# Structural Calculations

# Mercer Island High School
## 80' Communication Tower

**SESEA00387B Mercer Island**
Atop the Theater Building
9100 S.E. 42nd Street
Mercer Island, WA 98040
King County

Sidesway Project No. 21052.05

**Results Summary: Sufficient Capacity**

Prepared By:

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40785
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

07/10/24

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## Project Description

Sidesway Engineering was retained by Day Wireless to analyze the existing 80' communication tower located atop the roof of the high school theater building at 9100 S.E. 42nd Street on Mercer Island. Dish Wireless is proposing to add a 2'ø microwave dish to their recent 2022 panel antenna installation at the top of the tower.

The tower was designed by Rohn and was placed atop the new theater building constructed in 1998. The original tower and building drawings were obtained and the drawings indicated that the building design accounted for the tower with additional framing and details specific to the tower installation. Our analysis was performed based on the information within the original design documents, which included geometry, member sizes, and material strengths.

## Tower Loading

The appurtenance loading utilized in this analysis is summarized in the table below. This represents the antennas that currently exist on the tower and the proposed Dish Wireless equipment. Mount elevations represent the centerline of the mount system relative to grade.

| Mount Elev. | Qty | Equipment | Qty | Feedline | Comments |
|---|---|---|---|---|---|
| 135' | 3<br>3<br>3<br>1 | Commscope FFVV-65A-R2-V1 Panels<br>Samsung RF4450T-71A RRUs<br>Samsung RF4451D-70A RRUs<br>Raycap RDIDC-9181-PF-48 | 1 | 1.6"ø Hybrid | Existing (Dish) |
| 135' | 1 | Commscope VHLP2-18 MW Dish | 1 | $^1/_2$" | Proposed (Dish) |
| 119' | 1 | 4-Bay Single Dipole on 2' Standoff | 1 | $^1/_2$" | Existing |
| 105' | 1 | Shively Model 6812B 2-Bay<br>Half Wave FM Antenna | 1 | $1^5/_8$" | Existing (M.I.) |
| 77' | 1 | 4-Bay Single Dipole on 2' Standoff | 1 | $^1/_2$" | Existing |

## Tower Design Criteria

A rigorous analysis was performed to determine if the tower is compliant with the current design standard, ANSI/TIA-222-H "Structural Standard for Antenna Supporting Structures, Antennas, and Small Wind Turbine Structures." The wind and seismic parameters used in our analysis are listed below. These represent the most stringent requirements of either the local jurisdiction or Annex B in the ANSI/TIA-222-H Standard. The tower is a Class III structure since it is located atop a school.

Wind Analysis Criteria:
Basic wind speed w/o ice = 105 mph
Basic wind speed w/ ice = 30 mph
Serviceability wind speed = 60 mph
Ice thickness (escalating) = 1.00"
Exposure = B
Topographic Category 5 (H = 350')

Seismic Analysis Criteria:
$S_{DS}$ = 0.941
$S_{D1}$ = 0.592
R = 3.0
Site Class 'D' Soils
I = 1.25

## Tower Analysis Results

The table on the following page summarizes our analysis results. The table expresses the actual stress levels in percentage form relative to what code allows. Stress levels of up to 105% are considered to be acceptable based on the provisions within the existing structures portion of the code. Stress levels higher than 105% require upgrades to the tower or modifications to the loading considered. Refer to the attached computer output for a complete stress summary.


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| Stress Summary | | |
|---|---|---|
| Load Combination | Legs | Diagonals |
| Proposed Antenna Configuration | 99% | 94% |

Please note that our analysis was for the primary structure alone. The connection of the antennas to the mounts, the mounts themselves, and the mount connections to the tower were excluded from our scope of work.

### Tower Reaction Summary

The original design loads provided by Rohn are listed in the table below and our calculated reactions are listed beside those for reference. We determined that all of the proposed tower reactions are less than the original design loads primarily due to changes in the building code from the time of the original design to present.

| Reaction Summary | | |
|---|---|---|
| | Rohn Design | Proposed Reactions |
| Leg Compression | 59.3 kips | 49.6 kips |
| Leg Tension | 56.8 kips | 44.5 kips |
| Tower Shear | 5.1 kips | 3.8 kips |
| Tower OTM | 228.8 kip-ft | 190.0 kip-ft |

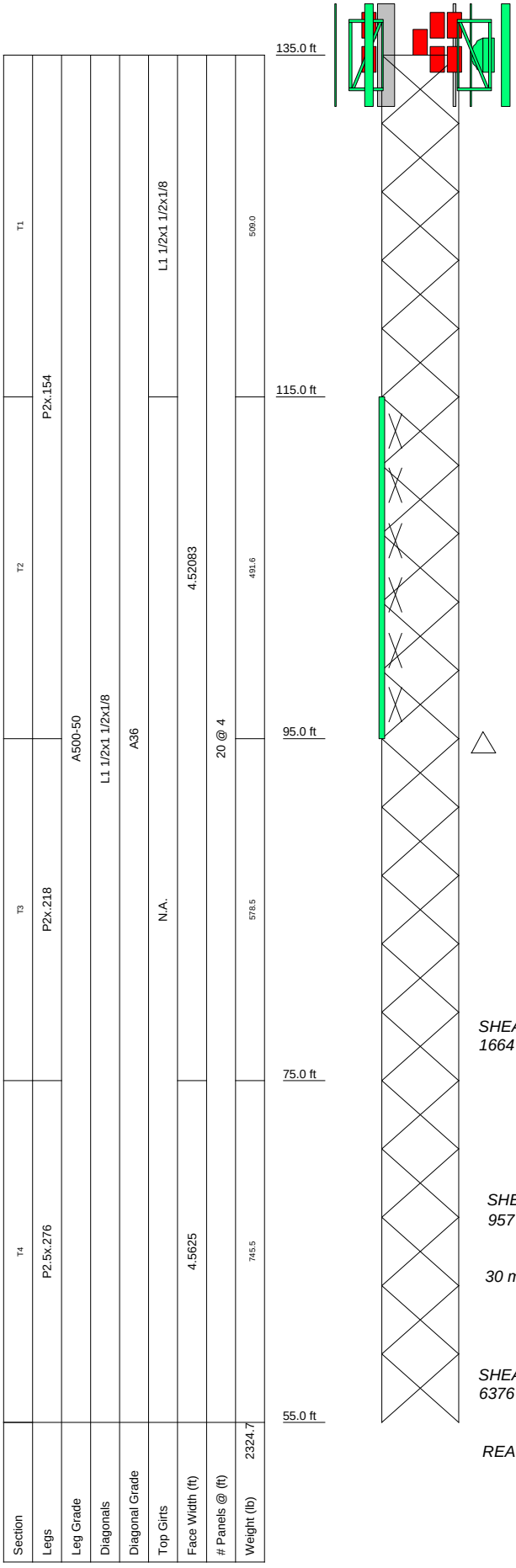
Because all of the existing reactions remain less than the design loads, the roof framing and building structural systems should be adequate as originally designed with no further analysis required as allowed by provisions within the International Existing Building Code. Furthermore, our 2022 analysis for the initial Dish collocation included analysis of the building elements and found that the maximum stressed member was at 85% capacity. The proposed reactions have increased negligibly by 2-3%, thus the building framing is adequate by inspection.

### Conclusions

We have determined that the existing tower and theater structure below can adequately support the proposed Dish Wireless microwave dish in conformance with applicable code requirements. All tower and roof framing are sufficient for the applied loads and are in conformance with the 2021 IBC and IEBC.

### Disclaimer

This structural evaluation was based on the limited documentation that was available to us. Sidesway Engineering did not perform an as-built to verify the accuracy of the building and tower information. We assume the structures were properly constructed and have been maintained to the minimum standards required by code. We assume there to be no known deterioration or damage that would adversely affect structural capacity.




