Oregon Department of Transportation

OUTDOOR ADVERTISING SIGN PERMIT APPLICATION

Outdoor Advertising Sign Program • 4040 Fairview Industrial Drive SE, MS #2 • Salem, OR 97302
https://www.oregon.gov/ODOT/ROW/Pages/Outdoor-Advertising-Sign.aspx

Part 1: Applicant Information and Sign Specifications

NAME OF APPLICANT: Meadow Outdoor Advertising					
MAILING ADDRESS: PO Box 331					
CITY: The Dalles	STATE: OR	ZIP: 97058	PHONE: 541 296 9684	FAX: 541 296 1855	E-MAIL: bcasady@meadowoutdoor.com

TYPE OF LEGAL ENTITY
☑ Oregon corporation ☐ Individual ☐ Individual, dba: "_____" ☐ Other: _____

NAME OF PERSON OR COMPANY TO ERECT SIGN: Meadow Outdoor Advertising					
MAILING ADDRESS: PO Box 331					
CITY: The Dalles	STATE: OR	ZIP: 97058	PHONE: 541 296 9684	FAX: 541 296 1855	E-MAIL: bcasady@meadowoutdoor.com

PURPOSE OF APPLICATION
☐ Reconstruction of permit no.: _____
☑ Relocation of permit no.: 8028
☐ Preexisting sign permit application (complete Supplement)

SKETCH OF SIGN, INCLUDING STRUCTURE, FACE, LIGHTING AND CONFIGURATION OF SUPPORTS. (MAY NOT RESEMBLE AN OFFICIAL SIGN – ORS 377.720)

SIGN FACE HEIGHT (FEET): 10	SUPPORT NUMBER AND SIZE: one 20"	HIGHWAY ROUTE NUMBER: 072	SIDE OF HIGHWAY: West	EST. MILE POINT: 2.92	
SIGN FACE LENGTH (FEET): 30	SUPPORT MATERIAL: steel	TOWNSHIP: 07	RANGE: 3	SECTION/SUBSECTION MAP NO.: 11	TAX LOT: 5101
SIGN FACE AREA (SQ. FEET): 300	NUMBER, TYPE AND LOCATION OF LIGHTING: two bottom mounted LED Holophane lights	LOCATION MARKING: ☑ The site is marked as follows: Stake at column location			
HAGL: 20'	SIGN PANEL NUMBERS:	OTHER INFORMATION: ☑ Sign will be posted for compensation ☑ Sign will not be at the location of a business or activity open to the public			

SIGN FACE
☑ Single face (SF) ☐ Tri-vision ☐ Back to back

NAME OF HIGHWAY: Salem Hwy. Hwy 99EB		PROPERTY OWNER NAME: Strickfaden Oregon LLC	
STREET ADDRESS OF SIGN SITE: 2848 Broadway St NE		MAILING ADDRESS: PO Box 7356	
CITY: Salem	STATE: OR ZIP: 97303	CITY: Salem	STATE: OR ZIP: 97303

Part 2: Certification of Local Jurisdiction – zoning and compliance with local regulations

This section to be completed by the representative of the local jurisdiction. (For questions, contact ODOT OAS Program at the website, listed below form title.)

ZONING OF THE SIGN SITE (MAP AND TAX LOT INFORMATION IN THE SIGN LOCATION INFORMATION ABOVE IN PART 1)

A. Current zoning of the sign site described on this application: _____

B. This is a (check one):
- ☐ Commercial classification
- ☐ Industrial classification
- ☐ Other (describe): _____

C. Location was first zoned a commercial or industrial classification:
- ☐ On or before January 1, 1973
- ☐ After January 1, 1973
- ☐ Date is unknown or cannot be determined

D. Check if the following statement is accurate:
- ☐ Current zoning was established as part of a comprehensive plan for the development of the overall area and not as spot or strip zoning devised primarily for the purpose of allowing outdoor advertising signs.

COMPLIANCE WITH LOCAL REGULATIONS

Check only one:
- ☐ The proposed sign location and structure ***comply*** with all applicable ordinances, plans, rules, and other requirements of this jurisdiction.
- ☐ The proposed sign location and structure ***do not comply*** with all applicable ordinances, plans, rules, and other requirements of this jurisdiction.
- ☐ Neither of the above statements is fully accurate. ***A letter of explanation must be attached.***

Certification of local jurisdiction

All of Part 2, including any required attachment, is accurate based on the written information provided on this application by the applicant. (Erroneous information or improper zoning can result in permit cancellation.)

PRINT NAME OF CITY/COUNTY REPRESENTATIVE: Peter Domine	CITY OR COUNTY WITH JURISDICTION: City of Salem	
TITLE OF CITY/COUNTY REPRESENTATIVE: Planner II	PHONE: 503-540-2311	FAX: pdomine@cityofsalem.net
SIGNATURE OF CITY/COUNTY REPRESENTATIVE: X Peter Domine	DATE: November 18, 2024	

Part 3: Certification of applicant

The applicant or authorized representative of the applicant certifies by signing below that the information contained in this application is accurate and complete, that information was accurate and complete when the local jurisdiction signed its certification, and that no changes were made or will be made after the local jurisdiction certification. The applicant further certifies by signing that the land described in this application is not encumbered by any prohibition on this type of sign, and that highway right of way will not be crossed to access the sign or site for construction or maintenance.

PRINT APPLICANT NAME	PRINT TITLE (IF SIGNING AS REPRESENTATIVE)
SIGNATURE X	DATE

ODOT USE ONLY

SITE LOCATION				PERMIT INFORMATION	APPROVAL
HIGHWAY 1 NO.	HIGHWAY 1 NAME			PERMIT NO.	☐ Approved ☐ Denied ☐ Withdrawn
SIDE	MILEPT	ES		OWNER CODE	DECISION MADE BY
HIGHWAY 2 NO.	HIGHWAY 2 NAME			CONSTRUCTION DATE*	DECISION DATE
SIDE	MILEPT	ES		* Failure to construct within 180 days results in cancellation of permit.	CANCELLED
PHYSICAL DESCRIPTION				☐ Conforming ☐ Non-conforming	CANCELLATION DATE / REASON
COUNTY	CITY	DISTRICT	REGION	REASON	COMMENT

Do not write below this line – ODOT Permit Office Use Only		
PERMIT FEE $	CHECK NUMBER	DATE PAID

DIGITAL BILLBOARD PERMIT APPLICATION

Oregon Department of Transportation

Outdoor Advertising Sign Program • 4040 Fairview Industrial Drive SE, MS #2 • Salem, OR 97302
https://www.oregon.gov/ODOT/ROW/Pages/Outdoor-Advertising-Sign.aspx

Part 1: Applicant Information and Sign Specifications

NAME OF APPLIANT: Meadow Outdoor Advertising					SELECT ONE: ■ Owns 10% or less relocation credit ☐ Owns more than 10% relocation credit
MAILING ADDRESS: PO Box 331					
CITY: The Dalles	STATE: OR	ZIP: 97058	PHONE: 541 296 9684	FAX: 541 296 1855	E-MAIL: bcasady@meadowoutdoor.com

TYPE OF LEGAL ENTITY: ■ Oregon corporation ☐ Individual ☐ Individual, dba: "_____" ☐ Other: _____

NAME OF PERSON OR ENTITY TO ERECT SIGN: Meadow Outdoor Advertising		NAME OF EMERGENCY MALFUNCTION CONTACT PERSON: Brian Casady	PHONE: 541 993 4839
MAILING ADDRESS: PO Box 331		FORFEITED ACTIVE PERMITS AND RELOCATION CREDITS: Standing: _____ Credits: _____	
CITY: The Dalles	STATE: OR ZIP: 97058		
PHONE: 541 296 9684	E-MAIL ADDRESS: bcasady@meadowoutdoor.com	DATE AND TIME APPLICATION RECEIVED (ODOT USE ONLY)	

PURPOSE OF APPLICATION
- ■ Reconstruction of permit no.: 7R0014
- ☐ Relocation of permit no.: _____
- ☐ Preexisting sign permit application (complete Supplement)

SKETCH OF SIGN, INCLUDING STRUCTURE, FACE, LIGHTING AND CONFIGURATION OF SUPPORTS. (MAY NOT RESEMBLE AN OFFICIAL SIGN – ors 377.720)

SIGN FACE HEIGHT (FEET): 10	SUPPORT NUMBER AND SIZE: 1 20"	HIGHWAY ROUTE NUMBER: 072		SIDE OF THE HIGHWAY: West	EST. MILE POINT: 2.92
SIGN FACE LENGTH (FEET): 30	SUPPORT MATERIAL: steel	TOWNSHIP: 07	RANGE: 3	SECTION/SUBSECTION MAP NO.: 11	TAX LOT: 5101
SIGN FACE AREA (SQ. FEET): 300	NUMBER, TYPE AND LOCATION OF LIGHTING: digital	LOCATION MARKING: ■ The site is marked as follows: stake at column location			
HAGL: 20'	SIGN PANEL NUMBERS:	OTHER INFORMATION: ■ Sign will be posted for compensation ■ Sign will not be at the location of a business or activity open to the public ■ Uses renewable energy source type: Hydro, wind, solar If no renewable source utilized, complete affidavit on Page 3			

SIGN FACE: ■ Single face (SF)	SIGN FACE SIZE: ☐ Poster ☐ Billboard	SIGN FACES DIRECTION: ■ North ☐ South ☐ East ☐ West			
NAME OF HIGHWAY: Salem Hwy. Hwy 99EB		PROPERTY OWNER NAME: Strickfaden Oregon LLC			
STREET ADDRESS OF SIGN SITE: 2848 Broadway St NE		MAILING ADDRESS: PO Box 7356			
CITY: Salem	STATE: OR ZIP: 97303	CITY: Salem		STATE: OR	ZIP: 97303

Part 2: Certification of Local Jurisdiction – zoning and compliance with local regulations

This section to be completed by the representative of the local jurisdiction. (For questions, contact ODOT OAS Program at the website, listed below form title.)

ZONING OF THE SIGN SITE (MAP AND TAX LOT INFORMATION IN THE SIGN LOCATION INFORMATION IN PART 1)

A. Current zoning of the sign site described on this application: MU-III (Mixed Use III)

B. This is a (check one):
- ☒ Commercial classification
- ☐ Industrial classification
- ☐ Other (describe)_____

c. Location was first zoned a commercial or industrial classification:
- ☐ On or before January 1, 1973
- ☒ After January 1, 1973
- ☐ Date is unknown or cannot be determined

D. Check if the following statement is accurate:
- ☒ Current zoning was established as part of a comprehensive plan for the development of the overall area and not as spot or strip zoning devised primarily for the purpose of allowing outdoor advertising signs.

COMPLIANCE WITH LOCAL REGULATIONS

Check only one:
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- ☐ The proposed sign location and structure ***do not comply*** with all applicable ordinances, plans, rules, and other requirements of this jurisdiction.
- ☐ Neither of the above statements is fully accurate. ***A letter of explanation must be attached.***

Certification of local jurisdiction

All of Part 2, including any required attachment, is accurate based on the written information provided on this application by the applicant. (Erroneous information or improper zoning can result in permit cancellation.) Approved sign permit 24-101315-SI

PRINT NAME OF CITY/COUNTY REPRESENTATIVE: Peter Domine	CITY OR COUNTY WITH JURISDICTION: City of Salem	
TITLE OF CITY/COUNTY REPRESENTATIVE: Planner II	PHONE: 503-540-2311	EMAIL ADDRESS OF REPRESENTATIVE: pomine@cityofsalem.net
SIGNATURE OF CITY/COUNTY REPRESENTATIVE: X Peter Domine	DATE: November 18, 2024	

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PRINT APPLICANT NAME	PRINT TITLE (IF SIGNING AS REPRESENTATIVE)
SIGNATURE X	DATE

ODOT USE ONLY

SITE LOCATION			
HIGHWAY 1 NO.	HIGHWAY 1 NAME		
SIDE	MILE POINT	ES	
HIGHWAY 2 NO.	HIGHWAY 2 NAME		
SIDE	MILE POINT	ES	
PHYSICAL DESCRIPTION			
COUNTY	CITY	DISTRICT	REGION

PERMIT INFORMATION
PERMIT NO.
OWNER CODE
CONSTRUCTION DATE*
* Failure to construct within 90 days results in cancellation of permit.
☐ Conforming ☐ Non-conforming
REASON

APPROVAL	
☐ Approved ☐ Denied ☐ Withdrawn	
DECISION MADE BY	
DECISION DATE	
CANCELLED	
CANCELLATION DATE	REASON
COMMENT	

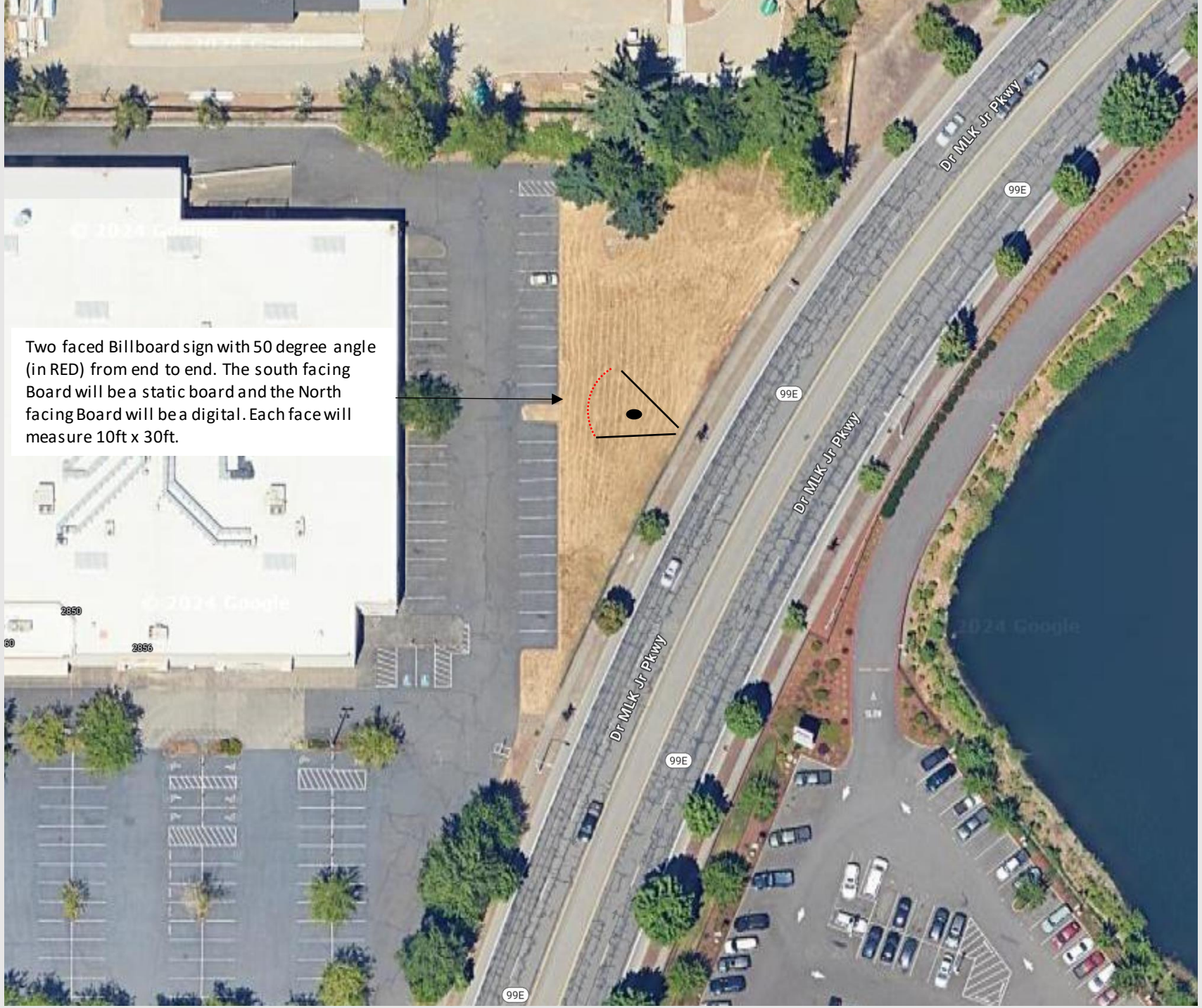
Do not write below this line – ODOT Permit Office Use Only		
PERMIT FEE $	CHECK NUMBER	DATE PAID

CITY OF Salem AT YOUR SERVICE
Public Works Department

APPROVED

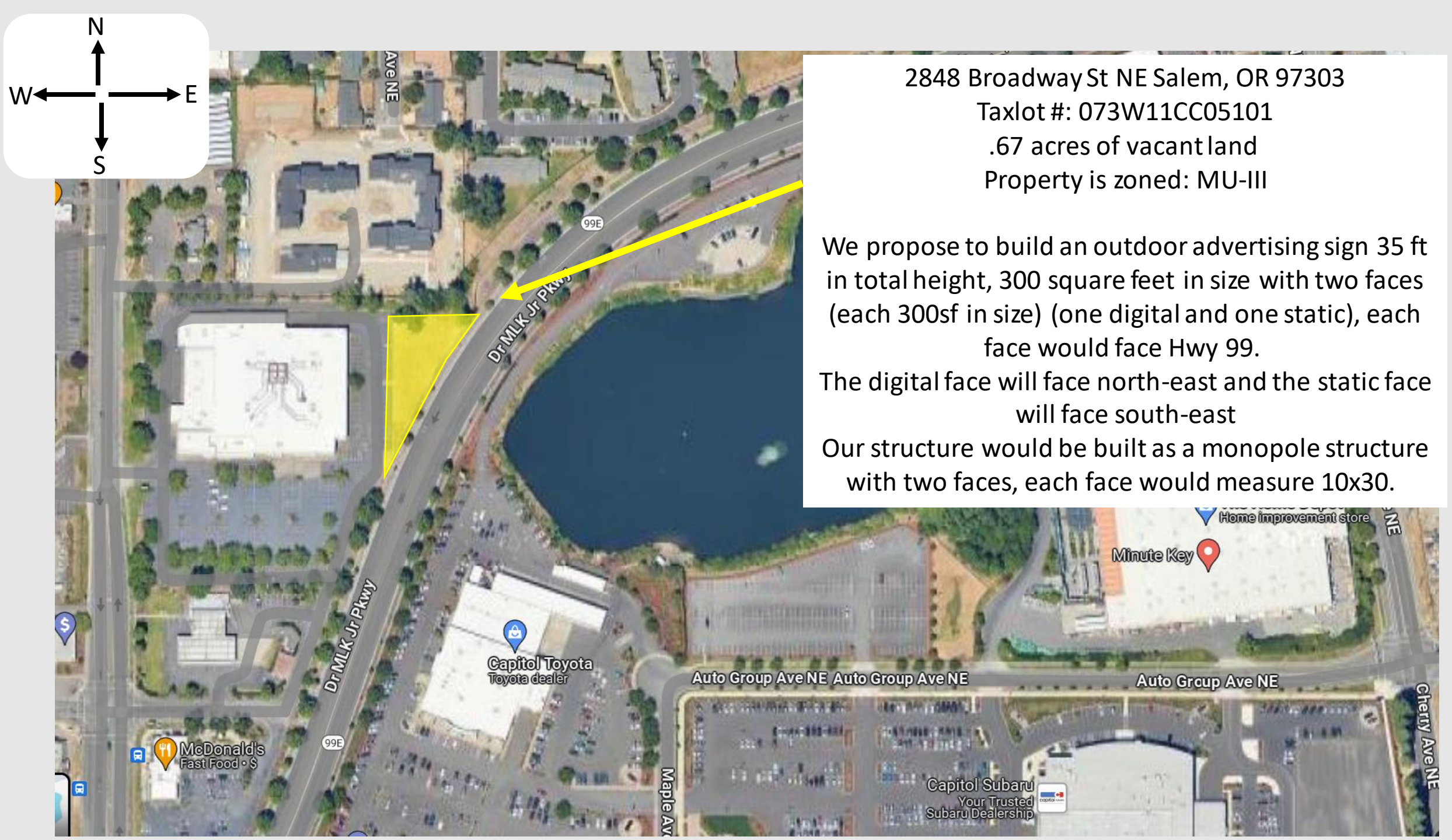
jvalyou, 02/06/2024

This project is along an ODOT managed road and is required to meet their rules and conditions for outdoor advertising. See: https://www.oregon.gov/odot/ROW/Pages/Sign-Resources.aspx



