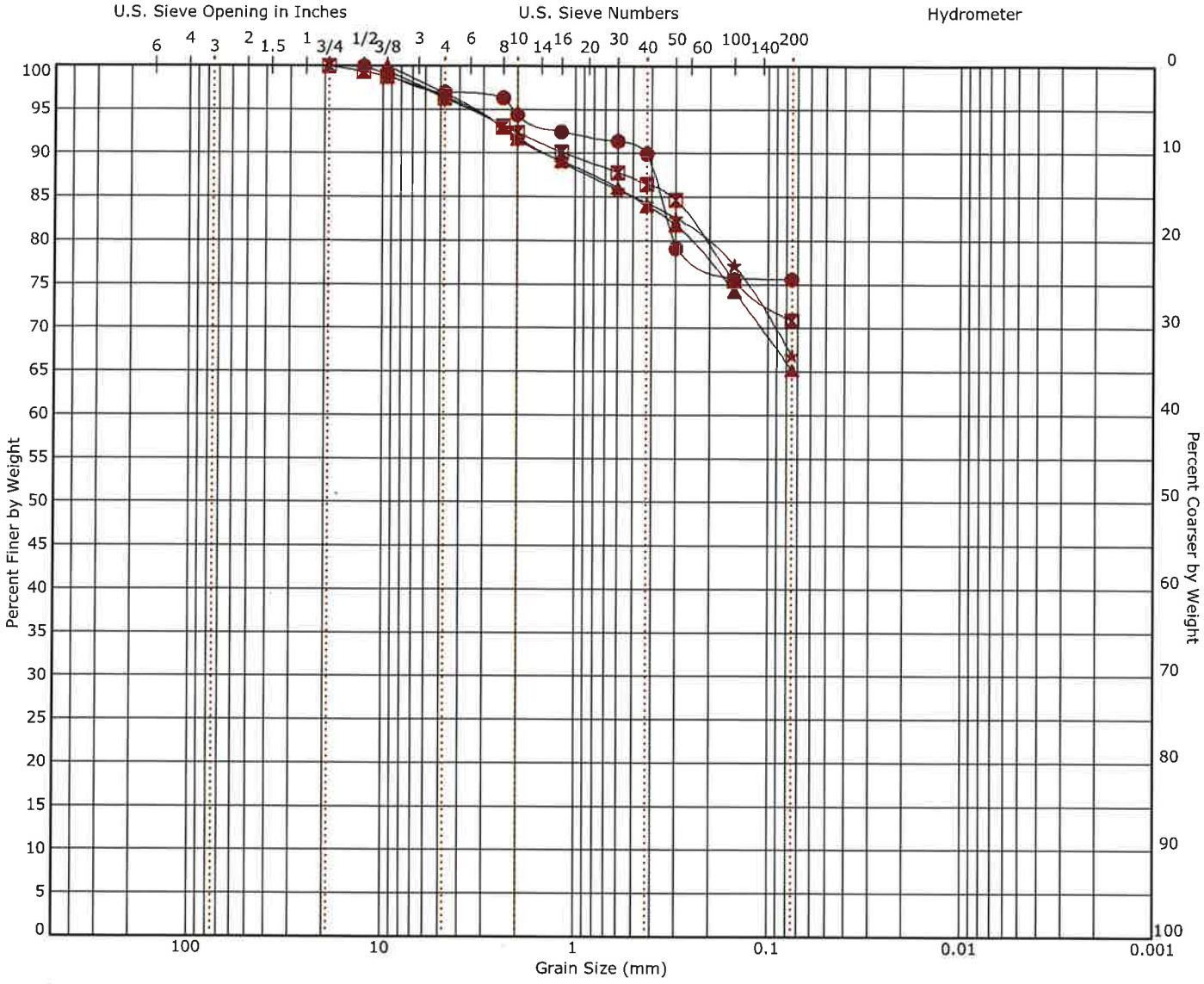
Colorado Springs, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	USCS Classification	USCS	AASHTO	LL	PL	PI	Cc	Cu
● B-1	0 - 5	LEAN CLAY with SAND	CL	A-6 (9)	32	18	14		
⊠ B-2	0 - 5	LEAN CLAY with SAND	CL	A-6 (8)	33	20	13		
▲ B-2	7 - 8	SANDY LEAN CLAY	CL	A-6 (9)	36	19	17		
★ B-3	0 - 5	SANDY LEAN CLAY	CL	A-6 (5)	31	20	11		

Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
● B-1	0 - 5	12.5				0.0	3.0	21.4	75.6		
⊠ B-2	0 - 5	19				0.0	3.7	25.4	70.9		
▲ B-2	7 - 8	9.5				0.0	3.2	31.6	65.2		
★ B-3	0 - 5	9.5					3.0	29.5	66.9		

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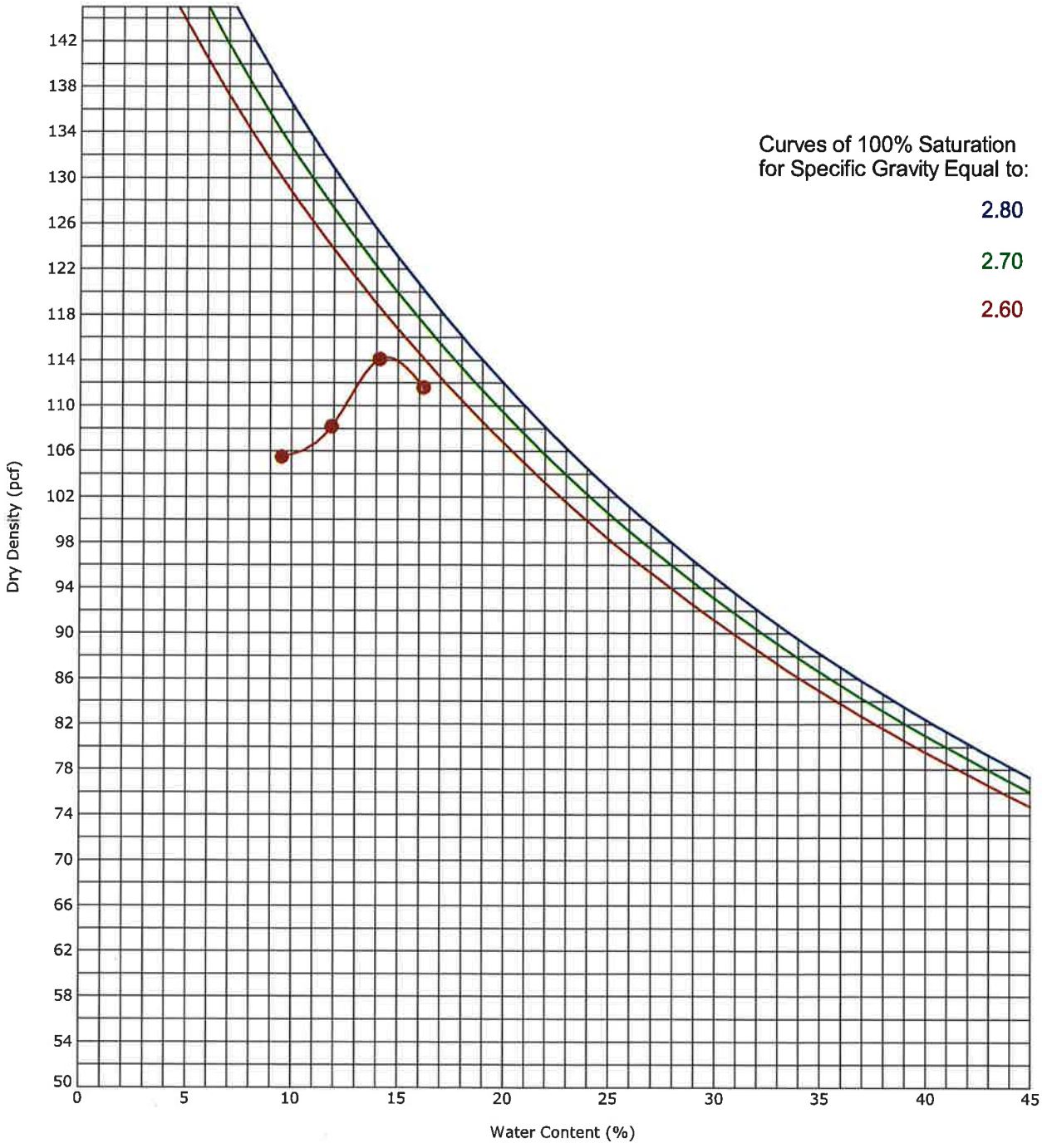
Moisture-Density Relationship