## DESIGNED APPURTENANCE LOADING

| TYPE | ELEVATION | TYPE | ELEVATION |
|---|---|---|---|
| FFVV-65A-R2-V1 w/ 6' Pipe Mount (Dish) | 135 | 6' Pipe Mount (Dish) | 135 |
| | | 5' T-Frame (Dish) | 135 |
| RF4450T-71A (Dish) | 135 | RDIDC-9181-PF-48 w/ 4' Pipe Mount (Dish) | 135 |
| RF4451D-70A (Dish) | 135 | | |
| 6' Pipe Mount (Dish) | 135 | VHLP2-18 (Dish) | 135 |
| 5' T-Frame (Dish) | 135 | EQ4 | 125 |
| FFVV-65A-R2-V1 w/ 6' Pipe Mount (Dish) | 135 | DB411-B | 119 |
| | | 4' Standoff Pipe Frame | 119 |
| RF4450T-71A (Dish) | 135 | 6812B-2 (Half-Wave) (Mercer Island H.S.) | 115 - 95 |
| RF4451D-70A (Dish) | 135 | | |
| 6' Pipe Mount (Dish) | 135 | EQ3 | 105 |
| 5' T-Frame (Dish) | 135 | EQ2 | 85 |
| FFVV-65A-R2-V1 w/ 6' Pipe Mount (Dish) | 135 | 4' Standoff Pipe Frame | 77 |
| | | DB411-B | 77 |
| RF4450T-71A (Dish) | 135 | EQ1 | 65 |
| RF4451D-70A (Dish) | 135 | | |

## MATERIAL STRENGTH

| GRADE | Fy | Fu | GRADE | Fy | Fu |
|---|---|---|---|---|---|
| A500-50 | 50 ksi | 62 ksi | A36 | 36 ksi | 58 ksi |

## TOWER DESIGN NOTES

1. Tower is located in King County, Washington.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 105 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 30 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category III.
7. Topographic Category 5 with Crest Height of 350'
8. TOWER RATING: 98.9%

*ALL REACTIONS ARE FACTORED*

*MAX. CORNER REACTIONS AT BASE:*
*DOWN: 81821 lb*
*SHEAR: 3612 lb*

*UPLIFT: -74302 lb*
*SHEAR: 3425 lb*

*AXIAL 5889 lb*
*SHEAR 1664 lb* *MOMENT 103164 lb-ft*

*TORQUE 11 lb-ft*
*SEISMIC*

*AXIAL 15779 lb*
*SHEAR 957 lb* *MOMENT 51854 lb-ft*

*TORQUE 504 lb-ft*
*30 mph WIND - 1.0000 in ICE*

*AXIAL 5091 lb*
*SHEAR 6376 lb* *MOMENT 316610 lb-ft*

*TORQUE 2545 lb-ft*
*REACTIONS - 105 mph WIND*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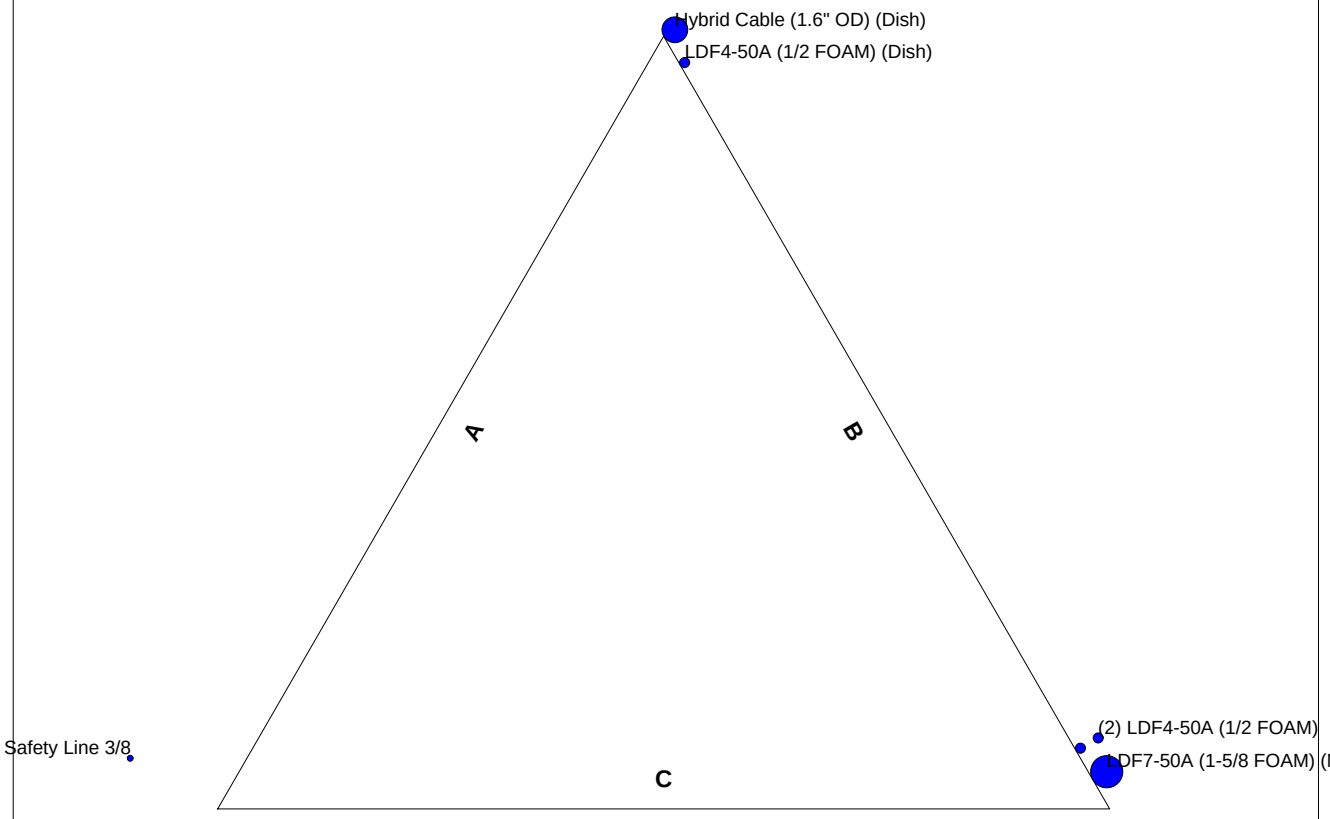
| | | | |
|---|---|---|---|
| Job: ***Dish Wireless MW Installation*** | | | |
| Project: ***21052.05 Mercer Island H.S. 80' Tower*** | | | |
| Client: Day Wireless | Drawn by: CAB | App'd: | |
| Code: TIA-222-H | Date: 06/27/24 | Scale: NTS | |
| Path: E:\Projects\21052.0x Mercer Island High School\Engineering\Tower\MI 6.0 - 2024 MW Addition.er | | Dwg No. E-1 | |

# Feed Line Plan
# 55'

## Section @ 55'





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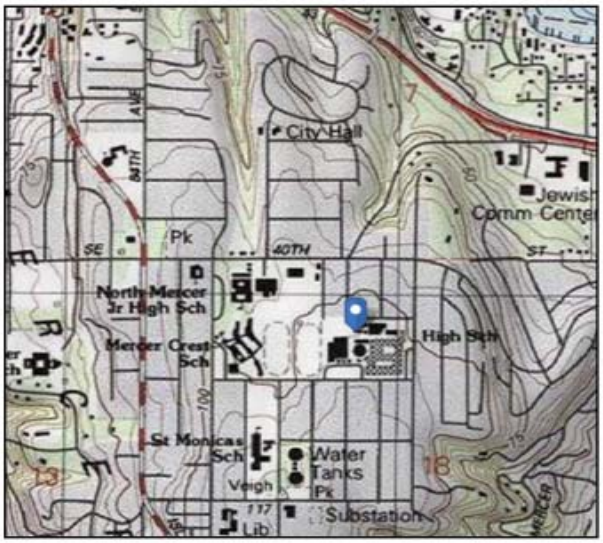
| Path: E:\Projects\21052.0x Mercer Island High School\Engineering\Tower\MI 6.0 - 2024 MW Addition.er | | Dwg No. E-7 | |