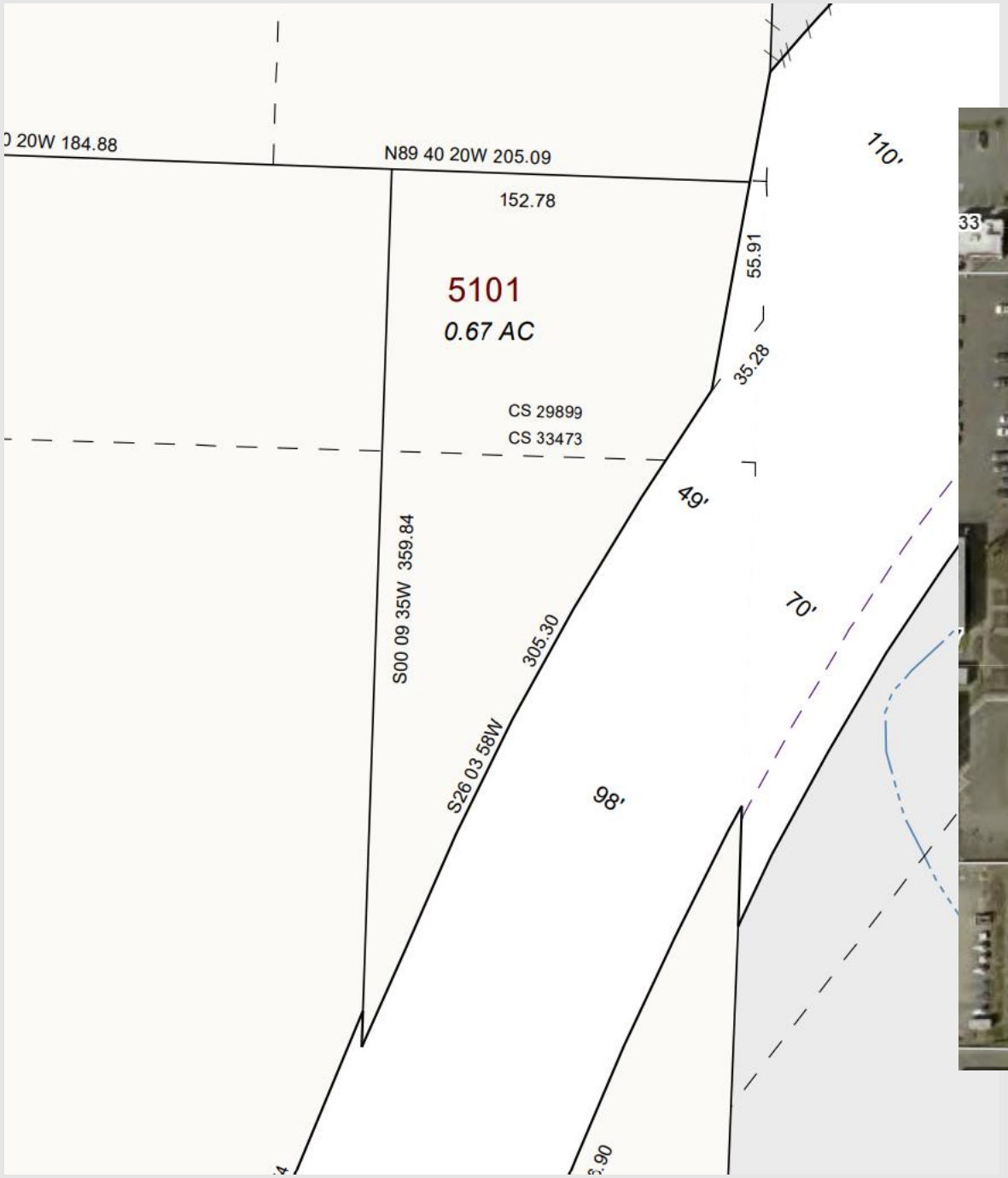
PLANNING ACTION
APPROVED SUBJECT TO DEVELOPMENT REQUIREMENTS NOTED ON PLANS.

Stephanie Wyers
Date and Signature of Planner
02/09/2024 12:43:45 PM

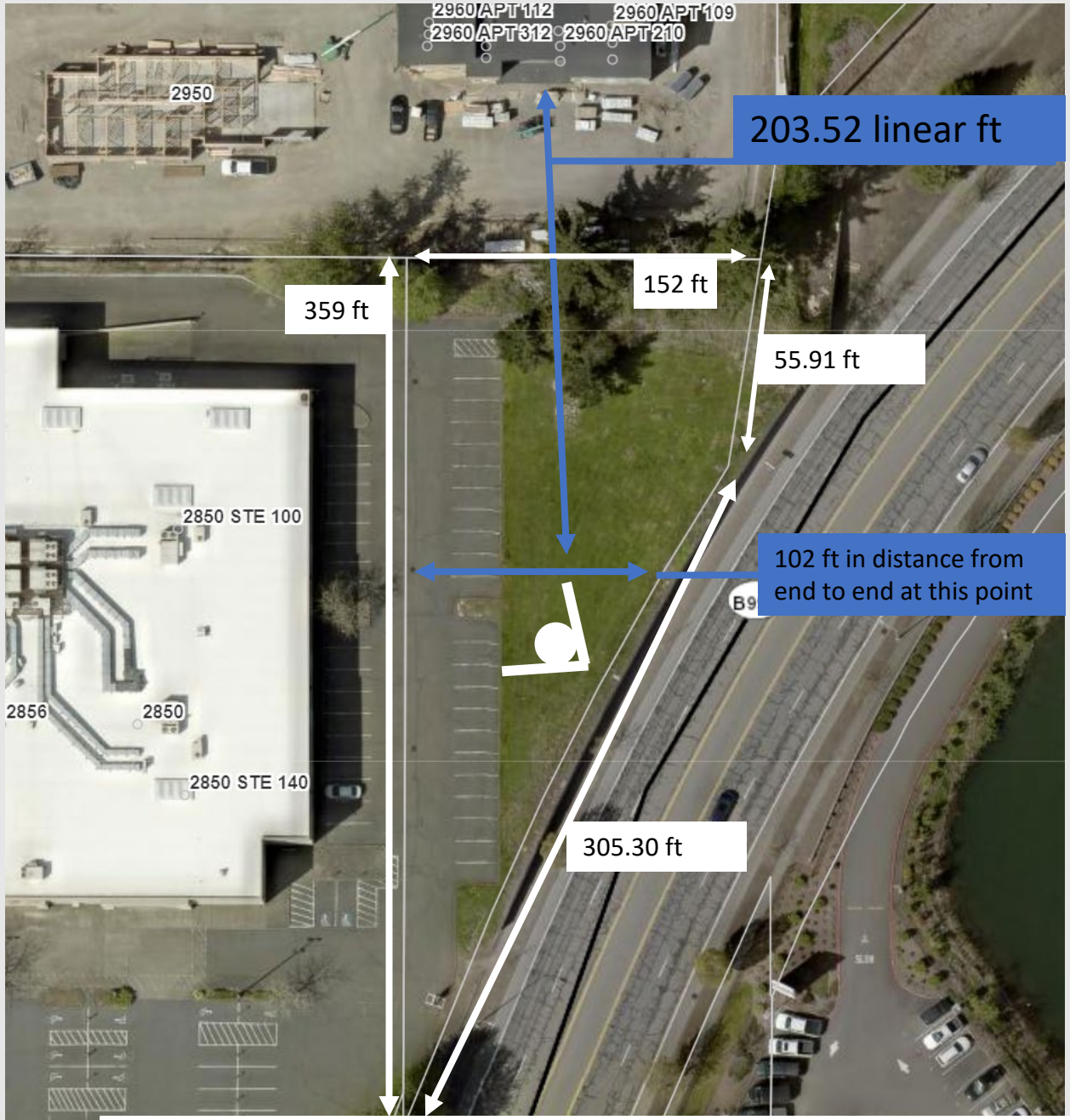


2848 Broadway St NE Salem, OR 97303
Taxlot #: 073W11CC05101
.67 acres of vacant land
Property is zoned: MU-III

We propose to build an outdoor advertising sign 35 ft in total height, 300 square feet in size with two faces (each 300sf in size) (one digital and one static), each face would face Hwy 99.
The digital face will face north-east and the static face will face south-east
Our structure would be built as a monopole structure with two faces, each face would measure 10x30.


0 20W 184.88
N89 40 20W 205.09
152.78
5101
0.67 AC
110'
55.91
35.28
CS 29899
CS 33473
49'
70'
S00 09 35W 359.84
305.30
S26 03 58W
98'


2960 APT 302
2960 APT 101
3121
3123
2970 APT 105
2960 APT 305
2970 APT 303
2960 APT 306
2970 APT 202
2960 APT 307
2970 APT 301
2960 APT 308
33
3130
2960 APT 211
2950
B99E
2870 STE 200
2850 STE 100
2870
2856
2850
2850 STE 140
2860
BROADWAY ST NE



203.52 ft from corner to residential property

PLANNING ACTION
APPROVED SUBJECT TO DEVELOPMENT REQUIREMENTS NOTED ON PLANS.
Stephanie Wyse
Date and Signature of Planner
01/17/2024 11:11:13 AM

Wall separating sidewalk and property line

Property line/ Abuts the wall

Digital sign 10x30

Min 6ft from property line

24 in diameter Monopole system

Static sign 10x30

CITY OF Salem AT YOUR SERVICE
Public Works Department
APPROVED
jvalyou, 02/09/2024

This project is along an ODOT managed road and is required to meet their rules and conditions for outdoor advertising. See https://www.oregon.gov/odot/ROW/Pages/Sign-Resources.aspx

Sidewalk with tree's 17ft in depth

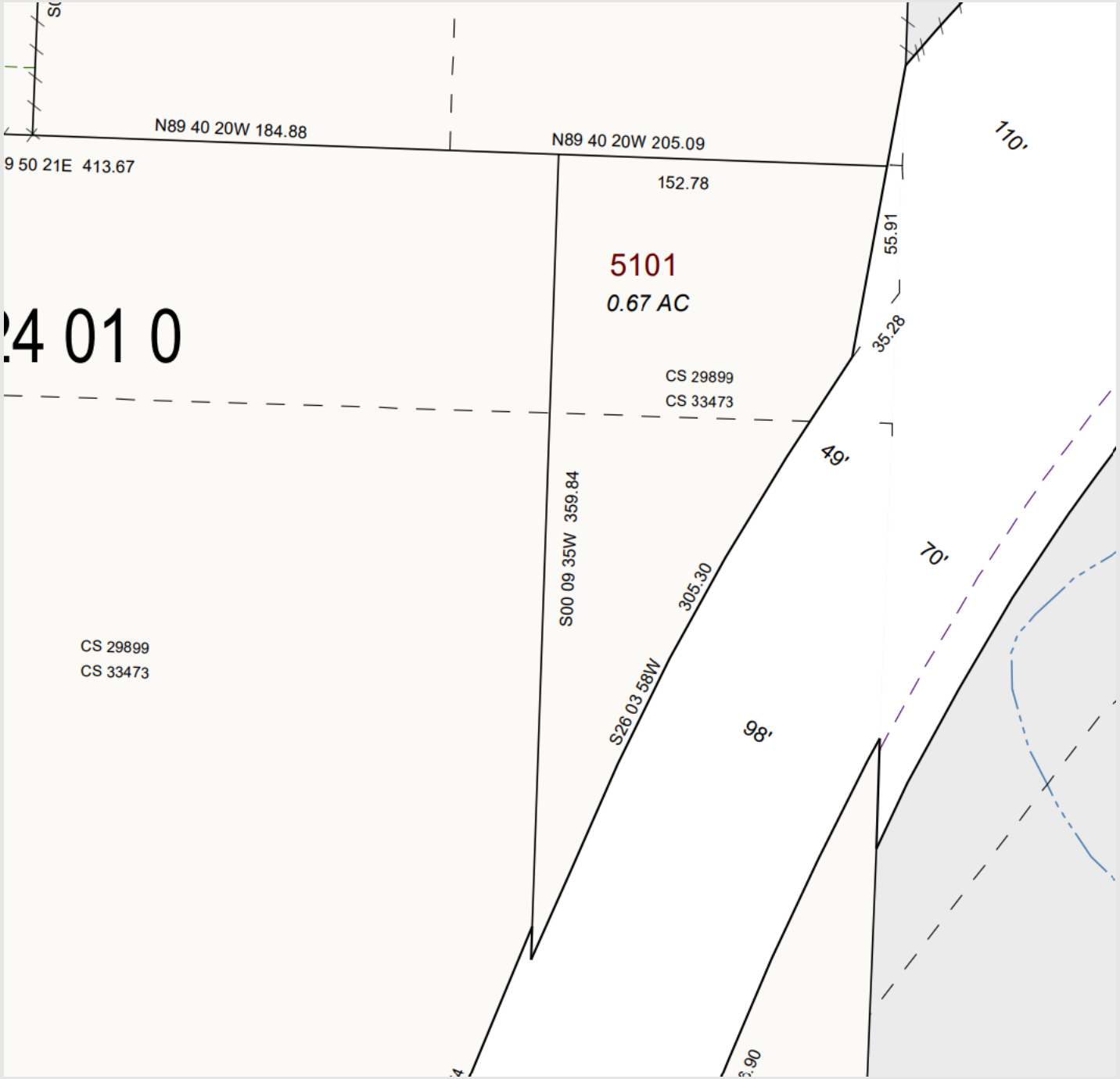
HWY 99E or MLK

N
W
E
S

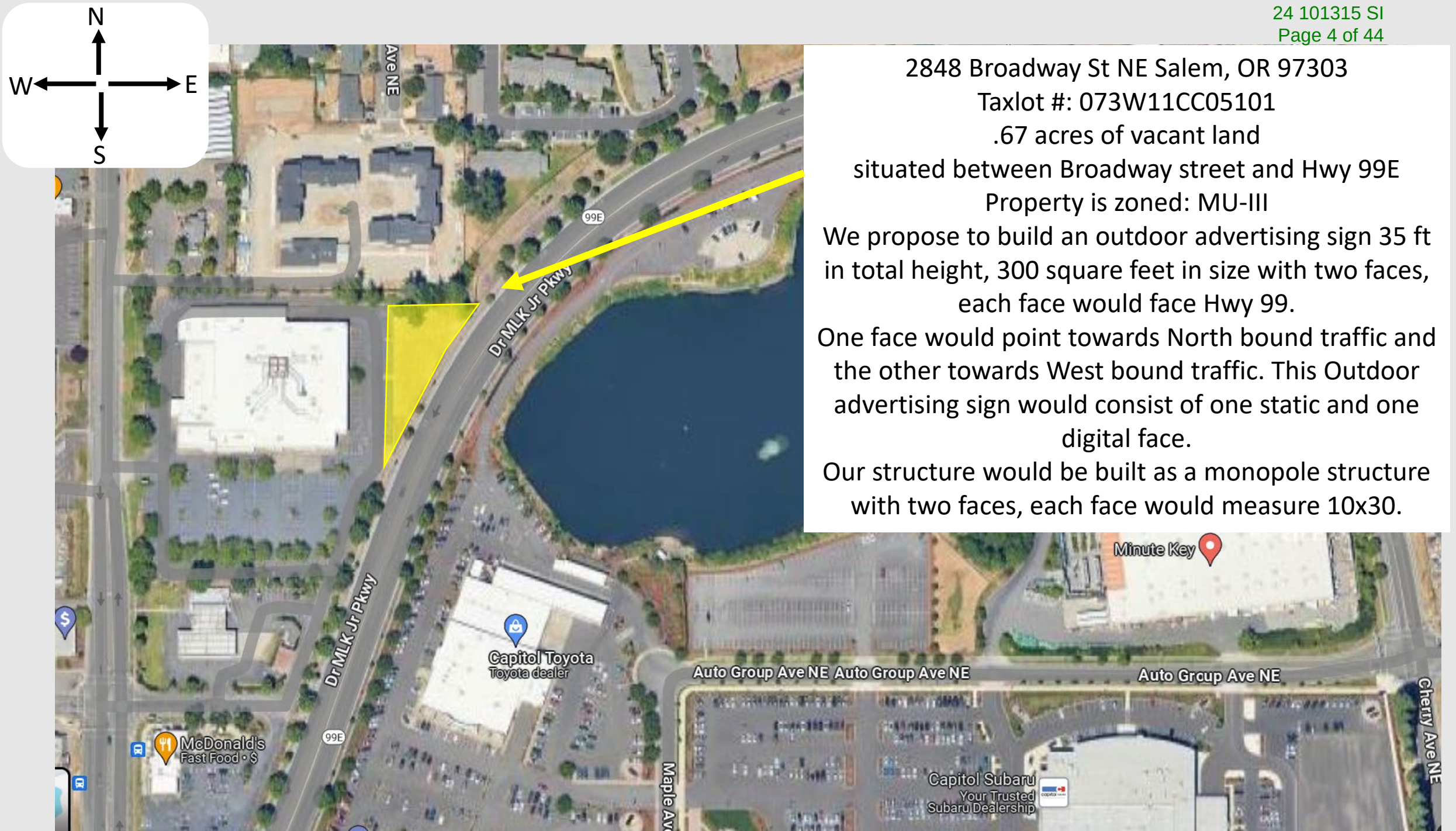
2848 Broadway St NE Salem OR- Proposed Billboard sign location with measurements.

2848 Broadway St NE Salem, OR 97303
Taxlot #: 073W11CC05101
.67 acres of vacant land
Property is zoned: MU-III

We propose to build an outdoor advertising sign 35 ft in total height, 300 square feet in size with two faces (one digital and one static), each face would face Hwy 99.
The digital face will face north-easternly and the static face will face south
Our structure would be built as a monopole structure with two faces, each face would measure 10x30.



Sec. 900.155. - Outdoor advertising signs.
(e)Freestanding signs. An outdoor advertising sign that is a freestanding sign shall conform with the standards for freestanding signs set forth in this chapter; provided, however, that the outdoor advertising sign shall not project over public right-of-way.
(f)Size. Maximum display surface of an outdoor advertising sign shall be limited to 300 square feet.
(i)Setbacks. Outdoor advertising signs shall be setback at least:(1)100 feet in all residential zones; all public zones; and Commercial Office (CO), Central Business District (CB), South Waterfront Mixed-Use (SWMU), Neighborhood Hub (NH), and Fairview Mixed-Use (FMU) Zones. (j)Spacing and density.(1)For the purposes of this subsection, back-to-back V-structured outdoor advertising signs are considered a single sign.(2)No outdoor advertising sign shall be erected or maintained within 500 feet of another outdoor advertising sign located on the same side of a street or highway.(3)No outdoor advertising sign shall be erected or maintained within 250 feet of another outdoor advertising sign located on the opposite side of a street or highway.(4)In addition to the requirements of subsections
(j)(2) and (3) of this section, no more than three outdoor advertising signs may be erected or maintained along both sides of a street or highway within a distance of 1,000 linear feet.



2848 Broadway St NE Salem, OR 97303
Taxlot #: 073W11CC05101
.67 acres of vacant land
situated between Broadway street and Hwy 99E
Property is zoned: MU-III
We propose to build an outdoor advertising sign 35 ft in total height, 300 square feet in size with two faces, each face would face Hwy 99.
One face would point towards North bound traffic and the other towards West bound traffic. This Outdoor advertising sign would consist of one static and one digital face.
Our structure would be built as a monopole structure with two faces, each face would measure 10x30.

Sec. 900.090. - Electronic display signs. (These standards are to be met)

Sec. 900.075. - General illumination standards; zone-specific standards. (These standards are to be met)

Sec. 900.200. - Permanent signs in Mixed Use-III (MU-III) Zones. (e)Outdoor advertising signs. Outdoor advertising signs that comply with this chapter are allowed.

Sec. 900.130. - Freestanding signs.
(a)Setbacks.(1)Freestanding signs shall have a setback of not less than three feet from the street front property line, unless the property is subject to a special setback area and no authorization to place a freestanding sign in the special setback area has been given, in which case the freestanding sign shall be setback not less than three feet from the special setback area.(2)Freestanding signs shall have a setback of not less than five feet from a side property line.