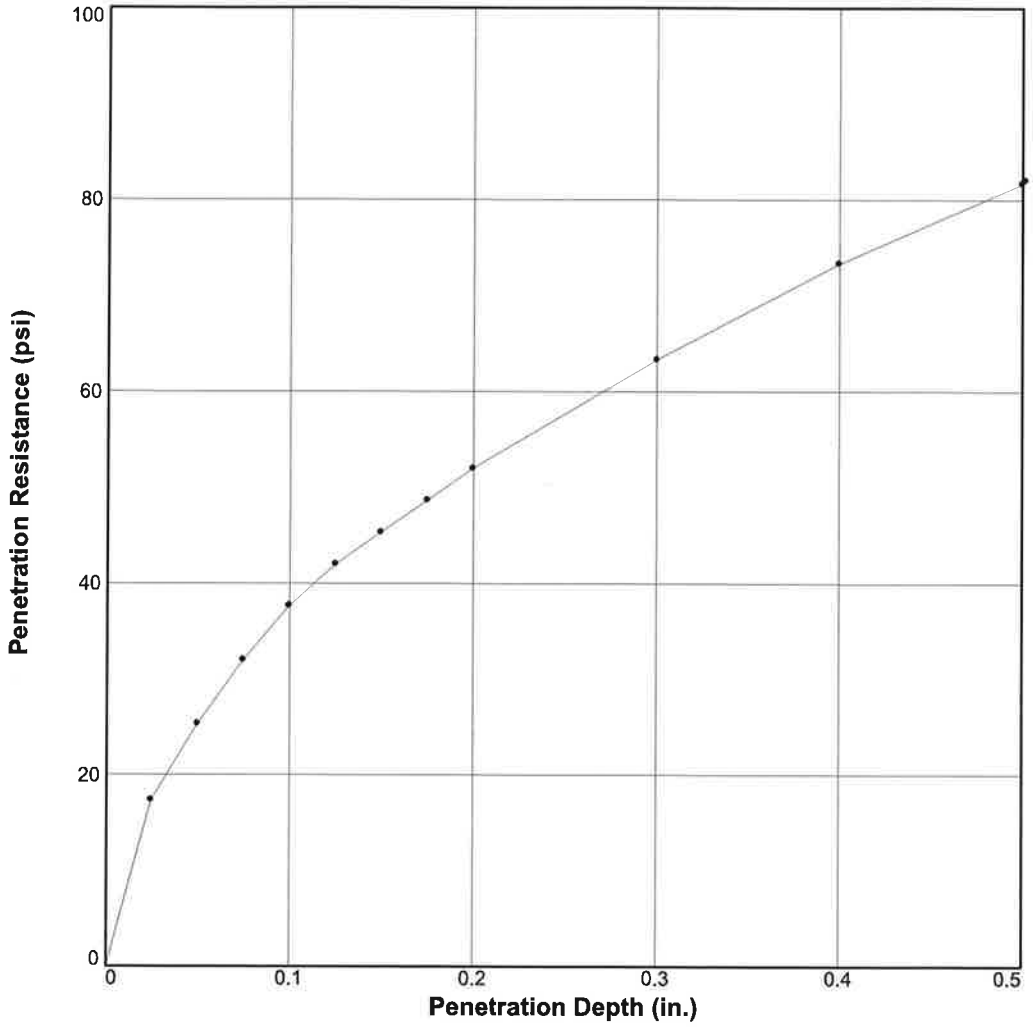
ASTM D698-Method B



Boring ID	Depth (Ft)	Description of Materials
B-2	0 - 5	LEAN CLAY with SAND(CL)

Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
71	0.0	33	20	13	ASTM D698-Method B	114.3	14.5

BEARING RATIO TEST REPORT
ASTM D1883-16



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	109.0	95.2	14.6	108.4	94.7	17.7	3.8	3.5	0.000	10	0.5
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
CL, Lean Clay with Sand	CL	114.5	14.8	33	13

Project No: 23235067
Project: Estes Rockets Solar
Location: B-2
Depth: 0' - 5'
Date: 1/19/2024

Test Description/Remarks:
Prepared according to ASTM D698 compaction efforts.

BEARING RATIO TEST REPORT

Terracon Consultants, Inc.