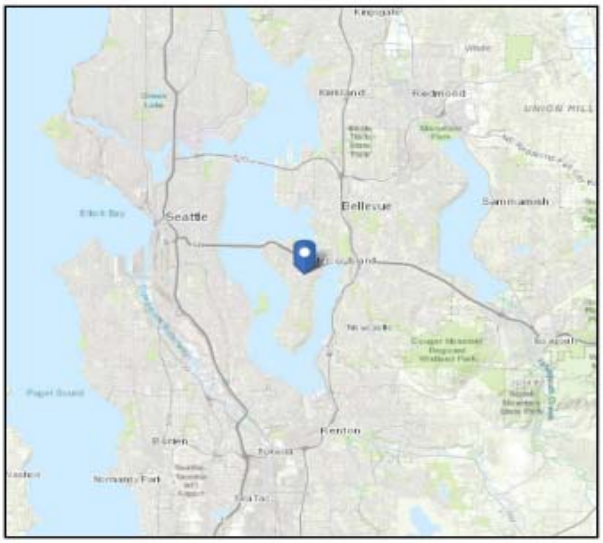
# ASCE 7 Hazards Report

**Address:**
No Address at This Location

**Standard:** ASCE/SEI 7-16
**Risk Category:** III
**Soil Class:** D - Stiff Soil

**Elevation:** 347.05 ft (NAVD 88)
**Latitude:** 47.572362
**Longitude:** -122.218431




## Wind

**Results:**

| | |
|---|---|
| Wind Speed: | 105 Vmph |
| 10-year MRI | 67 Vmph |
| 25-year MRI | 74 Vmph |
| 50-year MRI | 78 Vmph |
| 100-year MRI | 83 Vmph |

Data Source: ASCE/SEI 7-16, Fig. 26.5-1C and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Thu Jul 15 2021

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 3% probability of exceedance in 50 years (annual exceedance probability = 0.000588, MRI = 1,700 years).

## Ice

**Results:**

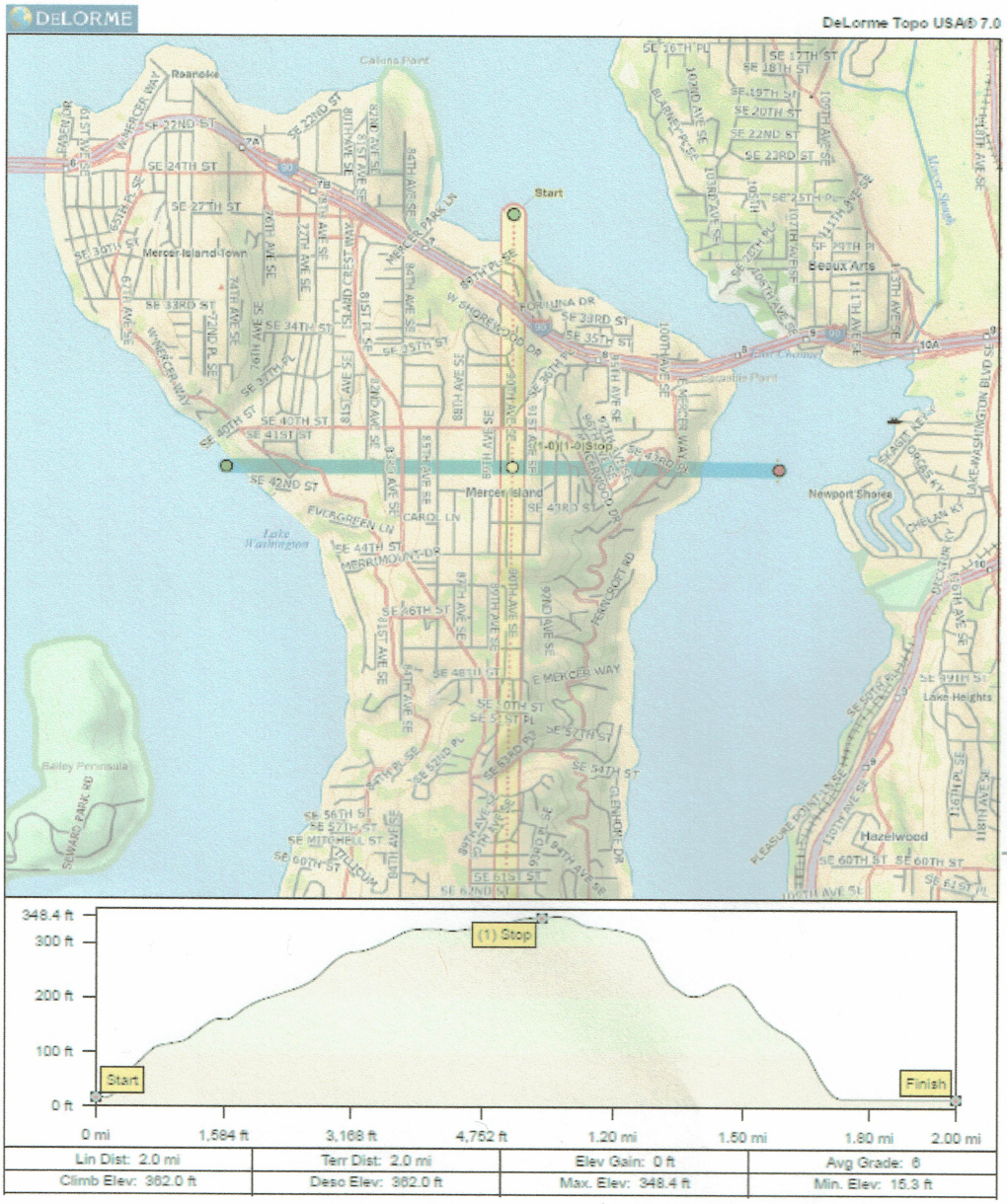
| | |
|---|---|
| Ice Thickness: | 1.00 in. |
| Concurrent Temperature: | 25 F |
| Gust Speed: | 30 mph |

**Data Source:** Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8
**Date Accessed:** Thu Jul 15 2021

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 500-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.


SITE BORDERS $K_{ZT}$ = 1.3 & $K_{ZT}$ = 1.6
∴ CALCULATE SITE SPECIFIC $K_{ZT}$




BOTH DIRECTIONS ARE FLAT TOPPED HILLS W/ RELIEF ON SIDES OF ISLAND

SEAW RAPID SOLUTION

$H_T$ = 350'
$L_H$ = 3960' (¾ MILE)
$k_1$ = 0.205
$K_2$ = 1.0 (@ TOP)
$K_3$ = 0.88

$K_{ZT} = (1+k_1K_2K_3)^2 = 1.40$

RESULTS ARE BETWEEN MAPPED VALUES ∴ REASONABLE

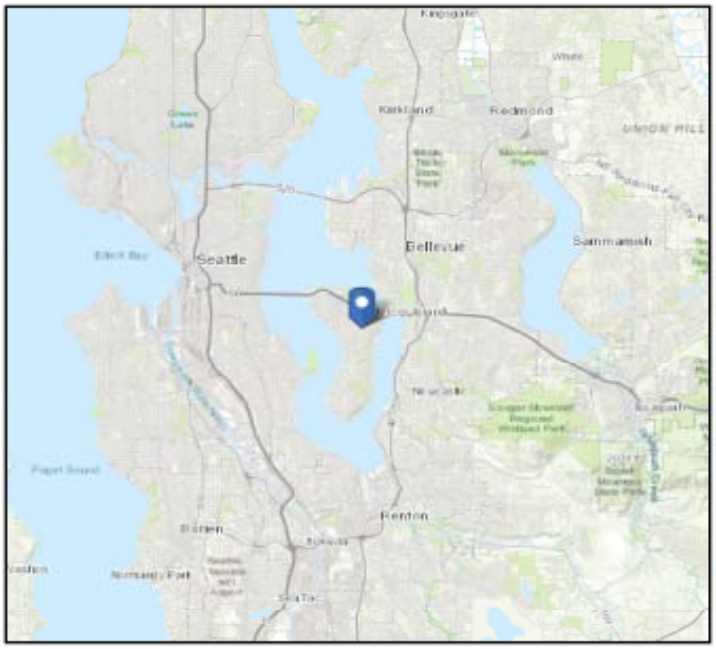
| | | | |
|---|---|---|---|
| SIDE SWAY ENGINEERING | Description: Topography | By: CAB | Project No.: 21052.02 |
| | | Date: 2/22/22 | |
| | Project: Mercer Island HS Tower | Checked | Sheet No. |
| | | Date | |