Marion County OREGON

Assessor's Property Records

Property Search | Property Summary | Printable Summary

Property Identification

Account ID:	526480	**Manufactured Home Details:**	
Tax Account ID:	526480	**Other Tax Liability:**	
Tax Roll Type:	Real Property	**Subdivision:**	
Primary Situs Address:		**Related Accounts:**	
Map Tax Lot:	073W11CC05101		
Owner:	STRICKFADEN LLC C/O GERRY HOOTS CPA PO BOX 7356 SALEM, OR 97303		

GIS Interactive Viewer | Assessor Map PDF

Owner History +

Property Details -

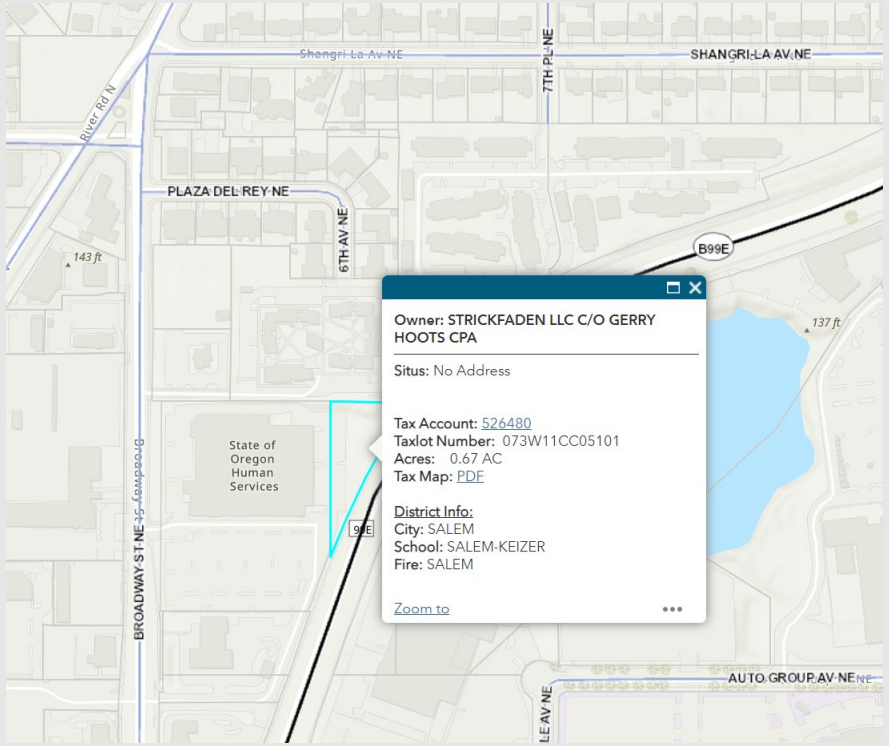
Building Diagram Links:	None Available	**AV Exemption(s):**	
Property Class:	201	**RMV Exemption(s):**	
RMV Property Class:	201	**Deferral(s):**	
Zoning:	(Contact Local Jurisdiction)	**Notes:**	

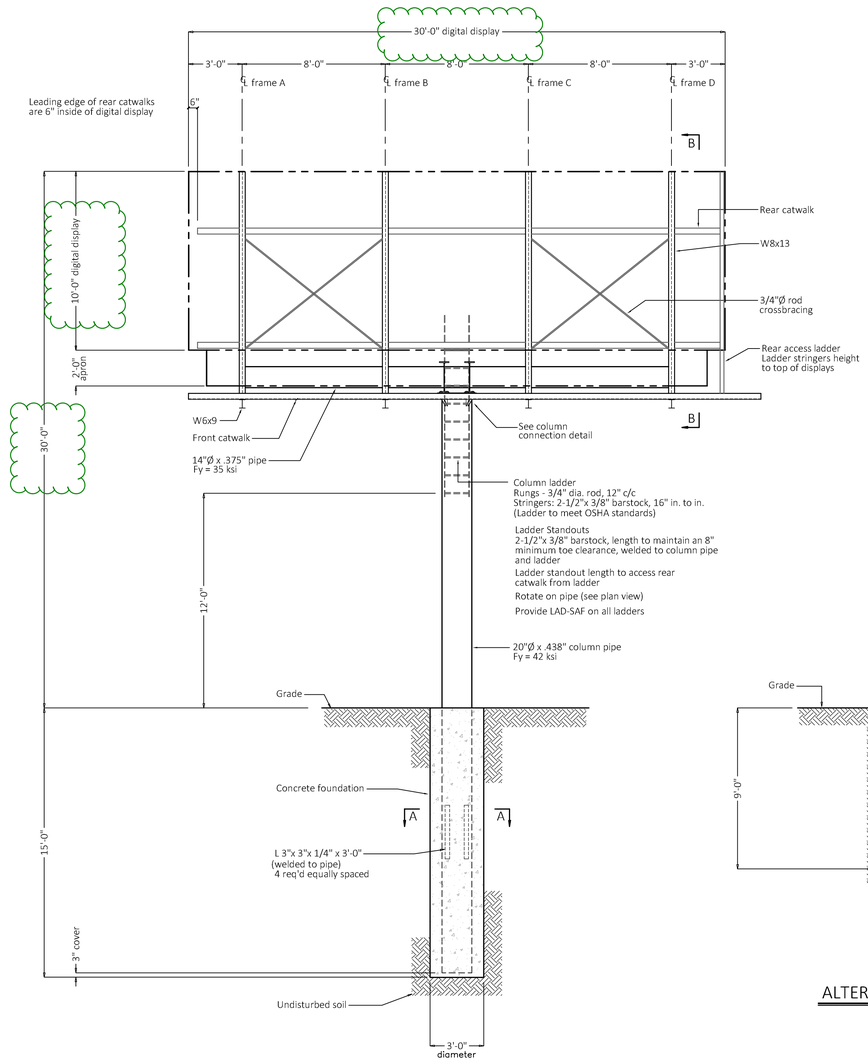
Land/On-Site Developments for Tax Account ID 526480

ID	Type	Acres	Sq Ft	Levy Code Area
1	002 Market CMLSR Commercial Standard	0.67	29185	24010

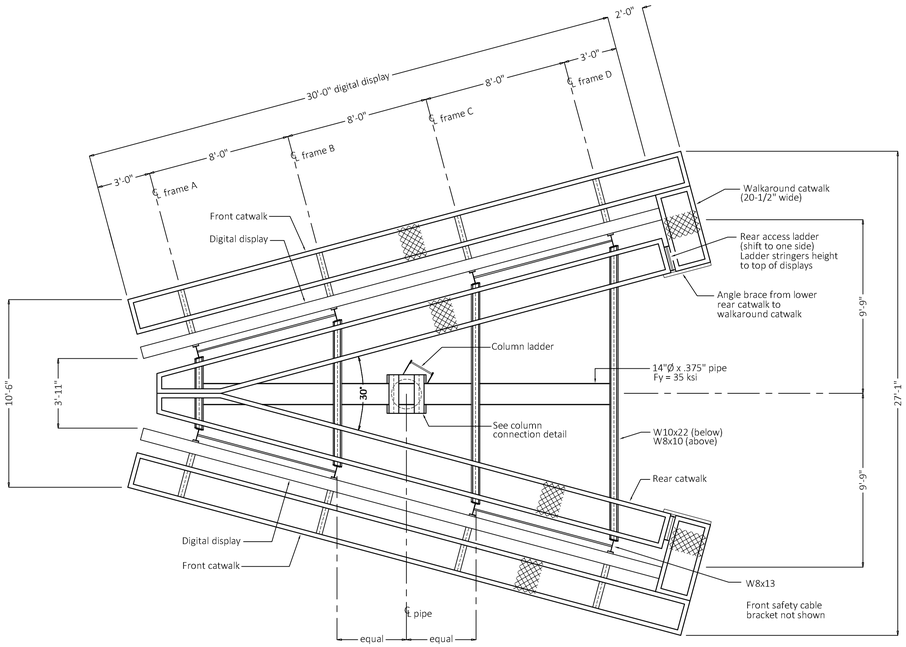
Improvements/Structures for Tax Account ID 526480

ID	Type	Stat Class	Make/Model	Class	Area/Count	Year Built	Levy Code Area
1	COMMERCIAL	581 OFFICE LOW RISE			10		24010





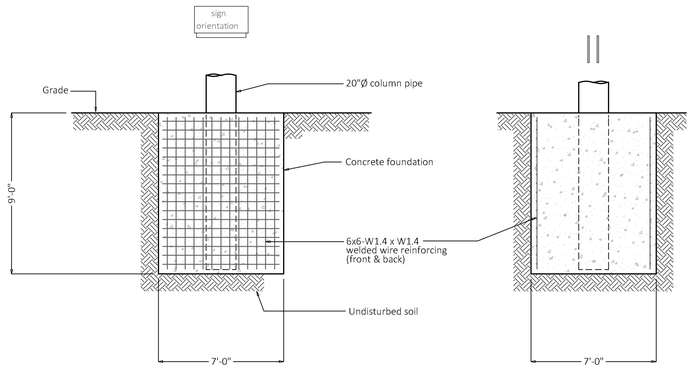
SIGN FACE ELEVATION



PLAN VIEW
SIGN STRUCTURE

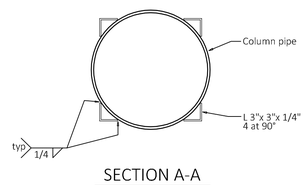
Size, height, setback and illumination plans meets minimum code requirements.

PLANNING ACTION
APPROVED SUBJECT TO DEVELOPMENT REQUIREMENTS NOTED ON PLANS.
Stephanie Mysers
Date and Signature of Planner
01/17/2024 11:01:47 AM



ALTERNATE CUBE FOUNDATION

FOUNDATION SIDE VIEW



SECTION A-A

NOTES
- Structural design conforms to the 2022 Oregon Structural Specialty Code
- Design standard is ASCE 7-16.
- Superstructure can accommodate two faces weighing up to 3,500 pounds each.

WIND
- Design winds - 98 mph. (3 sec. gust) Exposure C.
- Structure is classified risk category II.
- Wind importance factor - Iw = 1.0
- Design wind pressure is 19.1 p.s.f.

SEISMIC
- Seismic load importance factor: IE = 1.0
- Structure is classified occupancy category II.
- Mapped spectral response accelerations:
  SS = 0.819 g
  S1 = 0.414 g
- Site class : D
- Spectral response coefficients:
  SDS = 0.640
  SD1 = 0.521
- Seismic design category is D.
- Seismic basic force resisting system:
  Non-buildings structure not similar to building - signs and billboards.
- Design base shear : 4.69 kips
- Seismic response coefficient: Cs = 0.21
- Response modification factor : R = 3.
- Analysis procedure used: Equivalent lateral force method.

STEEL
- Structural steel pipe shall conform to ASTM A252 or API 5L, with grade that corresponds to the specified yield stress.
- Structural steel plate, rods, angles, and channels shall conform to ASTM A36.
- Structural steel wide flange shapes shall conform to ASTM A992.
- High strength bolts shall conform to ASTM A325 (unless noted otherwise)
- Nuts shall conform to ASTM A563.
- A325 bolts and nuts to be galvanized.
- High strength A325 bolts shall be installed according to the latest RCSC specifications.
- Bolt holes shall be the AISC standard size (unless noted otherwise).
- All high strength bolts shall be fully pretensioned (unless noted otherwise).
- Steel shall be primed and painted, except for the embedded portions of members.
- Steel welding shall be in accordance with AWS standards.
- Steel members and elements of the structure shall be fabricated and erected according to the latest AISC specifications and standard practice.

FOUNDATION & CONCRETE
- Concrete shall attain a 28 day compressive strength of f'c = 2500 p.s.i.
- Allowable lateral bearing of the soil profile is an assumed 150 p.s.f./ft.
- Type and structural character of the soil profile is to be confirmed with an investigation by others.

GENERAL
- The contractor shall verify all dimensions and conditions in the field and notify the engineer of any discrepancies.
- Voss Structural Engineering, PLLC. will not be supervising or monitoring the erection/installation of this structure.

VOSS STRUCTURAL ENGINEERING, PLLC
7264 W Benton Dr, Frankfort, IL 60423
(815) 595-VOSS (8677)

seal

REGISTERED PROFESSIONAL ENGINEER
100623PE
OREGON
JULY 12, 2022
FRANK T VOSS
EXPIRES: 6/30/24
1/5/24

DocuSigned by:
Frank Voss 1/5/2024
06A61EA841854CE...

This drawing has been digitally signed and sealed by Frank Voss on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed, and the signature must be verified on any electronic copies.

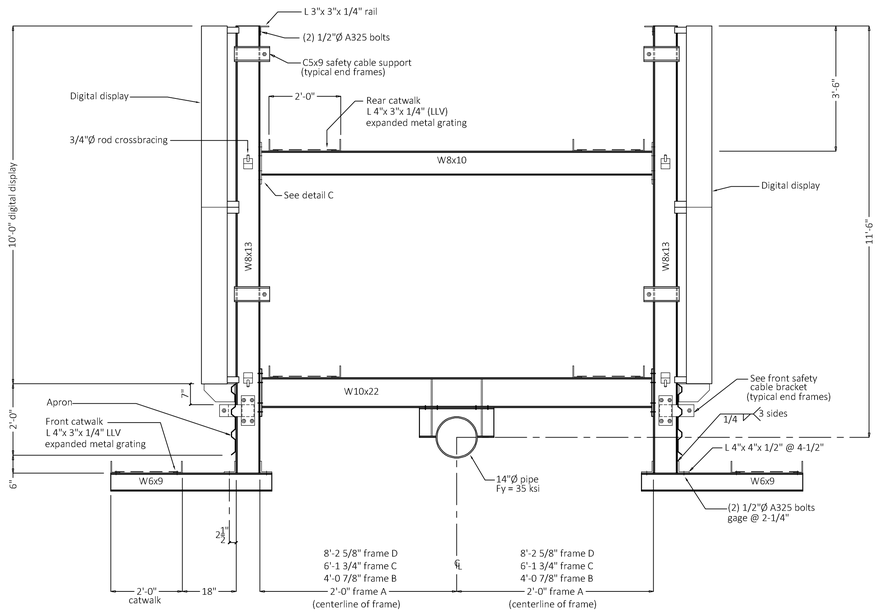
ENGINEER	ISSUE	DATE	REMARKS	CAD
fv	OO	11-9-23	for approval	zkd

MEADOW OUTDOOR ADVERTISING

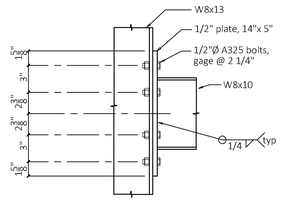
10'-0" x 30'-0"
MONOPOLE SIGN STRUCTURE
CENTER MOUNT 20' V
30'-0" OVERALL HEIGHT

2848 BROADWAY ST NE
SALEM, OREGON

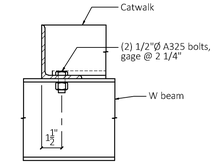
VOSS NO. 23-130-532
DRAWING NO. 23128b
SHEET S1 of S2



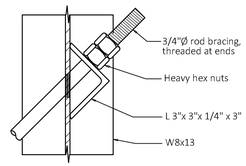
SECTION B-B
FRAME DETAIL



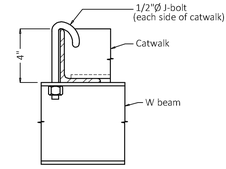
DETAIL C



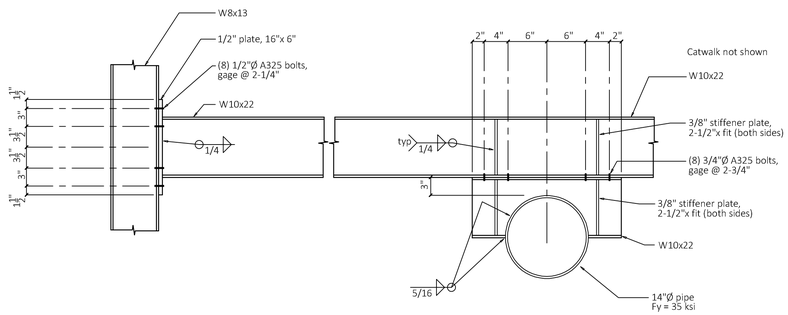
CATWALK MOUNTING DETAIL
Front Catwalk



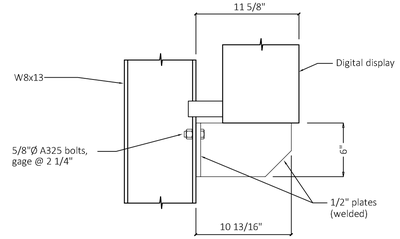
CROSSBRACING DETAIL



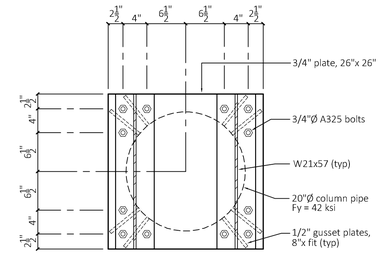
CATWALK MOUNTING DETAIL
Rear Catwalk



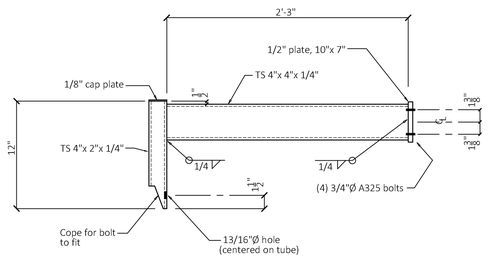
FRAME MOUNTING DETAIL



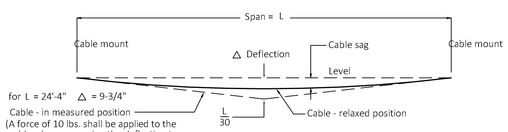
DIGITAL DISPLAY MOUNTING BRACKET



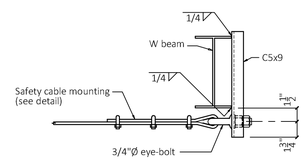
SECTION D-D



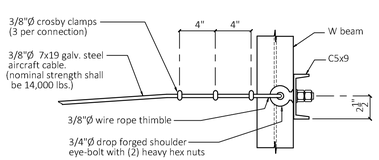
FRONT SAFETY CABLE MOUNTING



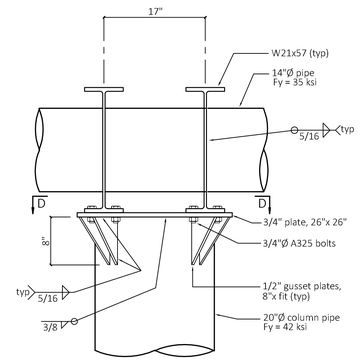
SAFETY CABLE INSTALLATION CRITERIA



TOP VIEW



SAFETY CABLE MOUNTING



COLUMN CONNECTION DETAIL

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seal

REGISTERED PROFESSIONAL ENGINEER
100623PE
OREGON
JULY 12, 2022
FRANK T VOSS
EXPIRES: 6/30/24

1/5/24

DocuSigned by:
Frank Voss 1/5/2024
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ENGINEER	ISSUE	DATE	CAD	REMARKS	2dd
fv	OO	11-9-23		for approval	

MEADOW
OUTDOOR ADVERTISING

10'-0" x 30'-0"
MONOPOLE SIGN STRUCTURE
CENTER MOUNT 20' V
30'-0" OVERALL HEIGHT

2848 BROADWAY ST NE
SALEM, OREGON

VOSS NO. 23-130-532
DRAWING NO. 23128b
SHEET S2 of S2

VOSS STRUCTURAL ENGINEERING, PLLC
7264 W Benton Dr, Frankfort, IL 60423
(815) 595-VOSS (8677)

CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 BROADWAY ST
DATE 11/13/2023 ENG. FV

1/36

LOCATION: 2848 BROADWAY ST SE
SALEM, OREGON

BUILDING CODE: 2021 INTERNATIONAL BUILDING CODE
(2022 OREGON STR SPECIALTY CODE)

WIND: 98 MPH, EXP "C," IW = 1
PER ASCE 7-16
RISK CATEGORY II PW = 18.2 PSF

SEISMIC: S_S = 0.810 g S_1 = 0.414 g
S_{DS} = 0.640 S_{D1} = 0.521
SC = D, SDC = D, CS = 0.213, V = CS*W = 4.69K

DESCRIPTION: DESIGN NEW BILLBOARD STRUCTURE

OTHER, CM, 20' NOM V, 30' OAH

HEAD STRUCTURE TO BE CAPABLE OF SUPPORTING ONE OR TWO HEAVY FACES WEIGHING UP TO 3600# EACH - STRINGERLESS DESIGN

USE 150 PSF/FT ASSUMED ALLOWABLE SOIL LATERAL BEARING CAPACITY USE 2.0 LBIF

REGISTERED PROFESSIONAL ENGINEER
100623PE
OREGON
JULY 12, 2022
FRANK T VOSS
EXPIRES: 6/30/24

1/5/24

DocuSigned by:
Frank Voss 1/5/2024
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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

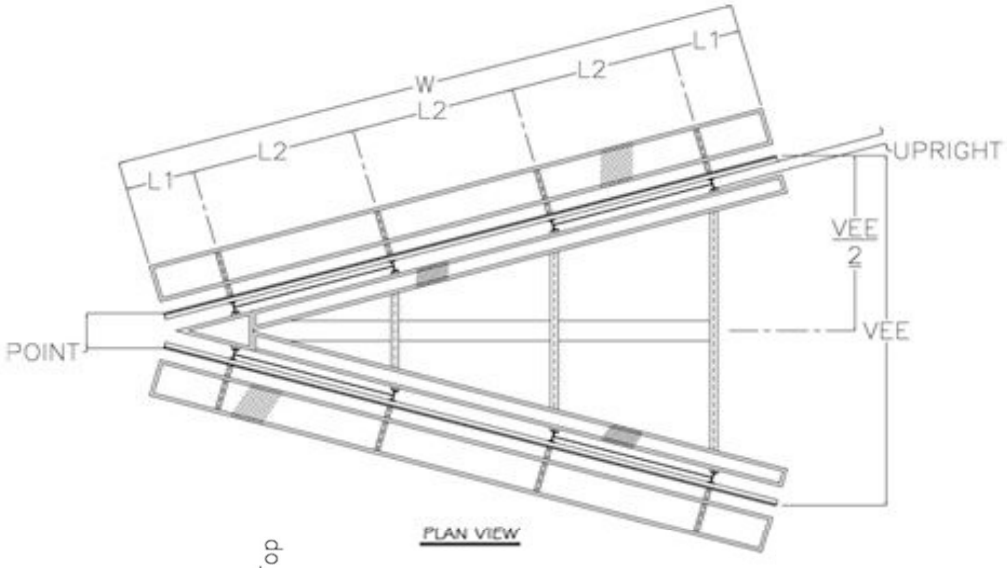
2/36

Overall Data Sheet

Location: 2848 Broadway St SE, Salem, Oregon

Building Code:	2021 International Building Code		
Wind Code:	ASCE 7-16		
Wind Speed (V):	98 mph	3 Second Gust	ASIF = 1
Wind Exposure:	C		
Wind Importance (I_w):	1.00		

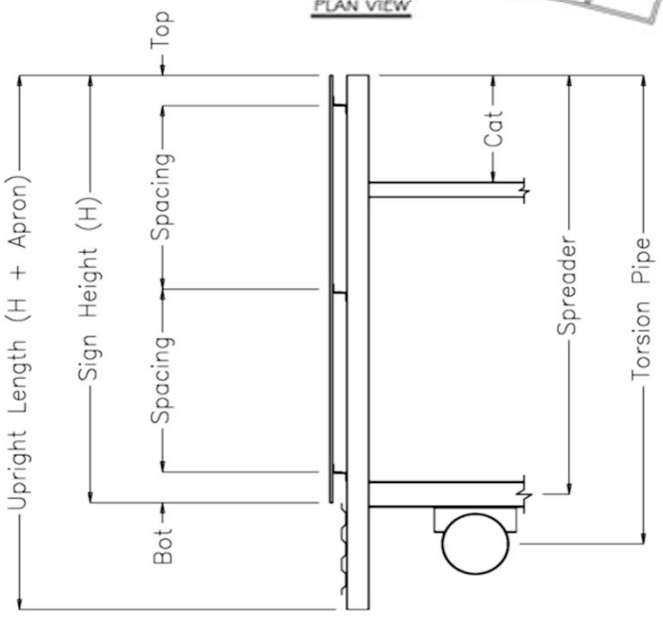
Max Overall Height:	30.0 ft
Sign Height (H):	10.0 ft
Sign Width (W):	30.0 ft
Apron plus extra:	2.5 ft
Flag (CL face to CL column)	.0 ft
Offset (CL torsion pipe to CL Column)	.0 ft



PLAN VIEW

Superstructure Layout

Cantilever (L1)	3.0 ft
Upright Spacing (L2)	8.0 ft
Point width (Point)	6.0 ft
Vee width (Vee)	21.0 ft
Upright (Upright)	30.0 in
Number of Uprights	4
Spreader	10.25 ft
Torsion Pipe	11.5 ft
Catwalk location (Cat)	3.83 ft
Top Stringer (Top)	.75 ft
Bot Stringer (Bot)	.25 ft
Number of stringers	3
Stringer Spacing (Spacing)	4.5 ft
Lat br spacing	9.0 ft



Various Other Data

Wall Thickness factor	0.93
Poff Multiplier	1

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV 3/36

Seismic Design Criteria

Building Code: 2021 International Building Code
Subsection: 1603.1.5 - Earthquake Design Data
ASCE Std: ASCE 7-16

1. Seismic importance Factor: I_E = **1.00**
   Risk Category (Table 1604.5): **II**

2. Mapped Spectral Response accelerations (From USGS Website):
   Lat: 44.8883 S_S = **0.819 g**
   Long: -123.0333 S_1 = **0.414 g**

3. Site Class: **D**

4. Spectral Response Coefficients:

S_{DS}	**0.640**	fv	**1.886**	null
S_{D1}	**0.521**	fa	**1.172**	1.172

5. Seismic Design Category: **D**
   S_{DS} S_{DC} D
   S_{D1} S_{DC} D

6. Basic Seismic Force Resisting System:
   Non-Building Structures Not Similar to Buildings - Signs and Billboards

7. Design Base Shear: **V = C_S * W =** **4.69** kips **Need to review Seismic Forces in Model**

8. Seismic Response Coefficient, **C_S =** **0.213**

9. Reponse Modification Factor (ASCE 7-16, Table 15.4-2)
   R = **3**

10. Analysis Procedure Used: **Equivalent Lateral Force Method**

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

4/36

Seismic Design Calculations

Building Code: 2021 International Building Code
Subsection: 1603.1.5 - Earthquake Design Data

Site Coefficients, Fa, Fv

Site Coefficient, Fa	1.1724	(interpolated from Table 11.4-1 in ASCE 7)	1.172
Site Coefficient, Fv	1.886	(interpolated from Table 11.4-2 in ASCE 7)	null

Natural Period of Structure

Ts	0.813	sec	T_L	16	sec
Approximate Period, T_a	0.256	sec			
Upper Limit Coefficient, C_u	1.400	(interpolated from Table 12.8-1 in ASCE 7)			
Maximim period, T_{max}	0.359	sec			
T_{actual}	0.645	sec (from analysis, computer or by hand)	T=	0.645	sec
			T<=1.5 Ts		

Calculation of Seismic Response Coefficient

$C_s = S_{DS} / (R/I)$ =	0.2133	Equation 12.8-2
need not exceed $S_{DS} / (T (R/I))$=	0.2690	Equation 12.8-3
$C_{s\,min}$ =	0.03	Equation 15.4-1
If $S_1 \geq 0.6g$, $C_{s\,min} = 0.8\ S_1/(R/I)$ =	N/A	Equation 15.4-2

Governing C_s = 0.2133

Seismic W

Appx Head Weight =	20 kips
Appx Column Weight =	2 kips
W =	**22 kips**

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

5/36

Wind Design Data

Building Code: 2021 International Building Code
Wind Code: ASCE 7-16
Wind Speed (V): 98 mph 3 Second Gust V_{ASD} 76 mph
Wind Exposure: C
Wind Importance (I_w): 1
Max Overall Height: 30.0 ft

Coefficients

Kz	0.982253	G	0.85
Kzt	1	Cf	1.736425
Kd	0.85	ω	1

LF 0.6

Load Cases to check
Load Case 1: Wind load applied at centroid of Sign area
Load Case 2: Wind load at 0.2*Sign Width from Centroid of Sign area
Figure 6-20, Footnote 3
Load Case 3: Case C, Fig 6-20, Computed elsewhere

qs = 20.53 psf
pw = 18.18 psf
ω pw = 18.2 psf

Therefore, use 18.18 psf for design
with 1.00 ASIF (Allowable Stress Increase Factor)
(Ultimate pw = 30.3 psf)

Wind applied to computer model with torsion pipe along global X axis:

Wind Pressure perpendicular to sign Face

Sign face angle from Global X-Axis: 14.5 degrees
pz 17.6 psf
px 4.5 psf

Wind pressure, 60% perpendicular, 30% transverse (used sometimes to size crossbracing)
pz 11.9 psf
px 8.0 psf

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

6/36

ASCE 7-05/ASCE 7-10/ASCE 7-16 Wind Pressure Calculations

V, mph	98
OAH, ft	30
Exp	C
Kz	0.982253
Kzt	1
ortance Fa	1
	1.00
Kd	0.85
G	0.85
Cf	1.736425
ω	1
LF	0.6
q	20.52741
Design	18.1786
Pressure	18.1786

s/h	0.416667	0.416667	0.416667	
B/s	2.4	2.4	2.4	
Cf	1.736425			
Cf(rounded to nearest (		1		1.75

Supporting Tables and Calculations

Table 6-2 - Terrain Exposure Constants

Exposure	α	z_g (ft)	â	b hat	alpha bar	b bar	c	ℓ (ft)	eps bar	z min (ft)
B	7	1200	0.142857	0.84	0.25	0.45	0.3	320	0.333333	30
C	9.5	900	0.105263	1	0.153846	0.65	0.2	500	0.2	15
D	11.5	700	0.086957	1.07	0.111111	0.8	0.15	650	0.125	7

13.5

Cf, Case A and Case B

Clearance Ratio, s/h	Aspect Ratio, B/s											
	<0.05	0.1	0.2	0.5	1	2	4	5	10	20	30	>45
1	1.8	1.7	1.65	1.55	1.45	1.4	1.35	1.35	1.3	1.3	1.3	1.3
0.9	1.85	1.75	1.7	1.6	1.55	1.5	1.45	1.45	1.4	1.4	1.4	1.4
0.7	1.9	1.85	1.75	1.7	1.65	1.6	1.6	1.55	1.55	1.55	1.55	1.55
0.5	1.95	1.85	1.8	1.75	1.75	1.7	1.7	1.7	1.7	1.7	1.7	1.75
0.3	1.95	1.9	1.85	1.8	1.8	1.8	1.8	1.8	1.8	1.85	1.85	1.85
0.2	1.95	1.9	1.85	1.8	1.8	1.8	1.8	1.8	1.85	1.9	1.9	1.95
<.16	1.95	1.9	1.85	1.85	1.8	1.8	1.85	1.85	1.85	1.9	1.9	1.95

Cf, Case C | **11.25541862**

Region	Aspect Ratio, B/s									Region	13	>45
	2	3	4	5	6	7	8	9	10			
0 to s	2.25	2.6	2.9	3.1	3.3	3.4	3.55	3.65	3.75	0 to s	4	4.3
s to 2s	1.5	1.7	1.9	2	2.15	2.25	2.3	2.35	2.45	s to 2s	2.6	2.55
2s to 3s		1.15	1.3	1.45	1.55	1.65	1.7	1.7	1.85	2s to 3s	2	1.95
3s to 10s			1.1	1.05	1.05	1.05	1.05	1.05	0.95	3s to 4s	1.5	1.85
										4s to 5s	1.35	1.85
										5s to 10s	0.9	1.1
										>10s	0.55	0.55

Case C wind pressures

Region	Cf	pw
0 to s	2.390	25.02
s to 2s	1.580	16.54
2s to 3s	1.150	12.04
3s to 10s	0.000	0.00

Case B vs Case C

	p_{max}		P_{total}
B	30.36	psf	6.82 kips
C	25.02	psf	7.25 kips

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

7/36

Detailed Deadload Takeoff

One Heavy Face

Side 1

	Number	Load	Area/Length	Total	Loc.	Mom.
Face	1	12	300	3600	6.75	24.3
Stringers	0	8.2	30	0	6.00	0.0
Clips	4	12.8	0.75	38	6.00	0.2
Uprights	4	13	12.5	650	5.50	3.6
Hangrail/lat brace	2	4.9	30	294	5.50	1.6
Front CW ledgers	4	9	5.45	196	8.56	1.7
Ledger Clips	8	12.8	0.42	43	5.50	0.2
Front CW stringers	2	5.8	37.67	437	8.56	3.7
Front CW grating	1	3	71.0	213	8.56	1.8
Apron	1	3	60	180	5.50	1.0
Rear CW stringers	4	5.8	34.0	789	4.17	3.3
Rear CW grating	2	3	70.0	420	4.17	1.8
Point Walkaround	0.5	130	1	65	5.00	0.3
Vee Walkaround	1	91	1	91	12.50	1.1
Handrails	1	8	14.4	115	4.17	0.5
Lights	0	50	1	0	11.56	0.0
				7132		45.2

Side 2

	Number	Load	Area/Length	Total	Loc.	Mom.
Face	1	3	300	900	6.75	6.1
Stringers	3	8.2	30	738	6.00	4.4
Clips	12	12.8	0.50	77	6.00	0.5
Uprights	4	13	12.5	650	5.50	3.6
Hangrail/lat brace	2	4.9	30	294	5.50	1.6
Front CW ledgers	4	9	5.45	196	8.56	1.7
Ledger Clips	8	12.8	0.42	43	5.50	0.2
Front CW stringers	2	5.8	37.67	437	8.56	3.7
Front CW grating	1	3	71.0	213	8.56	1.8
Apron	1	3	60	180	5.50	1.0
Rear CW stringers	4	5.8	34.0	789	4.17	3.3
Rear CW grating	2	3	70.0	420	4.17	1.8
Point Walkaround	0.5	130	1	65	5.00	0.3
Vee Walkaround	1	91	1	91	12.50	1.1
Handrails	1	8	14.4	115	4.17	0.5
Lights	2	50	1	100	11.56	1.2
				5308		32.8

Common

	Number	Load	Area/Length	Total	Loc.	Mom.
Upper Spreaders	4	10	10.33	413	0.00	0.0
End Plates	8	6.8	1.17	63	0.00	0.0
Lower Spreaders	4	22	10.33	909	0.00	0.0
End Plates	8	10.2	1.33	109	0.00	0.0
Moonbeams	4	22	1.92	169	0.00	0.0
Torsion Pipe	1	54.6	26	1420	0.00	0.0
Ladders	2	8	12.5	200	0.00	0.0
X-bracing	8	1.5	11.26	135	0.00	0.0
Bolts	1	200	1	200	0.00	0.0
Safety system	6	50	1	300	0.00	0.0
Head Plate	0	61	4.71	0	0.00	0.0
Connection Beams	2	57.0	2.17	247	0.00	0.0
Box Plates	0	30.6	1.79	0	0.00	0.0
Gussets1	0	0.21	31.25	0	0.00	0.0
Gussets2	0	0.21	102.19	0	0.00	0.0
Misc	1	1000	1	1000	0.00	0.0
				5167		

Total Weight	17606	Net Moment (abs)	12.41092
Total Weight without faces	13106	Net Offset	0.704925

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VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

8/36

Detailed Deadload Takeoff

Two Heavy Faces

Side 1

	Number	Load	Area/Length	Total	Loc.	Mom.
Face	1	12	300	3600	6.75	24.3
Stringers	0	8.2	30	0	6.00	0.0
Clips	4	12.8	0.75	38	6.00	0.2
Uprights	4	13	12.5	650	5.50	3.6
Hangrail/lat brace	2	4.9	30	294	5.50	1.6
Front CW ledgers	4	9	5.45	196	8.56	1.7
Ledger Clips	8	12.8	0.42	43	5.50	0.2
Front CW stringers	2	5.8	37.67	437	8.56	3.7
Front CW grating	1	3	71.0	213	8.56	1.8
Apron	1	3	60	180	5.50	1.0
Rear CW stringers	4	5.8	34.0	789	4.17	3.3
Rear CW grating	2	3	70.0	420	4.17	1.8
Point Walkaround	0.5	130	1	65	5.00	0.3
Vee Walkaround	1	91	1	91	12.50	1.1
Handrails	1	8	14.4	115	4.17	0.5
Lights	0	50	1	0	11.56	0.0
				7132		45.2

Side 2

	Number	Load	Area/Length	Total	Loc.	Mom.
Face	1	12	300	3600	6.75	24.3
Stringers	0	8.2	30	0	6.00	0.0
Clips	4	12.8	0.75	38	6.00	0.2
Uprights	4	13	12.5	650	5.50	3.6
Hangrail/lat brace	2	4.9	30	294	5.50	1.6
Front CW ledgers	4	9	5.45	196	8.56	1.7
Ledger Clips	8	12.8	0.42	43	5.50	0.2
Front CW stringers	2	5.8	37.67	437	8.56	3.7
Front CW grating	1	3	71.0	213	8.56	1.8
Apron	1	3	60	180	5.50	1.0
Rear CW stringers	4	5.8	34.0	789	4.17	3.3
Rear CW grating	2	3	70.0	420	4.17	1.8
Point Walkaround	0.5	130	1	65	5.00	0.3
Vee Walkaround	1	91	1	91	12.50	1.1
Handrails	1	8	14.4	115	4.17	0.5
Lights	0	50	1	0	11.56	0.0
				7132		45.2

Common

	Number	Load	Area/Length	Total	Loc.	Mom.
Upper Spreaders	4	10	10.33	413	0.00	0.0
End Plates	8	6.8	1.17	63	0.00	0.0
Lower Spreaders	4	22	10.33	909	0.00	0.0
End Plates	8	10.2	1.33	109	0.00	0.0
Moonbeams	4	22	1.92	169	0.00	0.0
Torsion Pipe	1	54.6	26	1420	0.00	0.0
Ladders	2	8	12.5	200	0.00	0.0
X-bracing	8	1.5	11.26	135	0.00	0.0
Bolts	1	200	1	200	0.00	0.0
Safety system	6	50	1	300	0.00	0.0
Head Plate	0	61	4.71	0	0.00	0.0
Connection Beams	2	57.0	2.17	247	0.00	0.0
Box Plates	0	30.6	1.79	0	0.00	0.0
Gussets1	0	0.21	31.25	0	0.00	0.0
Gussets2	0	0.21	102.19	0	0.00	0.0
Misc	1	1000	1	1000	0.00	0.0
				5167		

Total Weight	19430	Net Moment (abs)	0
Total Weight without faces	12230	Net Offset	0

VOSS STRUCTURAL ENGINEERING, PLLC
7264 W Benton Dr, Frankfort, IL 60423
(815) 595-VOSS (8677)

CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

9/36

Ice Loading Calculations

From Map

t	1	in
Vc	30	mph

Other input parameters

Kzt	1	z	30	ft
Ii	1	fz	0.99	

Design Ice Thickness, td **0.99 in**

Design Ice Density, γi 56 pcf

Weight of Ice

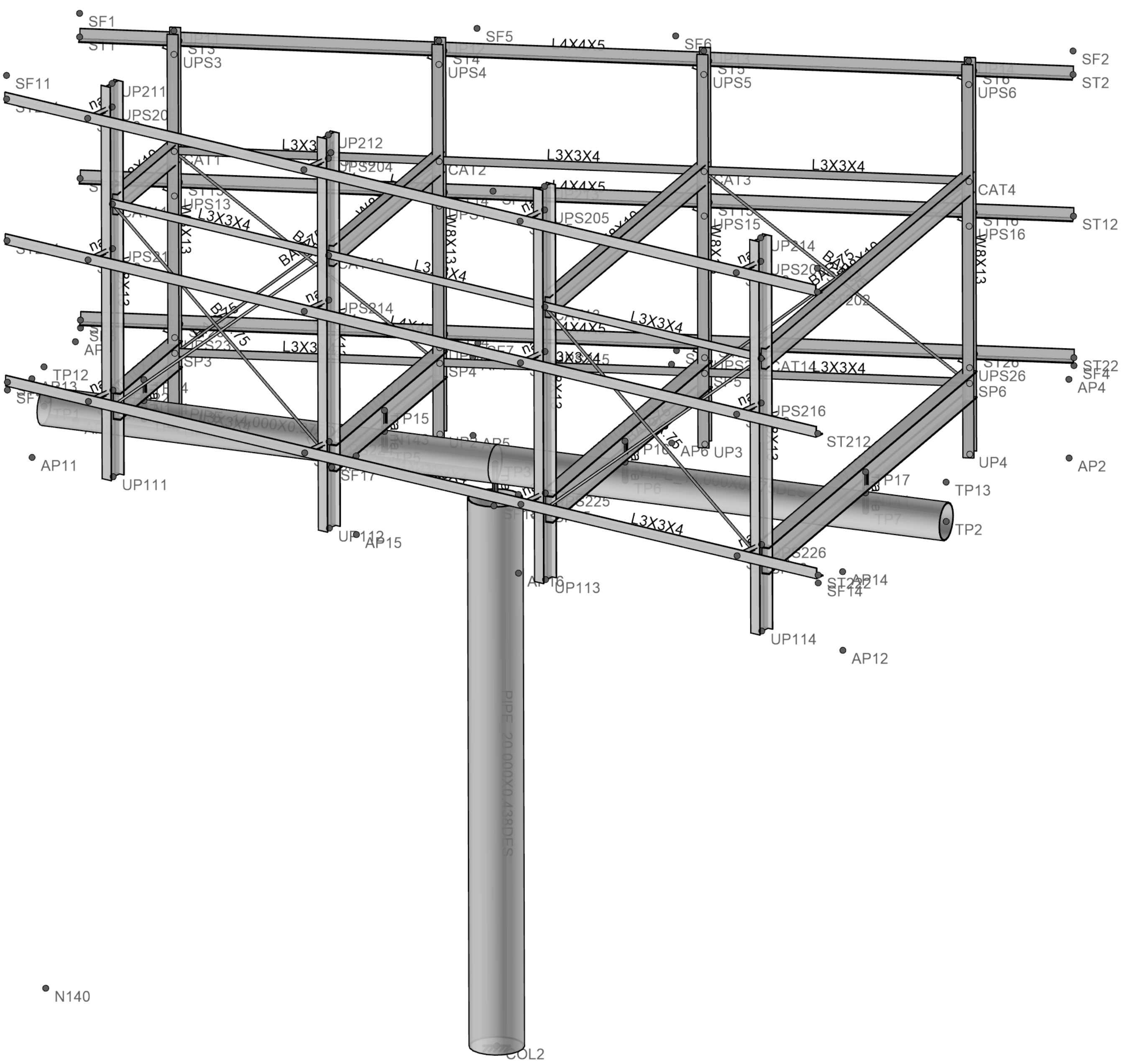
Desc	Number	H	W	Length	Dc(Factor)	Ai (or Vi)	total	Weight	Weight
Faces	2	12.5	30	1	0.8	78	156	8.71	8.71
Front CW	2	2.125	34	1	0.6	11	22	1.26	1.26
Rear CW	4	2	34	1	0.6	11	42	2.37	2.37
Lights	2	2	2	1	0.6	1	1	0.07	0.07
Uprights	8	0.666	0.333	17.5	0.745	0.21	30	0.012	1.68
Upper Spreaders	4	0.6575	0.328333	10.33	0.735	0.21	9	0.012	0.49
Lower Spreaders	4	0.85	0.479167	10.33	0.976	0.27	11	0.015	0.64
Stringers	6	0.333333	0.333333	48	0.471	0.14	41	0.008	2.32
Ledgers	8	0.5	0.333	5.45	0.601	0.18	8	0.010	0.43
Ladder stringers	6	0.167	0.020833	17.5	0.168	0.07	7	0.004	0.38
Ladder rungs	30	0.0625	0	1.5	0.063	0.04	2	0.002	0.09
Handrail Angles	2	0.167	0.167	28.75	0.236	0.08	5	0.005	0.27
Torsion Pipe	1	1.166667		26	1.167	0.32	8	0.018	0.47
Hangrails/Lat brace	4	0.33	0.33	30	0.467	0.14	17	0.008	0.96
									20.14