# ASCE 7 Hazards Report

**Address:**
No Address at This Location

**Standard:** ASCE/SEI 7-16
**Risk Category:** III
**Soil Class:** D - Stiff Soil

**Elevation:** 347.05 ft (NAVD 88)
**Latitude:** 47.572362
**Longitude:** -122.218431


## Seismic

**Site Soil Class:** D - Stiff Soil

**Results:**

| | | | |
|---|---|---|---|
| $S_S$ : | 1.412 | $S_{D1}$ : | N/A |
| $S_1$ : | 0.491 | $T_L$ : | 6 |
| $F_a$ : | 1 | PGA : | 0.604 |
| $F_v$ : | N/A | $PGA_M$ : | 0.665 |
| $S_{MS}$ : | 1.412 | $F_{PGA}$ : | 1.1 |
| $S_{M1}$ : | N/A | $I_e$ : | 1.25 |
| $S_{DS}$ : | 0.941 | $C_v$ : | 1.382 |

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

**Data Accessed:** Thu Jul 15 2021

**Date Source:** USGS Seismic Design Maps

| | | | |
|---|---|---|---|
| SIDE SWAY ENGINEERING | Description: Seismic Design Maps (ASCE 7, USGS) | By: CAB | Project No. |
| | | Date: 6/27/24 | 21052.05 |
| | Project: Mercer Island HS Tower | Checked | Sheet No. |
| | | Date | |

## Self-Supporting Tower Seismic Analysis

**Seismic Parameters:**

| | | | | | |
|---|---|---|---|---|---|
| $S_{DS}$ = | 0.941 (ASCE 7, USGS) | | R = | 3.0 (ASCE Table 15.4-2, Trussed Tower) | |
| $S_{D1}$ = | 0.592 (ASCE 7, USGS) | | I = | 1.25 (ASCE Table 1.5-2, Risk Category III) | |
| $S_1$ = | 0.491 (1s Spectral Response) | | $f_1$ = | 2.824 Hz (Fundamental Frequency) | |
| T = | 0.354 (Fundamental Period) | | $k_e$ = | 1.000 (Distribution Exponent) | |
| $T_s$ = | 0.629 ($S_{D1}/S_{DS}$) | | $K_f$ = | 4540 (Constant) | |
| $T_L$ = | 16 | | | | |

**Tower Properties:**

| | | | | | |
|---|---|---|---|---|---|
| Height = | 80 ft | | W = | 4.24 kips | |
| $w_a$ = | 4.54 ft | | $W_1$ = | 4.83 kips | |
| $w_o$ = | 4.56 ft | | $W_2$ = | 1.44 kips | |

**Seismic Response Coefficient, $C_s$:**

$C_s$ min = $0.044S_{DS}I$ = 0.052 ≥ 0.030

$C_s$ min = $0.8S_1I/R$ = 0.164 (If $S_1$>0.6)

$C_s$ = $S_{DS}I/R$ = 0.392 ($T \le 1.5T_s$, ASCE 11.4.8)

$C_s$ max = $S_{D1}I/TR$ = 1.045 ($T<T_L$) (Includes 1.5 increase, ASCE 11.4.8)

**Seismic Base Shear, $V_s$:**

$V_s$ = $C_SW$ = 1.663 kips

**Vertical Distribution of Seismic Forces:**

| Section | Height (ft) | $w_z$ (lbs) | $w_zh_z^k$ | $\frac{w_zh_z^k}{\Sigma w_zh_z^k}$ | $F_{sz}$ (kips) | $\Sigma F_{sz}$ (kips) | ΣM (k-ft) |
|---|---|---|---|---|---|---|---|
| 15 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 14 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 13 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 12 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 11 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 10 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 9 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 8 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 7 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 6 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 5 | 80.0 | 0.0 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 |
| 4 | 70.0 | 2013.7 | 140.958 | 0.687 | 1.143 | 1.14 | 79.98 |
| 3 | 50.0 | 665.8 | 33.292 | 0.162 | 0.270 | 1.41 | 93.47 |
| 2 | 30.0 | 766.2 | 22.986 | 0.112 | 0.186 | 1.60 | 99.06 |
| 1 | 10.0 | 796.3 | 7.963 | 0.039 | 0.065 | 1.66 | 99.70 |
| | Σ | 4242.0 | 205.199 | **Base Shear, $V_s$ =** | | **1.663** | **kips** |
| | | | | **Seismic OTM, $M_s$ =** | | **99.7** | **kip-ft** |

**Wind loads govern over seismic loads at each section and for the overall tower.**

| | | | |
|---|---|---|---|
| SIDE SWAY ENGINEERING | Description: Self Support Tower Seismic Analysis | By: CAB | Project No.: 21052.05 |
| | | Date: 6/27/24 | |
| | Project: Mercer Island HS Tower | Checked | Sheet No. |
| | | Date | |

# Tower Input Data

This tower is designed using the TIA-222-H standard.
The following design criteria apply:

Tower is located in King County, Washington.
Basic wind speed of 105 mph. Risk Category III.
Exposure Category B.
Rigorous Topographic Factor Procedure for wind speed-up calculations is used.
Topographic Feature: Flat Topped Ridge. Crest Height: 350'.
Slope Distance L: 3960'. Distance from Crest x: 0'.
Nominal ice thickness of 1.00" increased with height.
Ice density of 56 pcf.
A wind speed of 30 mph is used in combination with ice.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

# Tower Section Geometry

| *Tower Section* | *Tower Elevation* | *Assembly Database* | *Description* | *Section Width* | *Number of Sections* | *Section Length* |
|---|---|---|---|---|---|---|
| | *ft* | | | *ft* | | *ft* |
| T1 | 135'-115' | | | 4'6-1/4" | 1 | 20' |
| T2 | 115'-95' | | | 4'6-1/4" | 1 | 20' |
| T3 | 95'-75' | | | 4'6-1/4" | 1 | 20' |
| T4 | 75'-55' | | | 4'6-23/32" | 1 | 20' |

# Tower Section Geometry *(cont'd)*

| *Tower Section* | *Tower Elevation* | *Diagonal Spacing* | *Bracing Type* | *Has K Brace End Panels* | *Has Horizontals* | *Top Girt Offset* | *Bottom Girt Offset* |
|---|---|---|---|---|---|---|---|
| | *ft* | *ft* | | | | *in* | *in* |
| T1 | 135'-115' | 4' | X Brace | No | No | 0.0000 | 0.0000 |
| T2 | 115'-95' | 4' | X Brace | No | No | 0.0000 | 0.0000 |
| T3 | 95'-75' | 4' | X Brace | No | No | 0.0000 | 0.0000 |
| T4 | 75'-55' | 4' | X Brace | No | No | 0.0000 | 0.0000 |

# Tower Section Geometry *(cont'd)*

| *Tower Elevation* *ft* | *Leg Type* | *Leg Size* | *Leg Grade* | *Diagonal Type* | *Diagonal Size* | *Diagonal Grade* |
|---|---|---|---|---|---|---|
| T1 135'-115' | Pipe | P2x.154 | A500-50 (50 ksi) | Single Angle | L1 1/2x1 1/2x1/8 | A36 (36 ksi) |
| T2 115'-95' | Pipe | P2x.154 | A500-50 (50 ksi) | Single Angle | L1 1/2x1 1/2x1/8 | A36 (36 ksi) |
| T3 95'-75' | Pipe | P2x.218 | A500-50 (50 ksi) | Single Angle | L1 1/2x1 1/2x1/8 | A36 (36 ksi) |
| T4 75'-55' | Pipe | P2.5x.276 | A500-50 (50 ksi) | Single Angle | L1 1/2x1 1/2x1/8 | A36 (36 ksi) |

## Tower Section Geometry *(cont'd)*

| Tower Elevation ft | Top Girt Type | Top Girt Size | Top Girt Grade | Bottom Girt Type | Bottom Girt Size | Bottom Girt Grade |
|---|---|---|---|---|---|---|
| T1 135'-115' | Single Angle | L1 1/2x1 1/2x1/8 | A36 (36 ksi) | Single Angle | | A36 (36 ksi) |

## Tower Section Geometry *(cont'd)*

| Tower Elevation ft | Gusset Area (per face) $ft^2$ | Gusset Thickness in | Gusset Grade | Adjust. Factor $A_f$ | Adjust. Factor $A_r$ | Weight Mult. | Double Angle Stitch Bolt Spacing Diagonals in | Double Angle Stitch Bolt Spacing Horizontals in | Double Angle Stitch Bolt Spacing Redundants in |
|---|---|---|---|---|---|---|---|---|---|
| T1 135'-115' | 1.25 | 0.1875 | A36 (36 ksi) | 1 | 1 | 1.05 | Mid-Pt | Mid-Pt | 36.0000 |
| T2 115'-95' | 1.25 | 0.1875 | A36 (36 ksi) | 1 | 1 | 1.05 | Mid-Pt | Mid-Pt | 36.0000 |
| T3 95'-75' | 1.25 | 0.1875 | A36 (36 ksi) | 1 | 1 | 1.05 | Mid-Pt | Mid-Pt | 36.0000 |
| T4 75'-55' | 1.25 | 0.1875 | A36 (36 ksi) | 1 | 1 | 1.05 | Mid-Pt | Mid-Pt | 36.0000 |

## Tower Section Geometry *(cont'd)*

| Tower Elevation ft | Leg Connection Type | Leg | | Diagonal | | Top Girt | | Bottom Girt | | Mid Girt | | Long Horizontal | | Short Horizontal | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. |
| T1 135'-115' | Flange | 0.6250 A325N | 4 | 0.5000 A325N | 1 | 0.5000 A325N | 1 | 0.5000 A325N | 0 | 0.6250 A325N | 0 | 0.5000 A325N | 0 | 0.6250 A325N | 0 |
| T2 115'-95' | Flange | 0.6250 A325N | 4 | 0.5000 A325N | 1 | 0.5000 A325N | 0 | 0.5000 A325N | 0 | 0.6250 A325N | 0 | 0.5000 A325N | 0 | 0.6250 A325N | 1 |
| T3 95'-75' | Flange | 0.6250 A325N | 4 | 0.5000 A325N | 1 | 0.5000 A325N | 0 | 0.5000 A325N | 0 | 0.6250 A325N | 0 | 0.5000 A325N | 0 | 0.6250 A325N | 0 |
| T4 75'-55' | Flange | 0.6250 A325N | 4 | 0.5000 A325N | 1 | 0.5000 A325N | 0 | 0.5000 A325N | 0 | 0.6250 A325N | 0 | 0.5000 A325N | 0 | 0.6250 A325N | 0 |

## Feed Line/Linear Appurtenances - Entered As Round Or Flat

| Description | Face or Leg | Allow Shield | Exclude From Torque Calculation | Component Type | Placement ft | Face Offset in | Lateral Offset (Frac FW) | # | # Per Row | Clear Spacing in | Width or Diameter in | Weight plf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LDF4-50A (1/2 FOAM) | B | No | No | Ar (CaAa) | 77' - 55' | 0.0000 | 0.425 | 2 | 1 | 0.6300 | 0.6300 | 0.15 |
| LDF4-50A (1/2 FOAM) | B | No | No | Ar (CaAa) | 119' - 77' | 0.0000 | 0.425 | 1 | 1 | 0.6300 | 0.6300 | 0.15 |
| LDF7-50A (1-5/8 FOAM) (Mercer Island) | B | No | No | Ar (CaAa) | 107' - 55' | 0.0000 | 0.4625 | 1 | 1 | 1.9800 | 1.9800 | 0.82 |
| Safety Line 3/8 | A | No | No | Ar (CaAa) | 135' - 55' | 6.0000 | -0.5 | 1 | 1 | 0.3750 | 0.3750 | 0.27 |
| Hybrid Cable (1.6" OD) (Dish) | B | No | No | Ar (CaAa) | 135' - 55' | 0.0000 | -0.5 | 1 | 1 | 1.6000 | 1.6000 | 1.00 |
| LDF4-50A (1/2 FOAM) (Dish) | B | No | No | Ar (CaAa) | 135' - 55' | 0.0000 | -0.4625 | 1 | 1 | 0.6300 | 0.6300 | 0.15 |

## Feed Line/Linear Appurtenances Section Areas

| Tower Section | Tower Elevation ft | Face | $A_R$ $ft^2$ | $A_F$ $ft^2$ | $C_AA_A$ In Face $ft^2$ | $C_AA_A$ Out Face $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|
| T1 | 135'-115' | A | 0.000 | 0.000 | 0.750 | 0.000 | 5.40 |
| | | B | 0.000 | 0.000 | 4.712 | 0.000 | 23.60 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| T2 | 115'-95' | A | 0.000 | 0.000 | 0.750 | 0.000 | 5.40 |
| | | B | 0.000 | 0.000 | 8.096 | 0.000 | 35.84 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| T3 | 95'-75' | A | 0.000 | 0.000 | 0.750 | 0.000 | 5.40 |
| | | B | 0.000 | 0.000 | 9.806 | 0.000 | 42.70 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| T4 | 75'-55' | A | 0.000 | 0.000 | 0.750 | 0.000 | 5.40 |
| | | B | 0.000 | 0.000 | 10.940 | 0.000 | 45.40 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |

## Feed Line/Linear Appurtenances Section Areas - With Ice

| Tower Section | Tower Elevation ft | Face or Leg | Ice Thickness in | $A_R$ $ft^2$ | $A_F$ $ft^2$ | $C_AA_A$ In Face $ft^2$ | $C_AA_A$ Out Face $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|
| T1 | 135'-115' | A | 1.466 | 0.000 | 0.000 | 6.615 | 0.000 | 71.36 |
| | | B | | 0.000 | 0.000 | 17.614 | 0.000 | 223.56 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| T2 | 115'-95' | A | 1.445 | 0.000 | 0.000 | 6.531 | 0.000 | 69.69 |
| | | B | | 0.000 | 0.000 | 28.909 | 0.000 | 362.55 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| T3 | 95'-75' | A | 1.420 | 0.000 | 0.000 | 6.429 | 0.000 | 67.65 |
| | | B | | 0.000 | 0.000 | 33.167 | 0.000 | 414.68 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| T4 | 75'-55' | A | 1.387 | 0.000 | 0.000 | 6.296 | 0.000 | 65.08 |
| | | B | | 0.000 | 0.000 | 39.492 | 0.000 | 465.63 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |

## User Defined Loads - Seismic

| Description | Elevation ft | Offset From Centroid ft | Azimuth Angle ° | $E_v$ lb | $E_{hx}$ lb | $E_{hz}$ lb | $E_h$ lb |
|---|---|---|---|---|---|---|---|
| EQ1 | 65' | 0' | 0.0000 | 150.00 | 0.00 | 0.00 | 65.00 |
| EQ2 | 85' | 0' | 0.0000 | 144.00 | 0.00 | 0.00 | 186.00 |
| EQ3 | 105' | 0' | 0.0000 | 125.00 | 0.00 | 0.00 | 270.00 |
| EQ4 | 125' | 0' | 0.0000 | 379.00 | 0.00 | 0.00 | 1143.00 |