Load on faces/aprons: 11.6 psf
Load to apply to uprights: 0.73 kips/upright
(apply dist load to uprights, upper & lower spreaders, stringers, torsion pipe, face)

Wind Load Factor

Vw	98	mph
Iw	1	
WL Factor	0.109	(includes 0.7 factor for 0.7 Wi)

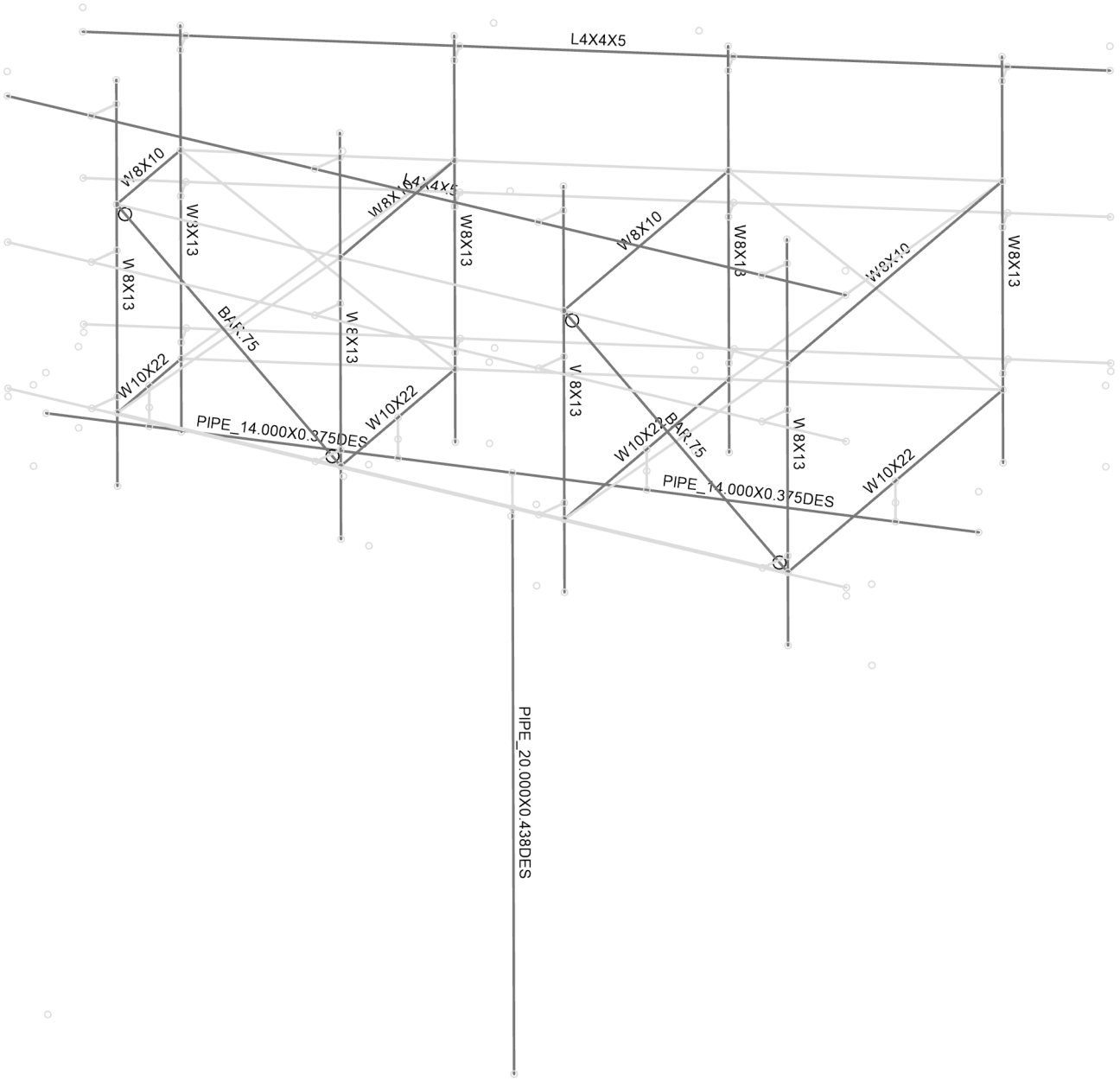
10/36



		SK-1
		Nov 13, 2023 at 06:01 PM
		Model 23-130-532.r3d

Y
Z X

11/36



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			Nov 13, 2023 at 06:02 PM
			Model 23-130-532.r3d

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11/13/2023
6:02:57 PM
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12/36

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	0.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	0.3	0.65	0.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	0.3	0.65	0.49	35	1.6	60	1.2
7	A252 Gr 2	29000	11154	0.3	0.65	0.49	35	1.25	65	1.15
8	A252 Gr 3	29000	11154	0.3	0.65	0.49	45	1.25	65	1.15
9	API 5L-X42	29000	11154	0.3	0.65	0.49	42	1.25	60	1.15
10	API 5L-X46	29000	11154	0.3	0.65	0.49	46	1.25	63	1.15
11	API 5L-X52	29000	11154	0.3	0.65	0.49	52	1.25	66	1.15
12	API 5L-X56	29000	11154	0.3	0.65	0.49	56	1.25	71	1.15
13	API 5L-X60	29000	11154	0.3	0.65	0.49	60	1.25	75.4	1.15
14	API 5L-X65	29000	11154	0.3	0.65	0.49	65	1.25	77.6	1.15
15	API 5L-X70	29000	11154	0.3	0.65	0.49	70	1.25	82.7	1.15
16	A1085	29000	11154	0.3	0.65	0.49	50	1.25	65	1.15
17	A913 Gr.65	29000	11154	0.3	0.65	0.49	65	1.1	80	1.1
18	Xrod	29000	11154	0.3	0.65	0	36	1.5	58	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	Uprights	W8X13	Column	Wide Flange	A992	DR1	3.84	2.73	39.6	0.0871
2	Spreaders	W10X22	Beam	Wide Flange	A992	DR1	6.49	11.4	118	0.239
3	Cat beams	W8X10	Beam	Wide Flange	A992	DR1	2.96	2.09	30.8	0.0426
4	Stringer1	L4X4X5	Beam	Single Angle	A36 Gr.36	DR1	2.4	3.67	3.67	0.0832
5	Stringer2	L4X4X5	Beam	Single Angle	A36 Gr.36	DR1	2.4	3.67	3.67	0.0832
6	Lat Braces	L3X3X4	HBrace	Single Angle	A36 Gr.36	DR1	1.44	1.23	1.23	0.0313
7	Torsion	PIPE_14.000X0.375DES	Beam	Pipe	A252 Gr 2	DR1	14.9672	348.8691	348.8691	697.7382
8	X brace	BAR.75	HBrace	None	Xrod	DR1	0.4418	0.0155	0.0155	0.0311
9	Column1	PIPE_20.000X0.438DES	Column	Pipe	API 5L-X42	DR1	25.0522	1202.6644	1202.6644	2405.3289

Node Loads and Enforced Displacements (BLC 1 : Dead Load)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	UP214	L	Y	-0.9259
2	UP213	L	Y	-0.9259
3	UP212	L	Y	-0.9259
4	UP211	L	Y	-0.9259
5	UP14	L	Y	-0.9605
6	UP13	L	Y	-0.9605
7	UP12	L	Y	-0.9605
8	UP11	L	Y	-0.9605
9	UPS6	L	Y	0
10	TP3	L	Y	-0.3

Node Loads and Enforced Displacements (BLC 10 : Ice)

	Node Label	L, D, M	Direction	Magnitude [(k, k-ft), (in, rad), (k*s²/ft, k*s²*ft)]
1	UP214	L	Y	-0.73
2	UP213	L	Y	-0.73
3	UP212	L	Y	-0.73
4	UP211	L	Y	-0.73
5	UP14	L	Y	-0.73
6	UP13	L	Y	-0.73
7	UP12	L	Y	-0.73
8	UP11	L	Y	-0.73

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Job Number :
Model Name :

11/13/2023
6:02:57 PM
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13/36

Member Area Loads (BLC 1 : Dead Load)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF1	SF3	SF4	SF2	Y	A-B	-0.003
2	AP3	AP4	AP2	AP1	Y	A-B	-0.003
3	SF11	SF13	SF14	SF12	Y	A-B	-0.012
4	AP13	AP14	AP12	AP11	Y	A-B	-0.003

Member Area Loads (BLC 2 : Wind Front)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF11	SF13	SF14	SF12	Z	A-B	-0.0176
2	AP13	AP14	AP12	AP11	Z	A-B	-0.0176
3	SF11	SF13	SF14	SF12	X	A-B	0.0045
4	AP13	AP14	AP12	AP11	X	A-B	0.0045

Member Area Loads (BLC 3 : Wind Rear)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF1	SF3	SF4	SF2	Z	A-B	0.0176
2	AP3	AP4	AP2	AP1	Z	A-B	0.0176
3	SF1	SF3	SF4	SF2	X	A-B	0.0045
4	AP3	AP4	AP2	AP1	X	A-B	0.0045

Member Area Loads (BLC 4 : Wind Front Rt)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF15	SF17	SF14	SF12	Z	A-B	-0.0293
2	AP17	AP14	AP12	AP15	Z	A-B	-0.0293
3	SF15	SF17	SF14	SF12	X	A-B	0.0076
4	AP17	AP14	AP12	AP15	X	A-B	0.0076

Member Area Loads (BLC 5 : Wind Front Lt)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF11	SF13	SF18	SF16	Z	A-B	-0.0293
2	AP13	AP18	AP16	AP11	Z	A-B	-0.0293
3	SF11	SF13	SF18	SF16	X	A-B	0.0076
4	AP13	AP18	AP16	AP11	X	A-B	0.0076

Member Area Loads (BLC 6 : Wind Rear Rt)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF5	SF7	SF4	SF2	Z	A-B	0.0293
2	AP7	AP4	AP2	AP5	Z	A-B	0.0293
3	SF5	SF7	SF4	SF2	X	A-B	0.0076
4	AP7	AP4	AP2	AP5	X	A-B	0.0076

Member Area Loads (BLC 7 : Wind Rear Lt)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF1	SF3	SF8	SF6	Z	A-B	0.0293
2	AP3	AP8	AP6	AP1	Z	A-B	0.0293
3	SF1	SF3	SF8	SF6	X	A-B	0.0076
4	AP3	AP8	AP6	AP1	X	A-B	0.0076

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Model Name :

11/13/2023
6:02:57 PM
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14/36

Member Area Loads (BLC 8 : Extra heavy face)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF1	SF3	SF4	SF2	Y	A-B	-0.009

Member Area Loads (BLC 10 : Ice)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF1	SF3	SF4	SF2	Y	A-B	-0.0116
2	AP3	AP4	AP2	AP1	Y	A-B	-0.0116
3	SF11	SF13	SF14	SF12	Y	A-B	-0.0116
4	AP13	AP14	AP12	AP11	Y	A-B	-0.0116

Member Area Loads (BLC 11 : Seismic X)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [ksf]
1	SF11	SF13	SF14	SF12	X	A-B	0.0063
2	AP13	AP14	AP12	AP11	X	A-B	0.0063

Basic Load Cases

	BLC Description	Category	Y Gravity	Nodal	Distributed	Area(Member)
1	Dead Load	None	-1.05	10	3	4
2	Wind Front	None			2	4
3	Wind Rear	None			2	4
4	Wind Front Rt	None			2	4
5	Wind Front Lt	None			2	4
6	Wind Rear Rt	None			2	4
7	Wind Rear Lt	None			2	4
8	Extra heavy face	None			3	1
9	Wind on col at point	None			2	
10	Ice	None		8	18	4
11	Seismic X	None				2
12	BLC 1 Transient Area Loads	None			188	
13	BLC 2 Transient Area Loads	None			188	
14	BLC 3 Transient Area Loads	None			188	
15	BLC 4 Transient Area Loads	None			132	
16	BLC 5 Transient Area Loads	None			132	
17	BLC 6 Transient Area Loads	None			132	
18	BLC 7 Transient Area Loads	None			132	
19	BLC 8 Transient Area Loads	None			90	
20	BLC 10 Transient Area Loads	None			188	
21	BLC 11 Transient Area Loads	None			94	

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	DL + WL Fr	Yes	Y	1	1	2	1								
2	DL + WL Rr	Yes	Y	1	1	3	1								
3	DL + WL Fr Rt	Yes	Y	1	1	4	1								
4	DL + WL Fr Lt	Yes	Y	1	1	5	1								
5	DL + WL Rr Rt	Yes	Y	1	1	6	1								
6	DL + WL Rr Lt	Yes	Y	1	1	7	1								
7	Wind Into Vee	Yes	Y	1	1	2	-1.4	3	-1.4	9	-1				
8	Wind at Point	Yes	Y	1	1	2	1.4	3	1.4	9	1				
9	DL + WL Fr	Yes	Y	1	1	2	1					8	1		
10	DL + WL Rr	Yes	Y	1	1	3	1					8	1		
11	DL + WL Fr Rt	Yes	Y	1	1	4	1					8	1		
12	DL + WL Fr Lt	Yes	Y	1	1	5	1					8	1		
13	DL + WL Rr Rt	Yes	Y	1	1	6	1					8	1		
14	DL + WL Rr Lt	Yes	Y	1	1	7	1					8	1		
15	Wind Into Vee	Yes	Y	1	1	2	-1.4	3	-1.4	9	-1	8	1		

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Job Number :
Model Name :

11/13/2023
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15/36

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
16	Wind at Point	Yes	Y	1	1	2	1.4	3	1.4	9	1	8	1		
17	DL + WL Fr	Yes	Y	1	1	2	0.109					8	1	10	0.7
18	DL + WL Rr	Yes	Y	1	1	3	0.109					8	1	10	0.7
19	DL + WL Fr Rt	Yes	Y	1	1	4	0.109					8	1	10	0.7
20	DL + WL Fr Lt	Yes	Y	1	1	5	0.109					8	1	10	0.7
21	DL + WL Rr Rt	Yes	Y	1	1	6	0.109					8	1	10	0.7
22	DL + WL Rr Lt	Yes	Y	1	1	7	0.109					8	1	10	0.7
23	Wind Into Vee	Yes	Y	1	1	2	-0.1526	3	-0.1526	9	-0.109	8	1	10	0.7
24	Wind at Point	Yes	Y	1	1	2	0.1526	3	0.1526	9	0.109	8	1	10	0.7
25	+ 0.7 EQ+X	Yes	Y	1	1.09	11	0.7					8	1		
26	DL - .08 EQ+X	Yes	Y	1	1.09	11	-0.7					8	1		

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
0	COL2	max	5.173	7	34.259	24	7.048	1	169.456	11	52.286	13	130.204	16
1		min	-5.173	16	20.076	7	-7.048	10	-181.43	5	-52.302	3	-111.883	15
2	Totals:	max	5.173	7	34.259	24	7.048	1						
3		min	-5.173	16	20.076	7	-7.048	10						

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
0	UPR3	W8X13	0.912	2.261	21	0.082	2.261	y	13	63.456	114.97	5.364	17.827	1	H1-1b
1	UPR13	W8X13	0.91	2.261	19	0.243	7.286	z	26	63.456	114.97	5.364	17.827	1	H1-1b
2	Tor2	PIPE 14.000X0.375DES	0.784	14.524	5	0.458	14.524		5	293.444	313.683	113.611	113.611	1	H3-6
3	UPR12	W8X13	0.749	2.261	12	0.231	7.286	z	25	63.456	114.97	5.364	17.827	1	H1-1b
4	UPR2	W8X13	0.748	2.261	14	0.092	2.701	y	14	63.456	114.97	5.364	17.827	1	H1-1b
5	SPR3	W10X22	0.647	6.507	23	0.161	6.507	y	23	122.415	194.311	15.22	64.87	1.996	H1-1b
6	Tor1	PIPE 14.000X0.375DES	0.598	14.524	23	0.456	14.524		6	293.444	313.683	113.611	113.611	1	H1-1b
7	Col1	PIPE 20.000X0.438DES	0.595	17.417	5	0.212	17.417		11	595.81	630.054	326.431	326.431	1	H1-1b
8	M76	BAR.75	0.554	10.255	23	0.007	10.255		14	0.154	9.524	0.119	0.119	1	H1-1a*
9	M72	BAR.75	0.55	10.255	23	0.009	10.255		25	0.154	9.524	0.119	0.119	1	H1-1a*
10	M68	L3X3X4	0.524	4.02	23	0.007	8	y	12	8.037	31.042	1.123	1.951	1.138	H2-1
11	M62	L3X3X4	0.521	4.02	23	0.007	8	y	14	8.037	31.042	1.123	1.951	1.138	H2-1
12	M77	BAR.75	0.511	10.255	24	0.009	10.255		5	0.154	9.524	0.119	0.119	1	H1-1a*
13	M73	BAR.75	0.507	10.255	24	0.009	10.255		11	0.154	9.524	0.119	0.119	1	H1-1a*
14	M69	L3X3X4	0.497	4.02	23	0.009	8	y	11	8.037	31.042	1.123	1.951	1.138	H2-1
15	M63	L3X3X4	0.494	4.02	23	0.009	8	y	5	8.037	31.042	1.123	1.951	1.138	H2-1
16	M70	L3X3X4	0.481	4.02	19	0.007	8	y	14	8.037	31.042	1.123	1.951	1.138	H2-1
17	M64	L3X3X4	0.478	4.02	21	0.007	8	y	4	8.037	31.042	1.123	1.951	1.138	H2-1
18	UPR4	W8X13	0.475	2.261	5	0.093	2.701	y	13	63.456	114.97	5.364	17.827	1	H1-1b
19	UPR14	W8X13	0.474	2.261	11	0.23	2.701	z	25	63.456	114.97	5.364	17.827	1	H1-1b
20	SPR2	W10X22	0.461	4.517	19	0.189	4.517	y	19	145.208	194.311	15.22	64.87	1.897	H1-1b
21	STGR2	L4X4X5	0.446	18.995	14	0.046	11.005	y	5	37.671	51.737	3.422	3.422	1.5	H2-1
22	STGR12	L4X4X5	0.446	11.005	12	0.046	18.995	y	11	37.671	51.737	3.422	3.422	1.5	H2-1
23	SPR1	W10X22	0.416	2.527	6	0.077	2.527	z	14	173.456	194.311	15.22	64.87	1.189	H1-1b
24	CW4	W8X10	0.329	17.079	5	0.017	13.904	y	5	7.479	88.623	4.071	10.456	2.119	H1-1b
25	STGR11	L4X4X5	0.329	11.005	7	0.03	18.995	y	11	37.671	51.737	3.422	3.422	1.5	H2-1
26	STGR1	L4X4X5	0.324	18.995	15	0.03	11.005	y	5	37.671	51.737	3.422	3.422	1.5	H2-1
27	UPR1	W8X13	0.315	2.261	6	0.078	2.701	y	14	63.456	114.97	5.364	17.827	1	H1-1b
28	STGR3	L4X4X5	0.311	18.995	14	0.029	11.005	y	5	37.671	51.737	3.422	3.422	1.5	H2-1
29	UPR11	W8X13	0.311	2.261	12	0.244	7.286	z	25	63.456	114.97	5.364	17.827	1	H1-1b
30	STGR13	L4X4X5	0.31	11.005	12	0.029	18.995	y	11	37.671	51.737	3.422	3.422	1.5	H2-1
31	CW3	W8X10	0.263	0	5	0.023	8.741	y	5	12.752	88.623	4.071	14.974	2.108	H1-1b
32	CW2	W8X10	0.22	0	6	0.041	4.973	y	6	26.464	88.623	4.071	21.87	2.171	H1-1b
33	CW1	W8X10	0.197	0	6	0.059	2.604	y	6	60.32	88.623	4.071	21.87	2.232	H1-1b
34	M66	L3X3X4	0.168	4.02	19	0.009	8	y	5	8.037	31.042	1.123	1.951	1.138	H2-1
35	M60	L3X3X4	0.167	4.02	21	0.009	8	y	11	8.037	31.042	1.123	1.951	1.138	H2-1
36	SPR4	W10X22	0.131	8.583	1	0.023	8.497	y	24	107.011	194.311	15.22	64.87	2.295	H1-1b
37	M65	L3X3X4	0.094	4.02	15	0.006	8	y	14	8.037	31.042	1.123	1.951	1.138	H2-1