## Discrete Tower Loads

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft<br>Vert ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|
| DB411-B | A | From Leg | 4.00<br>0' | 0.0000 | 77' | No Ice<br>1/2" Ice | 1.50<br>2.70 | 1.50<br>2.70 | 25.00<br>32.50 |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral<br>Vert<br>ft<br>ft<br>ft | Azimuth Adjustment<br>° | Placement<br>ft | | $C_AA_A$ Front<br>$ft^2$ | $C_AA_A$ Side<br>$ft^2$ | Weight<br>lb |
|---|---|---|---|---|---|---|---|---|---|
| | | | 5' | | | 1" Ice | 3.90 | 3.90 | 40.00 |
| 4' Standoff Pipe Frame | A | From Leg | 2.00 | 0.0000 | 77' | No Ice | 3.83 | 4.70 | 114.60 |
| | | | 0' | | | 1/2" Ice | 4.76 | 5.87 | 146.76 |
| | | | 0' | | | 1" Ice | 5.51 | 6.88 | 186.99 |
| 6812B-2 (Half-Wave) | C | Stand-Off | 0.00 | 0.0000 | 115' - 95' | No Ice | 10.75 | 10.75 | 133.00 |
| (Mercer Island H.S.) | | Right | 4' | | | 1/2" Ice | 14.81 | 14.81 | 228.54 |
| | | | 0' | | | 1" Ice | 18.91 | 18.91 | 341.25 |
| DB411-B | A | From Leg | 4.00 | 0.0000 | 119' | No Ice | 1.50 | 1.50 | 25.00 |
| | | | 0' | | | 1/2" Ice | 2.70 | 2.70 | 32.50 |
| | | | 5' | | | 1" Ice | 3.90 | 3.90 | 40.00 |
| 4' Standoff Pipe Frame | A | From Leg | 2.00 | 0.0000 | 119' | No Ice | 3.83 | 4.70 | 114.60 |
| | | | 0' | | | 1/2" Ice | 4.76 | 5.87 | 146.76 |
| | | | 0' | | | 1" Ice | 5.51 | 6.88 | 186.99 |
| FFVV-65A-R2-V1 w/ 6' Pipe | A | From Leg | 2.00 | 0.0000 | 135' | No Ice | 10.59 | 5.51 | 110.09 |
| Mount | | | -2' | | | 1/2" Ice | 11.17 | 6.33 | 190.04 |
| (Dish) | | | 0' | | | 1" Ice | 11.71 | 7.01 | 277.22 |
| RF4450T-71A | A | From Face | 1.00 | 0.0000 | 135' | No Ice | 2.06 | 1.38 | 94.60 |
| (Dish) | | | -2' | | | 1/2" Ice | 2.24 | 1.52 | 115.26 |
| | | | -1' | | | 1" Ice | 2.43 | 1.68 | 138.87 |
| RF4451D-70A | A | From Face | 1.00 | 0.0000 | 135' | No Ice | 1.88 | 1.11 | 61.30 |
| (Dish) | | | -2' | | | 1/2" Ice | 2.05 | 1.25 | 78.54 |
| | | | 1' | | | 1" Ice | 2.22 | 1.39 | 98.49 |
| 6' Pipe Mount | A | From Leg | 2.00 | 0.0000 | 135' | No Ice | 1.43 | 1.43 | 21.90 |
| (Dish) | | | 2' | | | 1/2" Ice | 1.92 | 1.92 | 32.73 |
| | | | 0' | | | 1" Ice | 2.29 | 2.29 | 47.61 |
| 5' T-Frame | A | From Leg | 1.00 | 0.0000 | 135' | No Ice | 3.00 | 0.75 | 135.00 |
| (Dish) | | | 0' | | | 1/2" Ice | 3.75 | 1.00 | 200.00 |
| | | | 0' | | | 1" Ice | 4.50 | 1.25 | 265.00 |
| FFVV-65A-R2-V1 w/ 6' Pipe | B | From Leg | 2.00 | 0.0000 | 135' | No Ice | 10.59 | 5.51 | 110.09 |
| Mount | | | -2' | | | 1/2" Ice | 11.17 | 6.33 | 190.04 |
| (Dish) | | | 0' | | | 1" Ice | 11.71 | 7.01 | 277.22 |
| RF4450T-71A | B | From Face | 1.00 | 0.0000 | 135' | No Ice | 2.06 | 1.38 | 94.60 |
| (Dish) | | | -2' | | | 1/2" Ice | 2.24 | 1.52 | 115.26 |
| | | | -1' | | | 1" Ice | 2.43 | 1.68 | 138.87 |
| RF4451D-70A | B | From Face | 1.00 | 0.0000 | 135' | No Ice | 1.88 | 1.11 | 61.30 |
| (Dish) | | | -2' | | | 1/2" Ice | 2.05 | 1.25 | 78.54 |
| | | | 1' | | | 1" Ice | 2.22 | 1.39 | 98.49 |
| 6' Pipe Mount | B | From Leg | 2.00 | 0.0000 | 135' | No Ice | 1.43 | 1.43 | 21.90 |
| (Dish) | | | 2' | | | 1/2" Ice | 1.92 | 1.92 | 32.73 |
| | | | 0' | | | 1" Ice | 2.29 | 2.29 | 47.61 |
| 5' T-Frame | B | From Leg | 1.00 | 0.0000 | 135' | No Ice | 3.00 | 0.75 | 135.00 |
| (Dish) | | | 0' | | | 1/2" Ice | 3.75 | 1.00 | 200.00 |
| | | | 0' | | | 1" Ice | 4.50 | 1.25 | 265.00 |
| FFVV-65A-R2-V1 w/ 6' Pipe | C | From Leg | 2.00 | 0.0000 | 135' | No Ice | 10.59 | 5.51 | 110.09 |
| Mount | | | -2' | | | 1/2" Ice | 11.17 | 6.33 | 190.04 |
| (Dish) | | | 0' | | | 1" Ice | 11.71 | 7.01 | 277.22 |
| RF4450T-71A | C | From Face | 1.00 | 0.0000 | 135' | No Ice | 2.06 | 1.38 | 94.60 |
| (Dish) | | | -2' | | | 1/2" Ice | 2.24 | 1.52 | 115.26 |
| | | | -1' | | | 1" Ice | 2.43 | 1.68 | 138.87 |
| RF4451D-70A | C | From Face | 1.00 | 0.0000 | 135' | No Ice | 1.88 | 1.11 | 61.30 |
| (Dish) | | | -2' | | | 1/2" Ice | 2.05 | 1.25 | 78.54 |
| | | | 1' | | | 1" Ice | 2.22 | 1.39 | 98.49 |
| 6' Pipe Mount | C | From Leg | 2.00 | 0.0000 | 135' | No Ice | 1.43 | 1.43 | 21.90 |
| (Dish) | | | 2' | | | 1/2" Ice | 1.92 | 1.92 | 32.73 |
| | | | 0' | | | 1" Ice | 2.29 | 2.29 | 47.61 |
| 5' T-Frame | C | From Leg | 1.00 | 0.0000 | 135' | No Ice | 3.00 | 0.75 | 135.00 |
| (Dish) | | | 0' | | | 1/2" Ice | 3.75 | 1.00 | 200.00 |

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft / Vert ft / ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|
| RDIDC-9181-PF-48 w/ 4' Pipe Mount (Dish) | A | From Leg | 0'<br>0.50<br>0'<br>0' | 0.0000 | 135' | 1" Ice<br>No Ice<br>1/2" Ice<br>1" Ice | 4.50<br>2.83<br>3.17<br>3.52 | 1.25<br>2.20<br>2.60<br>3.02 | 265.00<br>36.42<br>66.65<br>101.07 |

## Dishes

| Description | Face or Leg | Dish Type | Offset Type | Offsets: Horz Lateral ft / Vert ft | Azimuth Adjustment ° | 3 dB Beam Width ° | Elevation ft | Outside Diameter ft | | Aperture Area $ft^2$ | Weight lb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VHLP2-18 (Dish) | B | Paraboloid w/Shroud (HP) | From Leg | 2.00<br>2'<br>0' | -10.0000 | | 135' | 2.00 | No Ice<br>1/2" Ice<br>1" Ice | 3.14<br>3.41<br>3.68 | 31.00<br>48.50<br>66.00 |

## Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical lb | Horizontal, X lb | Horizontal, Z lb |
|---|---|---|---|---|---|
| Leg C | Max. Vert | 18 | 81590.90 | 3000.40 | -2057.68 |
| | Max. $H_x$ | 18 | 81590.90 | 3000.40 | -2057.68 |
| | Max. $H_z$ | 5 | -64420.76 | -2325.64 | 1950.30 |
| | Min. Vert | 7 | -73315.17 | -2773.65 | 1944.38 |
| | Min. $H_x$ | 7 | -73315.17 | -2773.65 | 1944.38 |
| | Min. $H_z$ | 18 | 81590.90 | 3000.40 | -2057.68 |
| Leg B | Max. Vert | 10 | 81691.14 | -2993.41 | -2091.94 |
| | Max. $H_x$ | 23 | -74301.93 | 2794.90 | 1979.74 |
| | Max. $H_z$ | 23 | -74301.93 | 2794.90 | 1979.74 |
| | Min. Vert | 23 | -74301.93 | 2794.90 | 1979.74 |
| | Min. $H_x$ | 10 | 81691.14 | -2993.41 | -2091.94 |
| | Min. $H_z$ | 10 | 81691.14 | -2993.41 | -2091.94 |
| Leg A | Max. Vert | 2 | 81820.79 | -47.19 | 3612.19 |
| | Max. $H_x$ | 20 | 2780.91 | 836.52 | -10.19 |
| | Max. $H_z$ | 2 | 81820.79 | -47.19 | 3612.19 |
| | Min. Vert | 15 | -72358.86 | 41.09 | -3358.50 |
| | Min. $H_x$ | 8 | 1916.41 | -843.91 | -35.67 |
| | Min. $H_z$ | 15 | -72358.86 | 41.09 | -3358.50 |

## Maximum Tower Deflections - Service Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|---|---|---|---|---|---|
| T1 | 135 - 115 | 4.220 | 39 | 0.3780 | 0.0546 |
| T2 | 115 - 95 | 2.650 | 39 | 0.3574 | 0.0508 |
| T3 | 95 - 75 | 1.282 | 39 | 0.2721 | 0.0386 |
| T4 | 75 - 55 | 0.357 | 39 | 0.1426 | 0.0229 |

## Maximum Tower Deflections - Design Wind

| Section No. | Elevation<br>ft | Horz. Deflection<br>in | Gov. Load Comb. | Tilt<br>° | Twist<br>° |
|---|---|---|---|---|---|
| T1 | 135 - 115 | 12.746 | 2 | 1.1402 | 0.1675 |
| T2 | 115 - 95 | 8.011 | 2 | 1.0778 | 0.1560 |
| T3 | 95 - 75 | 3.879 | 2 | 0.8225 | 0.1186 |
| T4 | 75 - 55 | 1.081 | 2 | 0.4311 | 0.0704 |

## Bolt Design Data

| Section No. | Elevation<br>ft | Component Type | Bolt Grade | Bolt Size<br>in | Number Of Bolts | Maximum Load per Bolt<br>lb | Allowable Load per Bolt<br>lb | Ratio Load / Allowable | Allowable Ratio | Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 135 | Leg | A325N | 0.6250 | 4 | 1993.08 | 20340.10 | 0.098 ✔ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 1261.10 | 3126.56 | 0.403 ✔ | 1 | Member Block Shear |
| | | Top Girt | A325N | 0.5000 | 1 | 250.76 | 3126.56 | 0.080 ✔ | 1 | Member Block Shear |
| T2 | 115 | Leg | A325N | 0.6250 | 4 | 5875.96 | 20340.10 | 0.289 ✔ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 1945.75 | 3126.56 | 0.622 ✔ | 1 | Member Block Shear |
| T3 | 95 | Leg | A325N | 0.6250 | 4 | 11147.60 | 20340.10 | 0.548 ✔ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 2381.40 | 3126.56 | 0.762 ✔ | 1 | Member Block Shear |
| T4 | 75 | Leg | A325N | 0.6250 | 4 | 17745.90 | 20340.10 | 0.872 ✔ | 1 | Bolt Tension |
| | | Diagonal | A325N | 0.5000 | 1 | 2947.65 | 3126.56 | 0.943 ✔ | 1 | Member Block Shear |

## Leg Design Data (Compression)

| Section No. | Elevation<br>ft | Size | L<br>ft | $L_u$<br>ft | Kl/r | A<br>$in^2$ | $P_u$<br>lb | $\phi P_n$<br>lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 135 - 115 | P2x.154 | 20' | 4' | 61.0<br>K=1.00 | 1.0745 | -9599.30 | 36842.20 | 0.261 [1] ✔ |
| T2 | 115 - 95 | P2x.154 | 20' | 4' | 61.0<br>K=1.00 | 1.0745 | -26299.50 | 36842.20 | 0.714 [1] ✔ |
| T3 | 95 - 75 | P2x.218 | 20' | 4' | 62.6<br>K=1.00 | 1.4773 | -49343.00 | 49904.80 | 0.989 [1] ✔ |
| T4 | 75 - 55 | P2.5x.276 | 20' | 4' | 51.9<br>K=1.00 | 2.2535 | -78011.80 | 83252.00 | 0.937 [1] ✔ |

## Diagonal Design Data (Compression)

| Section No. | Elevation<br>ft | Size | L<br>ft | $L_u$<br>ft | Kl/r | A<br>$in^2$ | $P_u$<br>lb | $\phi P_n$<br>lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 135 - 115 | L1 1/2x1 1/2x1/8 | 6'15/32" | 2'9-3/8" | 114.5<br>K=1.02 | 0.3594 | -1273.81 | 7601.18 | 0.168 [1] ✔ |

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T2 | 115 - 95 | L1 1/2x1 1/2x1/8 | 6'15/32" | 2'9-3/8" | 114.5 K=1.02 | 0.3594 | -1988.23 | 7601.18 | 0.262 [1] ✔ |
| T3 | 95 - 75 | L1 1/2x1 1/2x1/8 | 6'23/32" | 2'9-19/32" | 115.1 K=1.01 | 0.3594 | -2475.71 | 7552.04 | 0.328 [1] ✔ |
| T4 | 75 - 55 | L1 1/2x1 1/2x1/8 | 6'27/32" | 2'9-1/4" | 114.2 K=1.02 | 0.3594 | -3331.04 | 7633.82 | 0.436 [1] ✔ |

## Top Girt Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 135 - 115 | L1 1/2x1 1/2x1/8 | 4'6-1/4" | 4'1-5/16" | 166.7 K=1.00 | 0.3594 | -249.85 | 3701.39 | 0.068 [1] ✔ |

## Leg Design Data (Tension)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 135 - 115 | P2x.154 | 20' | 4' | 61.0 | 1.0745 | 7972.33 | 48353.90 | 0.165 [1] ✔ |
| T2 | 115 - 95 | P2x.154 | 20' | 4' | 61.0 | 1.0745 | 23503.80 | 48353.90 | 0.486 [1] ✔ |
| T3 | 95 - 75 | P2x.218 | 20' | 4' | 62.6 | 1.4773 | 44590.50 | 66476.60 | 0.671 [1] ✔ |
| T4 | 75 - 55 | P2.5x.276 | 20' | 4' | 51.9 | 2.2535 | 70983.60 | 101409.00 | 0.700 [1] ✔ |

## Diagonal Design Data (Tension)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 135 - 115 | L1 1/2x1 1/2x1/8 | 6'15/32" | 2'9-3/8" | 74.5 | 0.2109 | 1261.10 | 9175.78 | 0.137 [1] ✔ |
| T2 | 115 - 95 | L1 1/2x1 1/2x1/8 | 6'15/32" | 2'9-3/8" | 74.5 | 0.2109 | 1945.75 | 9175.78 | 0.212 [1] ✔ |
| T3 | 95 - 75 | L1 1/2x1 1/2x1/8 | 6'23/32" | 2'9-19/32" | 74.9 | 0.2109 | 2381.40 | 9175.78 | 0.260 [1] ✔ |
| T4 | 75 - 55 | L1 1/2x1 1/2x1/8 | 6'27/32" | 2'9-1/4" | 74.2 | 0.2109 | 2947.65 | 9175.78 | 0.321 [1] ✔ |