Company :
Designer :
Job Number :
Model Name :

11/13/2023
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Envelope AISC 15TH (360-16): ASD Member Steel Code Checks (Continued)

16/36

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
38	M59	L3X3X4	0.094	4.02	7	0.006	8	y	4	8.037	31.042	1.123	1.951	1.138	H2-1
39	M67	L3X3X4	0.084	4.02	8	0.007	8	y	5	8.037	31.042	1.123	1.951	1.138	H2-1
40	M61	L3X3X4	0.082	4.02	8	0.007	8	y	11	8.037	31.042	1.123	1.951	1.138	H2-1
41	M71	BAR.75	0	10.255	26	0	10.255		26	0.154	9.524	0.119	0.119	1	H1-1a
42	M74	BAR.75	0	10.255	26	0	10.255		26	0.154	9.524	0.119	0.119	1	H1-1a
43	M75	BAR.75	0	10.255	26	0	10.255		26	0.154	9.524	0.119	0.119	1	H1-1a
44	M78	BAR.75	0	10.255	26	0	10.255		26	0.154	9.524	0.119	0.119	1	H1-1a

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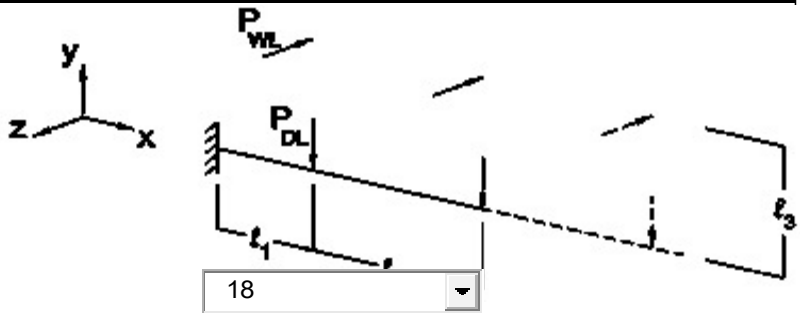
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

17/36

Torsion Pipe



Pr	0.213	kips	(axial)
Mrx	35.603	ft-kips	(torsion)
Mry	43.829	ft-kips	(WL)
Mrz	49.323	ft-kips	(DL)
Mres	65.98287	ft-kips	
Vres	11.00734	kips	
IC Gov	0.793208		

18

LC 5
Member Tor2
Section 2

Pipe Properties

E (ksi)	Fy (ksi)	Diameter D (in)	Ins. Diam. D_1 (in)	Wall thick-ness t (in)	t_{eff} (in)	D/t	rad. of gyr. r (in)	Weight (lb/ft)
29000	35	14	13.3025	0.375	0.34875	40.14	4.83	54.62

Area A (in^2)	I (ksi)	S (in^3)	Z (in^3)	J (in^4)	C (in^3)	Bending Compact?	Axial Compact?
14.96	348.6	49.8	65.0	697.3	99.6	Compact	Compact

λ_p bending 58.00 λ_r bending 256.86
λ_p axial - λ_r axial 91.14

Axial Checks

r_{eff} from above (in)	Length above (for r) (ft)	Length of this pipe (ft)	Total Length (ft)	r_{eff} (in)	K	Kl/r	Fe (ksi)
4.83	0	28.83	28.83	4.82800152	2.1	150.479654	12.639857

Ω_c 1.67

Flexural buckling Limit State Q=1.0
Q=Qa ??

F_{cr} 11.08515 ksi Fa 6.63781732 ksi P_n/Ω_c = 99.280008 kips

Flexure

Ω_b 1.67 D/t max 372.857143

Applicable Limit States: Yielding,

Yielding "Fb" = 27.354478 ksi (= Fy/Ωb*Z/C) M_n/Ω_b = 113.53346 ft-kips

Local Buckling "Fb" =

Torsion and Shear

Shear yielding and shear buckling

Ω_v 1.67

F_{cr}/Ω_v = "Fv" = 12.5748503 $V_c = V_n/\Omega_v$ 94.03929 kips

Torsion

Ω_T 1.67

F_{cr}/Ω_T = "Fv_T" = 12.5748503 $T_c = T_n/\Omega_T$ 104.3818 ft-kips

Identity Checks

H1:
Pr/Pc 0.002145 Use H1-1b Axial Compression
IC = 0.582248 H1-1b

H3:
Tr/Tc 0.34108432 Use checks Below
IC = 0.7932085

USE 14" diam x 0.375" thick, Fy = 35 ksi

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Company :
Designer :
Job Number :
Model Name :

11/13/2023
6:04:07 PM
Checked By : _____

18/36

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-ft]	z-z Moment[k-ft]
1	1	Tor2	1	0	0	0	0	0	0
2			2	0.164	-9.215	3.633	10.623	24.344	49.25
3	1	Tor1	1	0	0	0	0	0	0
4			2	1.852	-8.995	-2.966	-14.581	-12.99	30.734
5	2	Tor2	1	0	0	0	0	0	0
6			2	0.165	-9.218	-3.584	-25.119	-24.492	49.272
7	2	Tor1	1	0	0	0	0	0	0
8			2	1.852	-8.992	3.014	26.191	13.178	30.723
9	3	Tor2	1	0	0	0	0	0	0
10			2	0.213	-9.222	6.052	21.005	43.68	49.28
11	3	Tor1	1	0	0	0	0	0	0
12			2	1.924	-8.988	-0.526	-4.379	8.622	30.632
13	4	Tor2	1	0	0	0	0	0	0
14			2	0.153	-9.214	1.158	0.827	1.599	49.299
15	4	Tor1	1	0	0	0	0	0	0
16			2	1.863	-8.996	-5.444	-24.252	-30.939	30.643
17	5	Tor2	1	0	0	0	0	0	0
18			2	0.213	-9.227	-6.002	-35.603	-43.829	49.323
19	5	Tor1	1	0	0	0	0	0	0
20			2	1.923	-8.983	0.577	15.968	-8.433	30.609
21	6	Tor2	1	0	0	0	0	0	0
22			2	0.153	-9.215	-1.11	-15.217	-1.746	49.29
23	6	Tor1	1	0	0	0	0	0	0
24			2	1.863	-8.995	5.492	35.884	31.126	30.638
25	7	Tor2	1	0	0	0	0	0	0
26			2	0.74	-8.721	0.023	-6.93	-0.122	35.162
27	7	Tor1	1	0	0	0	0	0	0
28			2	-3.985	-9.443	0.023	5.595	0.051	52.883
29	8	Tor2	1	0	0	0	0	0	0
30			2	-0.113	-9.407	0.025	-7.408	-0.049	55.675
31	8	Tor1	1	0	0	0	0	0	0
32			2	4.612	-8.754	0.025	5.91	0.118	20.148
33	9	Tor2	1	0	0	0	0	0	0
34			2	0.197	-10.157	3.607	18.468	24.47	53.736
35	9	Tor1	1	0	0	0	0	0	0
36			2	1.885	-10.016	-2.991	-20.875	-13.134	35.153
37	10	Tor2	1	0	0	0	0	0	0
38			2	0.197	-10.157	-3.61	-17.53	-24.459	53.735
39	10	Tor1	1	0	0	0	0	0	0
40			2	1.885	-10.016	2.988	20.206	13.12	35.152
41	11	Tor2	1	0	0	0	0	0	0
42			2	0.246	-10.165	6.024	28.916	43.809	53.778
43	11	Tor1	1	0	0	0	0	0	0
44			2	1.956	-10.008	-0.554	-10.656	8.475	35.044
45	12	Tor2	1	0	0	0	0	0	0
46			2	0.186	-10.155	1.134	8.603	1.724	53.769
47	12	Tor1	1	0	0	0	0	0	0
48			2	1.896	-10.018	-5.468	-30.561	-31.082	35.064
49	13	Tor2	1	0	0	0	0	0	0
50			2	0.246	-10.165	-6.027	-27.971	-43.797	53.776
51	13	Tor1	1	0	0	0	0	0	0
52			2	1.956	-10.008	0.551	9.988	-8.489	35.044
53	14	Tor2	1	0	0	0	0	0	0
54			2	0.186	-10.155	-1.137	-7.671	-1.713	53.771
55	14	Tor1	1	0	0	0	0	0	0
56			2	1.896	-10.018	5.465	29.891	31.068	35.062

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VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

Extended End Plate Moment Connection per AISC Design Guide 16

Upright-to-Upper-Spreader Connection

Upright

Size: W8X13 — ASIF: 1

Vertical load on Conn.	0.792895	kips	V_{nom}	(Shear into beam)				LC	6
Tension on Conn.	0.074667	kips	T_{nom}	M_{add}	0.024547	ft-kips		Member	CW2
Moment into spreader	4.24	ft-kips	$M_{nom\text{-}RISA}$	M_{nom}	4.264547	ft-kips		Sec	1
b_{fc}	4	in	Flange width			kdes	0.555	in	
d_c	7.99	in	Depth			k1	0.5625	in	
t_{fc}	0.255	in	Flange thickness			t_{wc}	0.23	in	

Upper Spreader

Size: W8X10

b_{fb}	3.94	in	Flange width	t_{fb}	0.205	in	Flange thickness
d_b	7.89	in	Depth	t_{wb}	0.17	in	Web thickness

Plate Properties

b_p	4	in	(Plate width)	**t_p**	0.5	in
d_p	14	in	(Plate length)	$D_{req'd}$	0.88	Sixteenths of an inch of weld req'd
w	0.25	in	(Weld size)		OK	

Bolts

Number	8		First bolt	2.375	in **"A"**			$F_{t,nom}$	90 ksi
Grade	A325		Spacing	3	in **"B"**			Tightening	Fully Tightened
diameter	0.5	inch **"C"**	End	1.625	in			Tb	12 kips
As	0.196	in^2	gage	2.25	in **"Gage"**			Pt	17.67146 kips
fv	0.50	ksi			F_f	6.66	kips		
Ft	43.98729	ksi			Tbolt =	1.66	kips		
ft	8.478526	ksi	OK		IC =	0.193			

Design Checks

F_{yc}, F_{yb}	50	ksi	F_{uc}, F_{ub}	65	ksi	w'	1.4375	in	
F_{yp}	36	ksi	F_{up}	58	ksi				
p_{ext}	3.055	in	d_e	1.63	in	s	1.50	in	
$p_{f,o}$ =	1.43	in	a_o	1.625	in	$Q_{max,o}$	1.8630945 kips	F'o	5.25662 kips
$p_{f,i}$ =	1.365	in	a_i	3.60	in	$Q_{max,i}$	0.8358628 kips	F'i	5.506935 kips

End Plate Yield

$p_{f,i}$ (alt)=	1.37	in	h_i	6.32	in	h_o	9.32 in
Y=	45.82		d_i	6.2175	in	d_o	9.2175 in

ϕMn =	30.93 ft-kips	Mu =	6.39682 ft-kips	OK

Bolt Rupture with Prying Action

ϕMn=Max(31.2986142 ft-kips, 27.5404496 ft-kips, 26.9106647 ft-kips, 23.1525 ft-kips) =

ϕMn =	31.29861 ft-kips		
Mu =	6.39682 ft-kips	OK	

Bolt Rupture without Prying Action

ϕMn =	34.09 ft-kips	Mu =	6.39682 ft-kips	OK

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

20/36

Check Uprights with (or without) Prying Action

Without Prying action:

b	1.01 in	b'	0.76 in	ρ	0.6755556	p	2.52 in
a	0.875 in	a'	1.125 in	d'	0.625 in		
t_{min}	0.227 in	**Flange OK - No Prying Action**					

With Prying Action:

δ	0.752	B	8.64 kips	β	6.1994632
α'	1				
t_{min}	0.171 in	**Flange OK without Stiffeners**	(Still need to check for Compression below)		

Check Uprights with Stiffeners - Model as stiffened extended end plate connection

t_f'	0.375 in (Stiffener thickness)			s	1.5 in	set $d_{e,eff}$ = s	
b_f'	4 in (Use stiffeners extending to end of upright flange)					h	8.125 in
d_e'	1.5 in	$p_{f,i} = p_{f,o}$=	1.125 in		p_{ext}	2.625 in	
h_i	6.625 in		h_o 9.625 in		Y	82.055556	
d_i	6.4375 in		d_o 9.4375 in				

Thin End Plate procedure

$t_{p,req'd}$	0.144 in	**No Stiffeners Required from above**

Check Web Yielding

Rn	45.77 kips	Rc	30.51333 kips	**OK**

Web Crippling

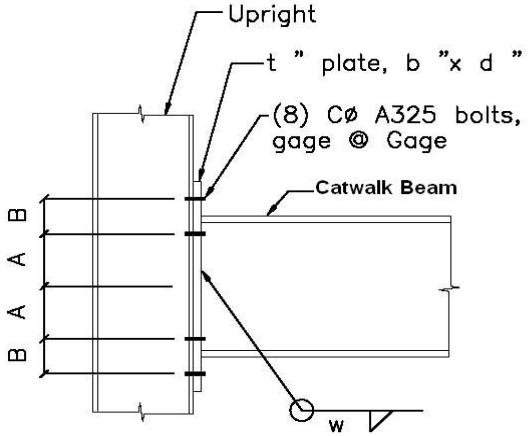
Rn	74.4541205 kips	Rc	37.22706 kips	**OK**

Web Compression Buckling

Rn	51.1081679 kips	Rc	29.03873 kips	**OK**

Web Panel Zone Shear (Assumes Pr < 0.4 Pc)

Rn	55.131 kips	Rc	33.01257 kips	**OK**



See Previous Page for Definitions of Nomenclature in Sketch

Company :
Designer :
Job Number :
Model Name :

11/13/2023
6:04:36 PM
Checked By : _____

21/36

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-ft]	z-z Moment[k-ft]
1	1	CW4	1	0.298	0.244	0	0.001	0.004	1.404
2			2	0.298	0.063	0	0.001	-0.004	-1.214
3	1	CW3	1	-0.286	0.338	-0.001	0.002	0.006	1.21
4			2	-0.286	0.2	-0.001	0.002	-0.003	-2.309
5	1	CW2	1	-0.076	0.496	0	0.004	-0.001	1.562
6			2	-0.076	0.4	0	0.004	-0.005	-2.506
7	1	CW1	1	0.376	0.548	0.006	0.014	-0.019	1.338
8			2	0.376	0.494	0.006	0.014	0.01	-1.309
9	2	CW4	1	0.291	-0.113	0	-0.001	-0.002	-1.636
10			2	0.291	-0.293	0	-0.001	0.002	1.829
11	2	CW3	1	-0.295	-0.256	0.001	-0.002	-0.002	-2.673
12			2	-0.295	-0.394	0.001	-0.002	0.006	1.574
13	2	CW2	1	-0.09	-0.541	0	-0.005	-0.004	-3.144
14			2	-0.09	-0.637	0	-0.005	-0.002	2.202
15	2	CW1	1	0.365	-0.616	-0.004	-0.015	0.007	-1.619
16			2	0.365	-0.67	-0.004	-0.015	-0.015	1.647
17	3	CW4	1	0.618	0.379	0	0.001	-0.008	2.528
18			2	0.618	0.198	0	0.001	-0.003	-2.4
19	3	CW3	1	0.176	0.492	0	0.002	-0.005	2.166
20			2	0.176	0.354	0	0.002	-0.005	-3.367
21	3	CW2	1	-0.327	0.388	-0.002	0.002	0	1.108
22			2	-0.327	0.292	-0.002	0.002	-0.02	-1.977
23	3	CW1	1	-0.14	-0.1	-0.01	-0.007	0.013	-0.203
24			2	-0.14	-0.154	-0.01	-0.007	-0.037	0.441
25	4	CW4	1	-0.237	0.052	-0.002	0	0.019	-0.184
26			2	-0.237	-0.129	-0.002	0	-0.015	0.468
27	4	CW3	1	-0.537	0.262	-0.002	0.001	0.014	0.739
28			2	-0.537	0.123	-0.002	0.001	-0.006	-1.78
29	4	CW2	1	0.382	0.724	0.001	0.007	-0.006	2.535
30			2	0.382	0.628	0.001	0.007	0.007	-3.603
31	4	CW1	1	0.691	0.99	0.017	0.031	-0.045	2.4
32			2	0.691	0.936	0.017	0.031	0.044	-2.492
33	5	CW4	1	0.61	-0.248	-0.001	-0.001	-0.001	-2.826
34			2	0.61	-0.429	-0.001	-0.001	-0.01	2.956
35	5	CW3	1	0.169	-0.409	0	-0.002	-0.004	-3.73
36			2	0.169	-0.548	0	-0.002	-0.005	2.531
37	5	CW2	1	-0.342	-0.433	0.002	-0.002	-0.02	-2.618
38			2	-0.342	-0.529	0.002	-0.002	-0.001	1.749
39	5	CW1	1	-0.146	0.033	0.011	0.007	-0.041	0.135
40			2	-0.146	-0.021	0.011	0.007	0.017	0.104
41	6	CW4	1	-0.242	0.079	0.002	0	-0.014	0.05
42			2	-0.242	-0.101	0.002	0	0.018	0.235
43	6	CW3	1	-0.547	-0.179	0.001	-0.002	-0.005	-2.144
44			2	-0.547	-0.317	0.001	-0.002	0.013	1.104
45	6	CW2	1	0.368	-0.768	-0.002	-0.007	0.007	-4.24
46			2	0.368	-0.865	-0.002	-0.007	-0.007	3.173
47	6	CW1	1	0.676	-1.059	-0.016	-0.032	0.04	-2.805
48			2	0.676	-1.113	-0.016	-0.032	-0.042	2.71
49	7	CW4	1	-1.387	0.066	0	0	0.002	0.188
50			2	-1.387	-0.114	0	0	0.001	0.601
51	7	CW3	1	-2.609	0.043	0	0	0.006	-0.608
52			2	-2.609	-0.096	0	0	0.005	-0.259
53	7	CW2	1	-2.323	-0.022	0	0	0	-0.42
54			2	-2.323	-0.118	0	0	0	0.212
55	7	CW1	1	-1.529	-0.033	0.001	-0.001	-0.004	0.07
56			2	-1.529	-0.086	0.001	-0.001	-0.001	0.373

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

22/36

Extended End Plate Moment Connection per AISC Design Guide 16

Upright-Spreader Connection

Upright

Size W8X13 ASIF 1

Vertical load on Conn.	6.711334	kips	V_{nom}	(Shear into beam)				LC	21
Tension on Conn.	0.106667	kips	T_{nom}	M_{add}	0.045333	ft-kips		Member	SPR3
Moment into spreader	8.527	ft-kips	$M_{nom-RISA}$	M_{nom}	8.572333	ft-kips		Sec	1
b_{fc}	4	in	Flange width		kdes	0.555	in		
d_c	7.99	in	Depth		k1	0.5625	in		
t_{fc}	0.255	in	Flange thickness		t_{wc}	0.23	in		

Spreader

Size W10X22

b_{fb}	5.75	in	Flange width	t_{fb}	0.36	in	Flange thickness
d_b	10.2	in	Depth	t_{wb}	0.24	in	Web thickness

Plate Properties

b_p	6	in	(Plate width)	**t_p**	0.5	in
d_p	16	in	(Plate length)	$D_{req'd}$	0.94	Sixteenths of an inch of weld req'd
w	0.25	in	(Weld size)		OK	

Bolts

Number	8		First bolt	3.5	in **"A"**		$F_{t,nom}$	90	ksi
Grade	A325		Spacing	3	in **"B"**		Tightening	Fully Tightened	
diameter	0.5	inch **"C"**	End	1.5	in		Tb	12	kips
As	0.196	in^2	gage	2.25	in **"Gage"**		Pt	17.67146	kips
fv	4.27	ksi		F_f	10.45	kips			
Ft	43.07971	ksi		Tbolt =	2.61	kips			
ft	13.31053	ksi	OK	IC =	0.309				

Design Checks

F_{yc}, F_{yb}	50	ksi	F_{uc}, F_{ub}	65	ksi	w'	2.4375	in			
F_{yp}	36	ksi	F_{up}	58	ksi						
p_{ext}	2.9	in	d_e	1.50	in	s	1.84	in			
$p_{f,o}$ =	1.4	in	a_o	1.5	in	$Q_{max,o}$	3.4681127	kips	F'o	8.021047	kips
$p_{f,i}$ =	1.24	in	a_i	3.60	in	$Q_{max,i}$	1.4239426	kips	F'i	9.056021	kips

End Plate Yield

$p_{f,i}$ (alt)=	1.24	in	h_i	8.6	in	h_o	11.6	in
Y=	81.73		d_i	8.42	in	d_o	11.42	in

ϕMn =	55.17	ft-kips	Mu = 12.8585 ft-kips	OK

Bolt Rupture with Prying Action

ϕMn=Max(	37.3757871	ft-kips	=	ϕMn = 37.37579 ft-kips
	32.9052764	ft-kips		
	34.2305107	ft-kips		Mu = 12.8585 ft-kips OK
	29.76	ft-kips		