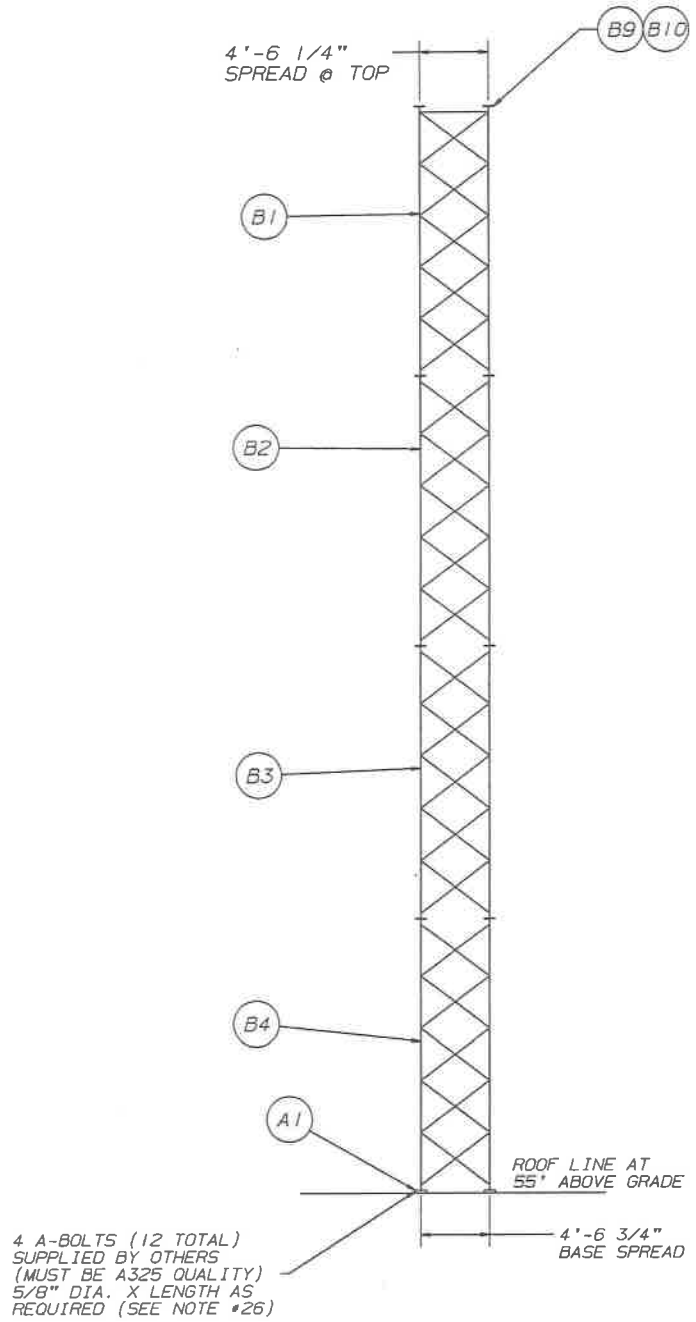
## Top Girt Design Data (Tension)

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ lb | $\phi P_n$ lb | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| T1 | 135 - 115 | L1 1/2x1 1/2x1/8 | 4'6-1/4" | 4'1-5/16" | 111.5 | 0.2109 | 250.76 | 9175.78 | 0.027 [1] ✔ |

# Section Capacity Table

| Section No. | Elevation ft | Component Type | Size | Critical Element | P lb | $\phi P_{allow}$ lb | % Capacity | Pass Fail |
|---|---|---|---|---|---|---|---|---|
| T1 | 135 - 115 | Leg | P2x.154 | 3 | -9599.30 | 36842.20 | 26.1 | Pass |
| | | Diagonal | L1 1/2x1 1/2x1/8 | 9 | -1273.81 | 7601.18 | 16.8 | Pass |
| | | | | | | | 40.3 (b) | |
| | | Top Girt | L1 1/2x1 1/2x1/8 | 6 | -249.85 | 3701.39 | 6.8 | Pass |
| | | | | | | | 8.0 (b) | |
| T2 | 115 - 95 | Leg | P2x.154 | 39 | -26299.50 | 36842.20 | 71.4 | Pass |
| | | Diagonal | L1 1/2x1 1/2x1/8 | 45 | -1988.23 | 7601.18 | 26.2 | Pass |
| | | | | | | | 62.2 (b) | |
| T3 | 95 - 75 | Leg | P2x.218 | 72 | -49343.00 | 49904.80 | 98.9 | Pass |
| | | Diagonal | L1 1/2x1 1/2x1/8 | 78 | -2475.71 | 7552.04 | 32.8 | Pass |
| | | | | | | | 76.2 (b) | |
| T4 | 75 - 55 | Leg | P2.5x.276 | 105 | -78011.80 | 83252.00 | 93.7 | Pass |
| | | Diagonal | L1 1/2x1 1/2x1/8 | 108 | -3331.04 | 7633.82 | 43.6 | Pass |
| | | | | | | | 94.3 (b) | |
| | | | | | | | Summary | |
| | | | | | | Leg (T3) | 98.9 | Pass |
| | | | | | | Diagonal (T4) | 94.3 | Pass |
| | | | | | | Top Girt (T1) | 8.0 | Pass |
| | | | | | | Bolt Checks | 94.3 | Pass |
| | | | | | | **RATING =** | **98.9** | **Pass** |

TOWER HT. =80'



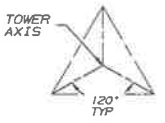

## TOWER DESIGN LOADING

DESIGN WIND LOAD PER ANSI/TIA/EIA-222-F 1996,
80 MPH BASIC WIND SPEED (1/2" RADIAL ICE LOAD).

THIS TOWER IS DESIGNED TO SUPPORT THE FOLLOWING LOADS:

| ELEVATION (FT.) | ANTENNA TYPE | E.P.A. (SF) NO ICE | E.P.A. (SF) WITH ICE | LINE SIZE |
|---|---|---|---|---|
| TOP | (2) UHF/VHF ANTENNAS W/ STUB MOUNTS | 8.0 TOTAL | 12.0 TOTAL | (2) 7/8" |
| 75 | (1) UHF/VHF ANTENNAS W/ (1) 3' SIDE ARM | 7.8 TOTAL | 10.6 TOTAL | (1) 7/8" |
| 60 | (1) UHF/VHF ANTENNA LEG MOUNTED | 3.0 TOTAL | 4.5 TOTAL | (1) 7/8" |

FOR BILL OF MATERIALS SEE DWG. CM971875-1
FOR GENERAL NOTES SEE DWG. CT971875, 1-2




TOWER CONFIGURATION
N.T.S.

TOWER SITE: MERCER ISLAND, WA
KING COUNTY

## TOWER REACTIONS

| | |
|---|---|
| COMPRESSION | 59.3 KIPS |
| TENSION | 56.8 KIPS |
| TOTAL SHEAR | 5.1 KIPS |
| O.T.M. | 228.8 FT.-KIPS |

| No. | Revision Description | Date | Rev By | Ckd By | Appd By |
|---|---|---|---|---|---|



ROHN

| | By | Date |
|---|---|---|
| Scale: NONE | | |
| Drawn: | LLK | 11/14/97 |
| Checked: | JAM | 12-16-97 |
| App. Eng.: | JC | 12/17/97 |
| App. Sales: | BM | 12-17-97 |

Title: 80' SSV (ROOF MOUNTED) TOWER ASSEMBLY FOR BERSCHAUER PHILLIPS CONSTRUCTION CO.

ENG. FILE: 35832PM001

DRAWING NO.: C971875