Bolt Rupture without Prying Action

ϕMn =	43.83	ft-kips	Mu = 12.8585 ft-kips	OK

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VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

23/36

Check Uprights with (or without) Prying Action

Without Prying action:

b	1.01 in	b'	0.76 in	ρ	0.6755556	p	2.52 in
a	0.875 in	a'	1.125 in	d'	0.625 in		
t_{min}	0.284 in	**Need to Check Prying Action**					

With Prying Action:

δ	0.752	B	8.46 kips	β	3.3106287
α'	1				
t_{min}	0.215 in	**Flange OK without Stiffeners**	(Still need to check for Compression below)		

Check Uprights with Stiffeners - Model as stiffened extended end plate connection

t_f'	0.375 in (Stiffener thickness)			s	1.5 in	set $d_{e,eff}$ = s	
b_f'	4 in (Use stiffeners extending to end of upright flange)					h	10.375 in
d_e'	1.5 in	$p_{f,i} = p_{f,o}$=	1.125 in		p_{ext}	2.625 in	
h_i	8.875 in	h_o	11.875 in		Y	105.05556	
d_i	8.6875 in	d_o	11.6875 in				

Thin End Plate procedure

$t_{p,req'd}$	0.181 in	**No Stiffeners Required from above**

Check Web Yielding

Rn	47.5525 kips	Rc	31.70167 kips	**OK**

Web Crippling

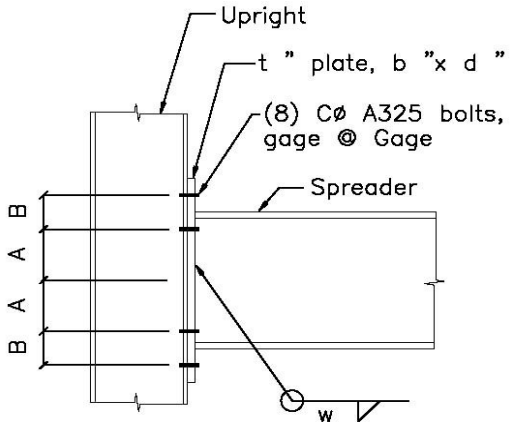
Rn	77.1291186 kips	Rc	38.56456 kips	**OK**

Web Compression Buckling

Rn	51.1081679 kips	Rc	29.03873 kips	**OK**

Web Panel Zone Shear (Assumes Pr < 0.4 Pc)

Rn	55.131 kips	Rc	33.01257 kips	**OK**



See Previous Page for Definitions of Nomenclature in Sketch

Company :
Designer :
Job Number :
Model Name :

11/13/2023
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Member Section Forces

24/36

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-ft]	z-z Moment[k-ft]
1	1	SPR3	1	0.248	-3.701	-0.101	-0.008	0.017	-2.287
2			2	2.243	3.331	-0.183	0.035	-0.012	-6.299
3	2	SPR3	1	2.216	-2.5	0.182	-0.034	-0.012	-6.4
4			2	0.312	4.522	0.1	0.008	0.017	-2.172
5	3	SPR3	1	-0.145	-3.941	-0.048	-0.002	0.009	-1.116
6			2	3.151	3.065	-0.125	0.039	-0.011	-7.388
7	4	SPR3	1	0.483	-3.361	-0.093	-0.009	0.019	-2.822
8			2	1.725	3.678	-0.177	0.034	-0.011	-5.806
9	5	SPR3	1	3.128	-2.224	0.124	-0.039	-0.012	-7.482
10			2	-0.077	4.764	0.047	0.002	0.009	-0.999
11	6	SPR3	1	1.695	-2.857	0.177	-0.033	-0.012	-5.913
12			2	0.542	4.178	0.092	0.01	0.02	-2.708
13	7	SPR3	1	-0.013	-3.602	0.244	-0.016	0.009	-5.077
14			2	0.037	4.396	-0.244	0.016	0.01	-4.972
15	8	SPR3	1	1.809	-2.875	-0.055	-0.024	-0.002	-4.012
16			2	1.851	3.717	0.054	0.024	-0.002	-3.903
17	9	SPR3	1	0.43	-4.577	-0.091	-0.01	0.018	-2.757
18			2	2.368	3.318	-0.194	0.037	-0.011	-6.899
19	10	SPR3	1	2.369	-3.374	0.194	-0.037	-0.011	-6.912
20			2	0.425	4.523	0.091	0.01	0.018	-2.743
21	11	SPR3	1	0.04	-4.818	-0.038	-0.005	0.01	-1.585
22			2	3.277	3.047	-0.135	0.041	-0.01	-7.984
23	12	SPR3	1	0.661	-4.235	-0.083	-0.012	0.02	-3.294
24			2	1.85	3.671	-0.188	0.036	-0.011	-6.408
25	13	SPR3	1	3.278	-3.102	0.136	-0.041	-0.01	-7.998
26			2	0.035	4.764	0.038	0.005	0.01	-1.571
27	14	SPR3	1	1.851	-3.726	0.188	-0.036	-0.011	-6.421
28			2	0.657	4.181	0.083	0.012	0.02	-3.28
29	15	SPR3	1	0.159	-4.463	0.255	-0.018	0.011	-5.572
30			2	0.156	4.41	-0.255	0.018	0.011	-5.56
31	16	SPR3	1	1.973	-3.757	-0.045	-0.027	-0.001	-4.501
32			2	1.971	3.701	0.045	0.026	-0.001	-4.487
33	17	SPR3	1	1.672	-6.756	0.147	-0.036	0.013	-7.93
34			2	1.874	6.569	-0.18	0.039	0.01	-8.395
35	18	SPR3	1	1.877	-6.624	0.18	-0.039	0.01	-8.406
36			2	1.669	6.701	-0.147	0.036	0.013	-7.919
37	19	SPR3	1	1.63	-6.782	0.153	-0.036	0.012	-7.803
38			2	1.972	6.543	-0.174	0.04	0.01	-8.515
39	20	SPR3	1	1.697	-6.719	0.148	-0.037	0.013	-7.989
40			2	1.819	6.605	-0.179	0.039	0.009	-8.339
41	21	SPR3	1	1.975	-6.598	0.174	-0.04	0.01	-8.527
42			2	1.626	6.727	-0.153	0.036	0.012	-7.792
43	22	SPR3	1	1.822	-6.66	0.179	-0.039	0.009	-8.35
44			2	1.694	6.665	-0.148	0.036	0.013	-7.978
45	23	SPR3	1	1.642	-6.745	0.186	-0.037	0.012	-8.248
46			2	1.639	6.69	-0.186	0.037	0.012	-8.237
47	24	SPR3	1	1.837	-6.664	0.153	-0.038	0.011	-8.131
48			2	1.834	6.609	-0.153	0.038	0.011	-8.119
49	25	SPR3	1	1.1	-4.332	0.153	-0.023	0.007	-5.242
50			2	1.185	4.257	0.007	0.027	-0.137	-5.449
51	26	SPR3	1	1.198	-4.491	0.075	-0.025	0.007	-5.671
52			2	1.115	4.603	-0.235	0.022	0.15	-5.413

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VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

25/36

Spreader/Moonbeam

Size W10X22 ASIF 1

Shear load on Conn.	3.36	kips		Load Case	Member	Section
Tension on Connection	0.00	kips	7.358	5	MOON13	1
Torsion on Conn.	1.10	ft-kips				
Strong Axis Moment	25.34	ft-kips				
Weak Axis Moment	0.01	ft-kips				

b_f	5.75 in	Flange width	kdes	0.66	in
d	10.2 in	Depth	k1	0.625	in
t_f	0.36 in	Flange thickness	gage	2.75	in
t_w	0.24 in		Fy	50	ksi
			Fu	65	ksi

Bolts - Loading without prying action

Number	8		First bolt	5.5	in **"A"**	$F_{t,nom}$	90 ksi
Grade	A325		Spacing	4	in **"B"**	Tightening	Fully Tightened
diameter	0.75	inch **"C"**	gage	2.75	in **GAGE**	Tb	28 kips
I_{st}	482	in^2	I_{wk}	15.125	in^2	Pt	39.76 kips
As	0.442	in^2				F_{nv}	48 ksi
fv	1.53	ksi	Vbolt =	0.67	kips		
Ft	45.00	ksi	Tbolt =	6.00	kips		
ft	13.59	ksi	**OK**	IC =	0.302		

Check Flange without stiffeners

Without Prying action:

b	1.255 in	b'	0.88 in	ρ	0.469333	p	2.75 in
a	1.5 in	a'	1.875 in	d'	0.875 in		
t_{min}	0.444 in	**Need to Check Prying Action**					

With Prying Action:

δ	0.682	B	19.88 kips	β	4.924023
α'	1				
t_{min}	0.342 in	**Flange OK without Stiffeners for Bolt Tension Considerations**			

Add 3/8" Full Depth Stiffeners for torsional continuity and erection purposes

Check Uprights with Stiffeners - Model as stiffened extended end plate connection

t_f'	0.375 in (Stiffener thickness)			s	1.988247 in
b_f'	5.75 in (Use stiffeners extending to end of spreader/moonbeam			h	15.375 in
d_e'	2 in	$p_{f,i} = p_{f,o}$=	1.8125 in	p_{ext}	3.800747 in
h_i	13.1875 in	h_o	17.1875 in	Y	176.2121
d_i	13 in	d_o	17 in		

Find Effective Moment in "Plate"	$T_{bolt,Mstrong}$	5.99 k/bolt	$T_{bolt,rem}$	0.01	k/bolt
	M_{add}	0.06 ft-kips	M_{nom}	25.40	ft-kips
	$M_{u,eff}$	38.09 ft-kips			

Thin End Plate procedure

$t_{p,req'd}$ 0.240 in **OK, Use Stiffeners** IC = 0.44482

Check Bolt Rupture with Prying Action

w'	2.0625 in	a_i	0.3222	F_i'	5.715558 kips	$Q_{max,i}$	9.994634 kips
		a_o	0.3222	F_o'	5.715558 kips	$Q_{max,o}$	9.994634 kips

ϕM_q=max(	111.62 ft-kips	ϕM_q =	111.62 ft-kips
	108.75 ft-kips		**OK for Bolt Rupture with Prying Action**
	107.87 ft-kips	M_u =	38.09 ft-kips
	105.00 ft-kips		

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JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

26/36

Spreader/Moonbeam

Size W10X22 ASIF 1

Shear load on Conn.	3.36	kips		Load Case	Member	Section	
Tension on Connection	0.00	kips	7.358	5	MOON13	1	
Torsion on Conn.	1.10	ft-kips					
Strong Axis Moment	25.34	ft-kips					
Weak Axis Moment	0.01	ft-kips					

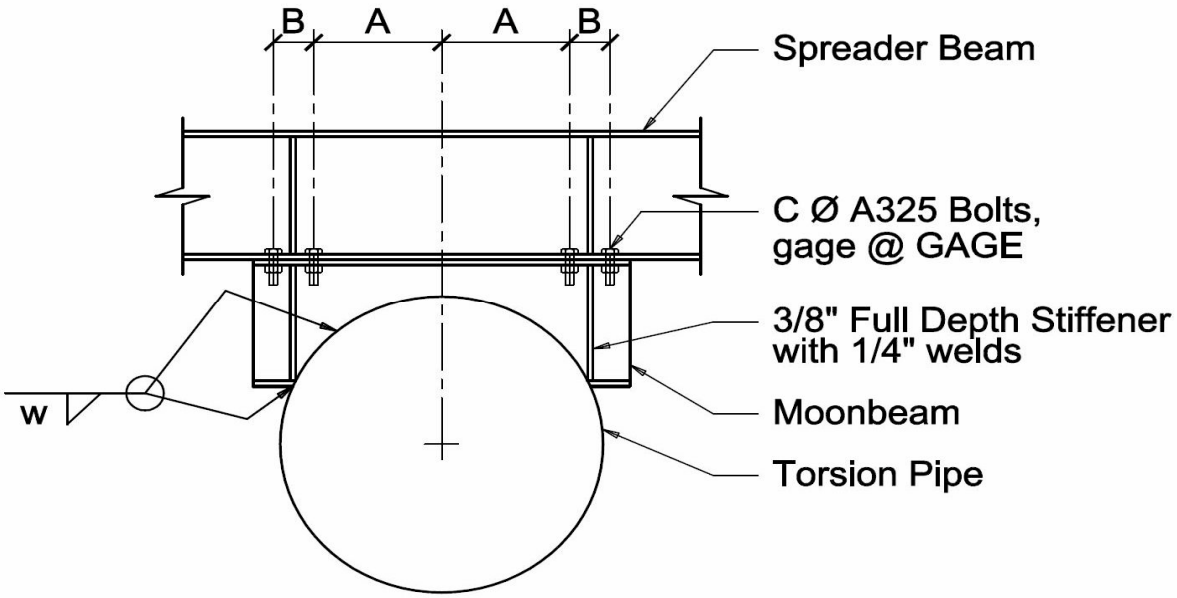
b_f	5.75	in	Flange width	kdes	0.66	in	
d	10.2	in	Depth	k1	0.625	in	
t_f	0.36	in	Flange thickness	gage	2.75	in	
t_w	0.24	in		Fy	50	ksi	
				Fu	65	ksi	

Bolts - Loading without prying action

Number	8		First bolt	5.5	in **"A"**	$F_{t,nom}$	90	ksi
Grade	A325		Spacing	4	in **"B"**	Tightening	Fully Tightened	
diameter	0.75	inch **"C"**	gage	2.75	in **GAGE**	Tb	28	kips
I_{st}	482	in^2	I_{wk}	15.125	in^2	Pt	39.76	kips
As	0.442	in^2				F_{nv}	48	ksi
fv	1.53	ksi		Vbolt =	0.67	kips		
Ft	45.00	ksi		Tbolt =	6.00	kips		
ft	13.59	ksi	OK	IC =	0.302			

Check Panel Zone Shear - Using "Factored" ASD loads to be consistent with DG 16 checks
Factored "Flange Force" 30.48 kips ("Flange Force" is applied through the stiffeners, based on Mu,eff)
Assume Pr < 0.4*Pc for the spreader (this shape is governed by bending moments, not axial loads)

Rn	73.44	kips	ϕ	0.9	ϕRn	66.10 kips
					IC	0.461 OK



Company :
Designer :
Job Number :
Model Name :

11/13/2023
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27/36

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-ft]	z-z Moment[k-ft]
1	1	MOON14	1	1.08	-0.069	1.654	1.72	-0.596	-0.057
2			2	1.08	-0.069	1.654	1.72	0.507	-0.011
3	1	MOON13	1	7.358	-0.021	2.102	1.829	-7.836	0.028
4			2	7.358	-0.021	2.102	1.829	-6.434	0.042
5	1	MOON12	1	8.416	0.301	1.985	-1.414	-6.615	0.339
6			2	8.416	0.301	1.985	-1.414	-5.292	0.139
7	1	MOON11	1	-0.19	1.581	1.105	-4.73	-6.163	1.213
8			2	-0.19	1.581	1.105	-4.73	-5.427	0.159
9	2	MOON14	1	1.081	-0.069	-1.702	-1.697	4.113	-0.057
10			2	1.081	-0.069	-1.702	-1.697	2.978	-0.011
11	2	MOON13	1	7.359	-0.021	-2.054	-1.817	18.815	0.028
12			2	7.359	-0.021	-2.054	-1.817	17.446	0.042
13	2	MOON12	1	8.413	0.301	-2.075	1.41	16.344	0.339
14			2	8.413	0.301	-2.075	1.41	14.961	0.138
15	2	MOON11	1	-0.19	1.581	-1.105	4.728	7.991	1.213
16			2	-0.19	1.581	-1.105	4.728	7.255	0.159
17	3	MOON14	1	1.088	-0.093	2.772	1.88	-3.115	-0.074
18			2	1.088	-0.093	2.772	1.88	-1.267	-0.012
19	3	MOON13	1	7.356	-0.046	3.414	1.109	-14.281	0.011
20			2	7.356	-0.046	3.414	1.109	-12.005	0.041
21	3	MOON12	1	8.405	0.308	1.109	-2.977	-7.304	0.345
22			2	8.405	0.308	1.109	-2.977	-6.565	0.14
23	3	MOON11	1	-0.186	1.646	-0.452	-3.912	3.308	1.268
24			2	-0.186	1.646	-0.452	-3.912	3.006	0.171
25	4	MOON14	1	1.085	-0.066	-0.069	0.864	1.715	-0.055
26			2	1.085	-0.066	-0.069	0.864	1.669	-0.01
27	4	MOON13	1	7.352	-0.011	1.341	1.736	-1.801	0.035
28			2	7.352	-0.011	1.341	1.736	-0.907	0.043
29	4	MOON12	1	8.428	0.321	3.419	-0.144	-6.94	0.35
30			2	8.428	0.321	3.419	-0.144	-4.661	0.136
31	4	MOON11	1	-0.202	1.572	2.145	-5.037	-14.066	1.198
32			2	-0.202	1.572	2.145	-5.037	-12.636	0.149
33	5	MOON14	1	1.091	-0.093	-2.821	-1.857	6.66	-0.074
34			2	1.091	-0.093	-2.821	-1.857	4.78	-0.012
35	5	MOON13	1	7.358	-0.045	-3.364	-1.095	25.336	0.011
36			2	7.358	-0.045	-3.364	-1.095	23.093	0.041
37	5	MOON12	1	8.401	0.308	-1.2	2.975	17.059	0.345
38			2	8.401	0.308	-1.2	2.975	16.259	0.14
39	5	MOON11	1	-0.187	1.646	0.453	3.91	-1.526	1.268
40			2	-0.187	1.646	0.453	3.91	-1.225	0.171
41	6	MOON14	1	1.083	-0.066	0.021	-0.842	1.769	-0.055
42			2	1.083	-0.066	0.021	-0.842	1.783	-0.01
43	6	MOON13	1	7.354	-0.012	-1.293	-1.726	12.707	0.035
44			2	7.354	-0.012	-1.293	-1.726	11.845	0.043
45	6	MOON12	1	8.428	0.321	-3.508	0.138	16.647	0.35
46			2	8.428	0.321	-3.508	0.138	14.308	0.136
47	6	MOON11	1	-0.202	1.572	-2.145	5.034	15.94	1.197
48			2	-0.202	1.572	-2.145	5.034	14.509	0.149
49	7	MOON14	1	-0.351	-0.249	-0.026	0.006	1.654	-0.194
50			2	-0.351	-0.249	-0.026	0.006	1.636	-0.028
51	7	MOON13	1	8.3	-0.551	0.028	0.003	5.277	-0.336
52			2	8.3	-0.551	0.028	0.003	5.296	0.032
53	7	MOON12	1	7.166	-0.95	-0.045	0	4.616	-0.538
54			2	7.166	-0.95	-0.045	0	4.586	0.095
55	7	MOON11	1	1.547	-3.154	0	0	0.953	-1.828
56			2	1.547	-3.154	0	0	0.953	0.275

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JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

28/36

Head Plate Connection Design

Design Loads

Mx	59.1 ft-kips	(about torsion pipe CL)
My	52.3 ft-kips	(torsion)
Mz	20.7 ft-kips	(perp to TP)
Px	1.8 kips	
Py	. kips	(use only for tension)
Pz	6.9 kips	

Total Number of Bolts: 12
X axis
- Spacing of Bolts: 4
- Distance to first bolt: 6.5

Z axis (stronger axis, if applicable)
- Spacing of Bolts: 4
- Distance to first bolt: 6.5

10

LC	Member	Section
5	HC1	2

Ix	1051 in^2	c_x	10.5 in
Iz	1051 in^2	c_z	10.5 in
J = Ix + Iz	2102 in^2	C	14.85 in

Bolt Design Checks

Tx	7.082015 k/bolt			Bolt Grade	A325
Tz	2.47804 k/bolt	Ttotal	9.560055 kips	Bolt diam	0.75
Tadd	0 k/bolt			ft	21.64 ksi
Vtotal	5.027627 k/bolt			fv	11.38 ksi

ASIF 1

Fnt 90 Pt 39.76078 Ft 37.16209 ksi IC= 0.582 Therefore OK
Fnv 48 Tb 28

Tightening: Fully Tightened

0.75" Ø A325 Bolts OK

Head Plate Design Checks

Col Diam 20.0 in

Fy_{Plate}	36 ksi	Fu	58 ksi	t_{plate}	0.75 in	B	26	N 26
Thickness to prevent Prying action:					B,N min		23.25	23.25
b	1.75 in	b'	1.375 in	ρ	0.536585366	p	4.0 in	
a	2.1875 in	a'	2.5625 in	d'	0.875 in	δ	0.796875	
tmin	0.614 in	Plate OK - No Prying Action		β	1.336830364	α'	1	

0.75" Plate Thickness OK 0.458608

Gussets

a = 8 b = 6 z = 0.348906 **Use 1/2" Gussets 8" x Fit, 2 per corner**

T_{gusset}	13.39607 kips	$t_{req'd}$	0.296254	t_{gusset}	0.5
M_{gusset}	43.41936 in-kips	$\tau_{req'd}$	0.188452	ℓ_{weld}	0.25 Each Side

Tw 2.658328 k/in Vw 0.956862 k/in Net 2.825295 k/in θ 70.20372084 deg Factor 1.456339 0.130666

Connection Beams

Size W21X57 ASIF 1

b_f	6.56 in	Flange width	k	1.15 in	
d	21.1 in	Depth	k1	0.8125 in	
t_f	0.65 in	Flange thickness	g	4 in	
t_w	0.405 in		Fy	50 ksi	
			Fu	65 ksi	

Check Flange without stiffeners

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

29/36

Head Plate Connection Design

Without Prying action:

b	1.7975 in	b'	1.4225 in	ρ	0.859516616	p	3.28 in
a	1.28 in	a'	1.655 in	d'	0.875 in		
t_{min}	0.652 in	Need to Check Prying Action					

With Prying Action:

δ	0.733	B	16.42 kips	β	0.834566309
α'	1				
t_{min}	0.495 in	Flange OK without Stiffeners for Bolt Tension Considerations			

Check Flange with Stiffeners - Model as stiffened extended end plate connection

t_f'	0	in (Stiffener thickness)		s	2.56125 in		
b_f'	6.56	in (Use stiffeners extending to end of spreader/moonbean				h	17 in
d_e'	1.3125	in	$p_{f,i} = p_{f,o}$=	2 in	p_{ext}	4.561249695	in
h_i	15 in		h_o	19 in	Y	152.8134315	
d_i	15 in		d_o	19 in			

Find Effective Moment in "Plate" when modeling connection beam as a beam with stiffened extended end plate

T_{bolt}	9.56 kips	$M_{nom,\ eff}$	54.17 ft-kips
$M_{u,eff}$	81.26 ft-kips		

Thin End Plate procedure

$t_{p,req'd}$	0.377 in	OK, No Stiffeners Required from above	IC =	0.335629

Check Bolt Rupture with Prying Action

w'	2.4675 in	a_i	2.311846	F_i'	14.43844 kips	$Q_{max,i}$	5.355737 kips
		a_o	2.311846	F_o'	14.43844 kips	$Q_{max,o}$	5.355737 kips

$\phi M_{q=}$max(	146.22 ft-kips	ϕM_q =	146.22 ft-kips
	134.21 ft-kips		OK for Bolt Rupture with Prying Action
	131.01 ft-kips	M_u =	81.26 ft-kips
	119.00 ft-kips		**Use W21X57 Conn. Beams w/o Gussets**

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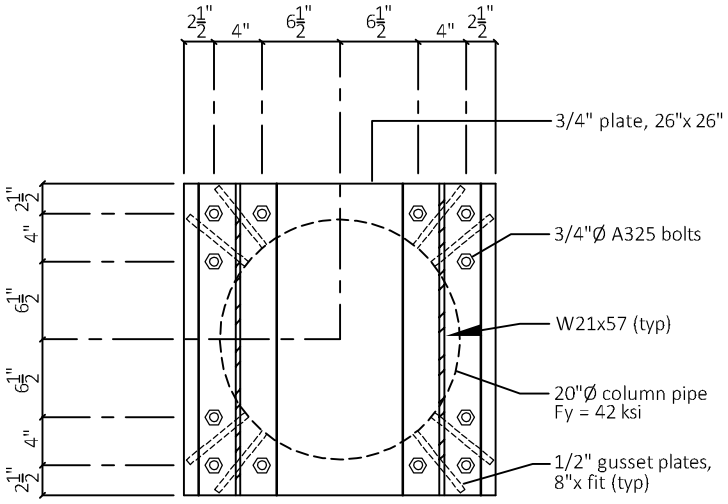
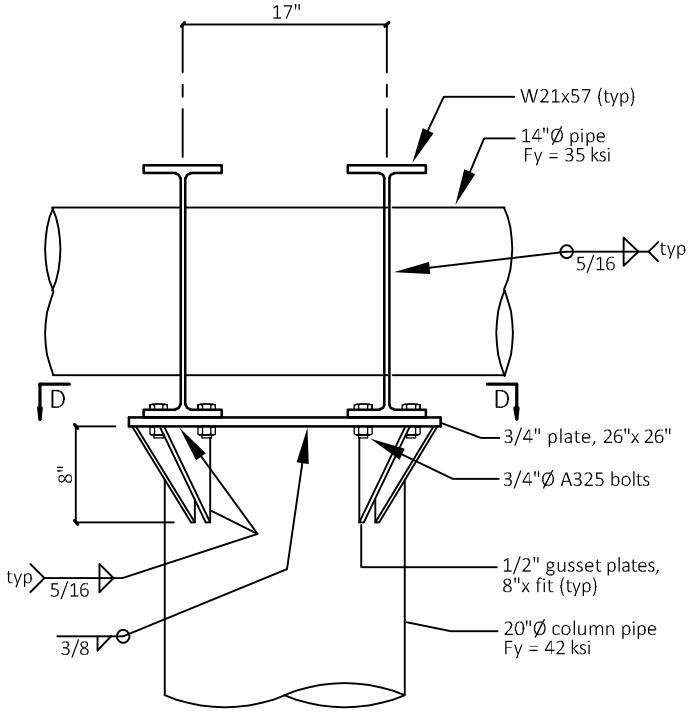


SECTION D-D



COLUMN CONNECTION DETAIL

Company :
Designer :
Job Number :
Model Name :

11/13/2023
6:08:27 PM
Checked By : _____

31/36

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-ft]	z-z Moment[k-ft]
1	1	HC1	1	18.517	-1.782	6.847	-11.353	25.204	18.516
2			2	18.517	-1.782	6.874	-11.353	32.636	20.447
3	2	HC1	1	18.517	-1.782	-6.918	11.314	-51.309	18.548
4			2	18.517	-1.782	-6.944	11.314	-58.818	20.479
5	3	HC1	1	18.517	-1.806	6.84	-52.302	25.384	18.648
6			2	18.517	-1.806	6.866	-52.302	32.808	20.605
7	4	HC1	1	18.517	-1.806	6.839	29.34	25.079	18.656
8			2	18.517	-1.806	6.866	29.34	32.503	20.612
9	5	HC1	1	18.517	-1.806	-6.911	52.261	-51.572	18.714
10			2	18.517	-1.806	-6.937	52.261	-59.073	20.67
11	6	HC1	1	18.517	-1.806	-6.91	-29.381	-51.101	18.652
12			2	18.517	-1.806	-6.936	-29.381	-58.601	20.608
13	7	HC1	1	18.517	4.902	-0.034	0.071	-12.525	-17.721
14			2	18.517	4.929	-0.034	0.071	-12.561	-23.046
15	8	HC1	1	18.517	-4.951	-0.036	-0.068	-13.318	35.526
16			2	18.517	-4.977	-0.036	-0.068	-13.357	40.903
17	9	HC1	1	20.479	-1.793	6.916	-11.336	39.343	18.583
18			2	20.479	-1.793	6.943	-11.336	46.85	20.525
19	10	HC1	1	20.479	-1.793	-6.911	11.338	-37.736	18.584
20			2	20.479	-1.793	-6.938	11.338	-45.238	20.526
21	11	HC1	1	20.479	-1.816	6.909	-52.284	39.572	18.735
22			2	20.479	-1.816	6.936	-52.284	47.071	20.702
23	12	HC1	1	20.479	-1.816	6.908	29.358	39.164	18.704
24			2	20.479	-1.816	6.934	29.358	46.662	20.672
25	13	HC1	1	20.479	-1.816	-6.904	52.286	-37.959	18.732
26			2	20.479	-1.816	-6.931	52.286	-45.453	20.699
27	14	HC1	1	20.479	-1.816	-6.903	-29.356	-37.563	18.709
28			2	20.479	-1.816	-6.93	-29.356	-45.055	20.677
29	15	HC1	1	20.479	4.922	0.002	-0.005	0.771	-17.913
30			2	20.479	4.948	0.002	-0.005	0.774	-23.259
31	16	HC1	1	20.479	-4.975	0.002	0.004	0.82	35.693
32			2	20.479	-5.002	0.002	0.004	0.822	41.097
33	17	HC1	1	32.7	-0.266	0.779	-1.238	5.142	15.277
34			2	32.7	-0.266	0.782	-1.238	5.988	15.566
35	18	HC1	1	32.7	-0.266	-0.771	1.236	-3.515	15.278
36			2	32.7	-0.266	-0.774	1.236	-4.352	15.566
37	19	HC1	1	32.7	-0.269	0.778	-5.667	5.144	15.289
38			2	32.7	-0.269	0.781	-5.667	5.989	15.581
39	20	HC1	1	32.7	-0.269	0.778	3.165	5.127	15.297
40			2	32.7	-0.269	0.781	3.165	5.972	15.589
41	21	HC1	1	32.7	-0.269	-0.771	5.665	-3.516	15.289
42			2	32.7	-0.269	-0.773	5.665	-4.352	15.581
43	22	HC1	1	32.7	-0.269	-0.77	-3.167	-3.5	15.298
44			2	32.7	-0.269	-0.773	-3.167	-4.336	15.589
45	23	HC1	1	32.7	0.487	0.004	-0.002	0.81	11.122
46			2	32.7	0.489	0.004	-0.002	0.814	10.593
47	24	HC1	1	32.7	-0.624	0.004	-0.001	0.816	17.247
48			2	32.7	-0.626	0.004	-0.001	0.82	17.924
49	25	HC1	1	22.145	-1.755	-0.001	-10.664	-0.37	19.08
50			2	22.145	-1.755	-0.001	-10.664	-0.371	20.981
51	26	HC1	1	22.145	1.692	-0.001	10.651	-0.376	0.304
52			2	22.145	1.692	-0.001	10.651	-0.378	-1.529

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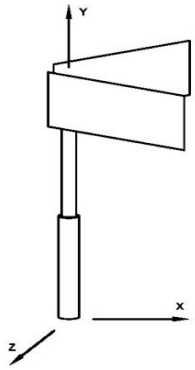
CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

Inputs

Overall Height:	30 ft				
Building Code:	2021 International Building Code				
Wind:	98 mph	Exp.	C		
Sign Height	10.00 ft	**Vee (Wide End)**	21.00 ft	**Point**	6.00 ft
Sign Width	30.00 ft	**Flag (CL Face to CL Column)**	0.00 ft	θ	14.036
Apron (plus extra)	2.50 ft	**Offset (CL torsion to CL Col.)**	0.95 ft		



Loads Applied to Sign

Wind Pressure	18.18 psf	Factor	1
ASCE Wind Pressure	18.178598	(uses ASCE 7 Case B - governing)	
ω	1	Iw =	1

Fundamental Period Determination - per ASCE §15.4.4

$$T = 2\pi\sqrt{\frac{\sum_{i=1}^{n} w_i\delta_i^2}{g\sum_{i=1}^{n} f_i\delta_i}}$$

$\sum_{i=1}^{n} w_i\delta_i^2 =$ 0.134786157 T = 0.64513036 sec

$\sum_{i=1}^{n} f_i\delta_i =$ 0.033088185 f = 1.5500743 Hz

Case A & B Column Loading Conditions

Loads at base of head

Pz	Px	Py (head weight)	Mx	My	Mz
6.61 k	1.66 k	17.61 k	58.1 ft-k	50.9 ft-k	10.4 ft-k

h-bar$_{Mx}$	h-bar$_{Mz}$	h-bar$_{My}$	r$_{equiv}$	length$_{equiv}$
8.79 ft	6.25 ft	7.70 ft	0.00 in	0.00 ft

Column 1

Length	Fy	Diam	Width$_{eff}$	Length$_{exp}$	Lb	Total length	t
17.50 ft	42 ksi	20.000 in	1.33 ft	17.50 ft	17.50 ft	32	0.438 in

Height Above Grade	Pz	Px	Py (axial load)	Mx	My	Mz	IC
0.00 ft	7.04 k	1.66 k	19.21 k	177.6 ft-k	50.9 ft-k	39.5 ft-k	0.5983648

h-bar$_{Mx}$	h-bar$_{Mz}$	h-bar$_{My}$	r$_{equiv}$	length$_{equiv}$	Total weight this pipe
25.23 ft	23.75 ft	7.23 ft	6.93 in	17.50 ft	2.93 k

B_1	1.0040	B_2	1.0177	$B_2(Mx_{tot})$	180.7 ft-k	$B_2(Mz_{tot})$	40.2 ft-k

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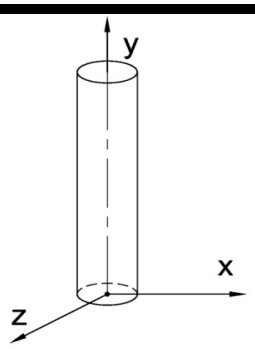
CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

33/36

Column Pipe 1

Good to 30 ft overall height



Pr	20.076	kips	(axial)		
Mrx	181.43	ft-kips	(WL)	10	
Mry	52.261	ft-kips	(torsion)		
Mrz	51.454	ft-kips	(DL)	LC	5
Mres	188.5852	ft-kips		Member	Col1
Vres	7.44886	kips		Section	2

IC Gov 0.598

Pipe Properties

E (ksi)	Fy (ksi)	Diameter D (in)	Ins. Diam. D_1 (in)	Wall thick-ness t (in)	t_{eff} (in)	D/t	rad. of gyr. r (in)	Weight (lb/ft)
29000	42	20	19.18625	0.4375	0.406875	49.16	6.93	91.49

Area A (in^2)	I (ksi)	S (in^3)	Z (in^3)	J (in^4)	C (in^3)	Bending Compact?	Axial Compact?
25.04	1202.3	120.2	156.2	2404.6	240.5	Noncompact	Compact

λ_p bending 48.33 λ_r bending 214.05
λ_p axial - λ_r axial 75.95

Axial Checks

r_{eff} from above (in)	Length above (for r) (ft)	Length of this pipe (ft)	Total Length (ft)	r_{eff} (in)	K_2	Kl/r	Fe (ksi)
0.00	0	17.5	17.5	6.92868206	2.1	63.6484682	70.651572

Ω_c 1.67

Flexural buckling Limit State Q=1.0
Q=Qa ??
F_{cr} 32.74844 ksi "Fa" 19.609846 ksi
P_n/Ω_c = 491.121302 kips

Flexure

Ω_b 1.67 D/t max 310.714286
Applicable Limit States: Yielding, Local Buckling

Yielding
"Fb" = 32.67717 ksi (= Fy/Ωb*Z/C) M_n/Ω_b = 326.313742 ft-kips

Local Buckling
"Fb" = 32.56847

Torsion and Shear

Shear yielding and shear buckling
Ω_v 1.67
F_{cr}/Ω_v = "Fv" = 15.08982 $V_c = V_n/\Omega_v$ 188.95947 kips

Torsion
Ω_T 1.67
F_{cr}/Ω_T = "Fv_T" = 15.08982 $T_c = T_n/\Omega_T$ 302.376944 ft-kips

Identity Checks

H1:
Pr/Pc 0.040878 Use H1-1b

IC = 0.598365 H1-1b

H3
Tr/Tc 0.172834 Need Not consider Torsion Effects, use H1 only
IC = 0.663856

USE 20" diam x 0.438" thick, Fy = 42 ksi

Company :
Designer :
Job Number :
Model Name :

11/13/2023
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Member Section Forces

34/36

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-ft]	z-z Moment[k-ft]
1	1	Col1	1	18.517	-1.744	6.785	-11.353	32.636	20.447
2			2	20.076	-1.744	7.207	-11.353	154.478	50.827
3	2	Col1	1	18.517	-1.744	-6.821	11.314	-58.818	20.479
4			2	20.076	-1.744	-7.244	11.314	-181.301	50.861
5	3	Col1	1	18.517	-1.767	6.777	-52.302	32.808	20.605
6			2	20.076	-1.767	7.199	-52.302	154.521	51.388
7	4	Col1	1	18.517	-1.767	6.777	29.34	32.503	20.612
8			2	20.076	-1.767	7.199	29.34	154.209	51.395
9	5	Col1	1	18.517	-1.768	-6.814	52.261	-59.073	20.67
10			2	20.076	-1.768	-7.236	52.261	-181.43	51.454
11	6	Col1	1	18.517	-1.767	-6.814	-29.381	-58.601	20.608
12			2	20.076	-1.767	-7.236	-29.381	-180.947	51.391
13	7	Col1	1	18.517	4.865	-0.018	0.071	-12.561	-23.046
14			2	20.076	5.287	-0.018	0.071	-12.869	-111.458
15	8	Col1	1	18.517	-4.89	-0.019	-0.068	-13.357	40.903
16			2	20.076	-5.313	-0.019	-0.068	-13.684	129.754
17	9	Col1	1	20.479	-1.75	6.823	-11.336	46.85	20.525
18			2	22.038	-1.75	7.245	-11.336	169.362	51.01
19	10	Col1	1	20.479	-1.75	-6.821	11.338	-45.238	20.526
20			2	22.038	-1.75	-7.243	11.338	-167.706	51.011
21	11	Col1	1	20.479	-1.774	6.816	-52.284	47.071	20.702
22			2	22.038	-1.774	7.238	-52.284	169.456	51.592
23	12	Col1	1	20.479	-1.773	6.815	29.358	46.662	20.672
24			2	22.038	-1.773	7.237	29.358	169.037	51.56
25	13	Col1	1	20.479	-1.774	-6.813	52.286	-45.453	20.699
26			2	22.038	-1.774	-7.235	52.286	-167.795	51.588
27	14	Col1	1	20.479	-1.773	-6.813	-29.356	-45.055	20.677
28			2	22.038	-1.773	-7.235	-29.356	-167.387	51.565
29	15	Col1	1	20.479	4.877	0.001	-0.005	0.774	-23.259
30			2	22.038	5.299	0.001	-0.005	0.795	-111.883
31	16	Col1	1	20.479	-4.905	0.001	0.004	0.822	41.097
32			2	22.038	-5.327	0.001	0.004	0.845	130.204
33	17	Col1	1	32.7	-0.228	0.759	-1.238	5.988	15.566
34			2	34.259	-0.228	0.805	-1.238	19.601	19.534
35	18	Col1	1	32.7	-0.228	-0.755	1.236	-4.352	15.566
36			2	34.259	-0.228	-0.801	1.236	-17.895	19.535
37	19	Col1	1	32.7	-0.23	0.758	-5.667	5.989	15.581
38			2	34.259	-0.23	0.804	-5.667	19.587	19.594
39	20	Col1	1	32.7	-0.23	0.758	3.165	5.972	15.589
40			2	34.259	-0.23	0.804	3.165	19.57	19.602
41	21	Col1	1	32.7	-0.23	-0.754	5.665	-4.352	15.581
42			2	34.259	-0.23	-0.8	5.665	-17.88	19.594
43	22	Col1	1	32.7	-0.23	-0.754	-3.167	-4.336	15.589
44			2	34.259	-0.23	-0.8	-3.167	-17.863	19.602
45	23	Col1	1	32.7	0.507	0.002	-0.002	0.814	10.593
46			2	34.259	0.553	0.002	-0.002	0.849	1.358
47	24	Col1	1	32.7	-0.578	0.002	-0.001	0.82	17.924
48			2	34.259	-0.624	0.002	-0.001	0.855	28.39
49	25	Col1	1	22.145	-1.709	-0.001	-10.664	-0.371	20.981
50			2	23.844	-1.709	-0.001	-10.664	-0.383	50.738
51	26	Col1	1	22.145	1.676	-0.001	10.651	-0.378	-1.529
52			2	23.844	1.676	-0.001	10.651	-0.388	-30.715

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CLIENT MEADOW OUTDOOR
VOSS NO. 23-130-532
JOB 2848 Broadway St
DATE 11/13/2023 ENG. FV

35/36

Augered Footings

Inputs

Building Code 2021 International Building Code

Augered Foundation Calculations

Inputs	
Moment (ft k)	188.5852
Total Shear (k)	7.44886
Depth (ft)	15
Depth of ignore (ft)	0
Dia (ft)	3

WIND INCREASE
1

soil bearing 150 psf/ft

Outputs	
H (ft)	25.31732
S allowable (ksf)	1.50
S Required (ksf)	1.23

1.5

0.820453 0.820453

Concrete Vol (cu yd) 3.926991

Use 3 ft diam. x 15 ft deep drilled foundation

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JOB 2848 Broadway St
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36/36

Augered Footings

Inputs

Building Code 2021 International Building Code

Augered Foundation Calculations

Inputs	
Moment (ft k)	183.7445
Total Shear (k)	7.231503
Depth (ft)	9
Depth of ignore (ft)	0
Dia (ft)	9.899495

WIND INCREASE	LBIF	Limit S1 to 12'?
1	2	Yes

	side 1	Side 2
	7	7

soil bearing 150 psf/ft

Outputs	
H (ft)	25.40889
S1	0.9
A	1.899279
d req'd	8.26

0.843185

Concrete Vol (cu yd) 25.65634

USE 1'X1'X9' DEEP BACKHOE FOUNDATION (ALTERNATE)