STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

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www.ct.gov/csc

VIA ELECTRONIC MAIL

December 2, 2019

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103

RE: **EM-VER-057-191120** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at Butternut Hollow Road, Greenwich, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) is in receipt of your correspondence of November 26, 2019 submitted in response to the Council's November 26, 2019 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/IN/emr

Robidoux, Evan

From: Dandeneau, Kathleen <KDANDENEAU@RC.com>
Sent: Tuesday, November 26, 2019 2:23 PM
To: Bachman, Melanie; CSC-DL Siting Council
Cc: Baldwin, Kenneth; Mayo, Rachel
Subject: EM-VER-057-191120 - Butternut Hollow Road, Greenwich, CT - Additional Information
Attachments: Greenwich_001.pdf

The original has been mailed to the Siting Council.

Kathleen M. Dandeneau
Legal Administrative Assistant

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November 26, 2019

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-057-191120 – Cellco Partnership d/b/a Verizon Wireless Notice of Intent to Modify an Existing Telecommunications Facility Located at Butternut Hollow Road, Greenwich, Connecticut**

Dear Ms. Bachman:

In response to your November 26, 2019 letter regarding the above-referenced notice of exempt modification, I offer the following additional information.

1. Analysis of Antenna Mount, dated June 27, 2019, prepared by AECOM.

2. Supplemental Mount Analysis Opinion Letter, dated October 30, 2019, prepared by On Air Engineering.

If you have any questions or need any additional information please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

Enclosures

AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
www.aecom.com

860.529.8882 tel
860.529.3991 fax

June 27, 2019

Mr. Aleksey Tyurin
Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

Reference: **Analysis of Antenna Mount:**
Verizon Site ID: Butternut CT
150 Butternut Hollow Road, Greenwich, Connecticut
Connecticut State Police Tower #74
AECOM Project Number: VZW-205 / 60537397

Dear Mr. Tyurin,

AECOM has been authorized by Verizon Wireless to conduct a structural evaluation of the proposed antenna modification to the existing antenna mount frame attached to an existing transmission tower structure located at 150 Butternut Hollow Road in Greenwich, Connecticut. The results of our independent structural analysis has determined that when the option to apply the "Contingent Passing Scenario" is considered, the proposed antenna upgrades to the existing antenna frame mounts are in compliance with the Codes and Standards stated herein.

The proposed antenna modification will consist of the removal of three (3) Swedcom SLCP 2X6014 Panel Antennas, three (3) Amphenol BXA-171063-8BF Panel Antennas, one (1) existing OVP/Distribution Box Unit and one (1) existing Hybrid Cable with the installation of six (6) Commscope JAHH-65B-R3B Panel antennas, three (3) Commscope BSAMNT-SBS-2-2 panel attachment brackets for JAHH antennas, three (3) Samsung 4x40 B2/B66 RRH units, three (3) Samsung 4x40 B5/B13 RRH units one (1) (new) OVP Distribution box unit and one (1) (new) Fiber Optic Cable (Considered as 1-5/8" Fiber Cable) on three (3) existing antenna mounts with one (1) support/tie-back arm connected to tower structure at 130 feet above the tower base. The existing mount applied for analysis was considered as three (3) MTS Wireless Components Tower Stand-off Pipe Frame assemblies, with four (4) antenna mount pipes (assumed as 126" length pipes), part number SF-SP-4-126.

An independent structural analysis was conducted considering the antenna pipe mounted frame mounted to the existing tower structure for its strength design. This analysis did not consider the loading of the proposed antenna mounting frame attached to the tower structure. A previous tower structure analysis has been designed (by AECOM, project # VZ5-205 / 60537397 Rev. 4) addressing the antenna modifications associated for this mount assembly stated above and herein.

Two load conditions were evaluated as shown below which were compared to factored stresses according to AISC and TIA-222-G.

Load Condition 1 = (1.6) * 101 mph (3-second gust) Wind Load (without ice) + (1.2) * (Antenna + Mount) Dead Load
Load Condition 2 = (1.0) * 50 mph (3-second gust) Wind Load (with ice) + (1.0) * 0.75" Ice Load + (1.2) * (Antenna + Mount) Dead Load

NOTE: The 0.75" Ice load thickness obtained from the TIA-222-G and the ASCE 7-10 Standard are considered to increase in thickness with the height of the Antenna and Mount assembly.

The independent structural analysis also considered the following site conditions (following the TIA-222-G Standard):

- Structure Class 3 – Essential Communications (ASCE7-10/CT B.C. Risk Category 4; State Police Structure)
- Topographic Category 3 – Structure located on upper half of hill – Wind Speed-up considered
  - Crest Height for surrounding terrain to site location = 36 feet
- Exposure Class C – Open Terrain with scattered obstructions

The independent structural analysis was conducted using the STAAD.Pro V8i software design program to assess the strength design of the antenna mount frame. The analysis was conducted in compliance with the Codes and Standards of the TIA-222 Revision G with Addendum 2, the ASCE 7-2010 Minimum Design Loads Standard, the 2015 International Building Code, and the 2018 State of Connecticut Building code amendments to the 2015 International Building Code.

The results of our primary independent structural analysis has determined that the proposed antenna upgrades to the existing antenna pipe mounts are NOT in compliance with the Codes and Standards previously mentioned. The controlling stress design for the existing mount with the proposed antenna inventory is noted at 117.1% structural capacity rating.

AECOM has also independently considered the re-location of an existing supporting arm from the overstressed vertical member to the top horizontal antenna mount frame (as indicated within these design calculations) and has performed a structural analysis for this re-location. When considering this adjustment of the re-location of the antenna mounting frame support arm, the updated stress design for the mount with the proposed antenna inventory indicated herein, is noted ***at 56.7%*** structural capacity rating, as a "Contingent Passing Scenario".

AECOM is considering the use of the term "Contingent Passing Scenario" herein, to be contingent with the location of adjustment of the support arm location and has assumed the location of the proposed antenna installations and existing frame dimensions. Verification of the adjusted location of the supporting antenna mounting arm along with the location(s) of proposed equipment shall be confirmed prior to any installation of the proposed antennas as part of the "Contingent Passing Scenario", as stated herein.

Should there be any questions, please do not hesitate to contact this office at (860) 529-8882.

Sincerely,

AECOM

Richard Sambor, P.E.
Senior Structural Engineer

cc: MJE, CF/Book – AECOM

AECOM

				Page	of
Job	Greenwich, CT (180') SST - Antenna Mount	Project No.	VZ5-205	Sheet 1	of 16
Description	Mount Frame Analysis (TIA-222-G) Conditions	Computed by	MCD	Date	06/27/19
		Checked by		Date	

Greenwich, CT - 180' Self-SupportingTower - Antenna Strength Design Analysis Calculations (Antenna Mount)

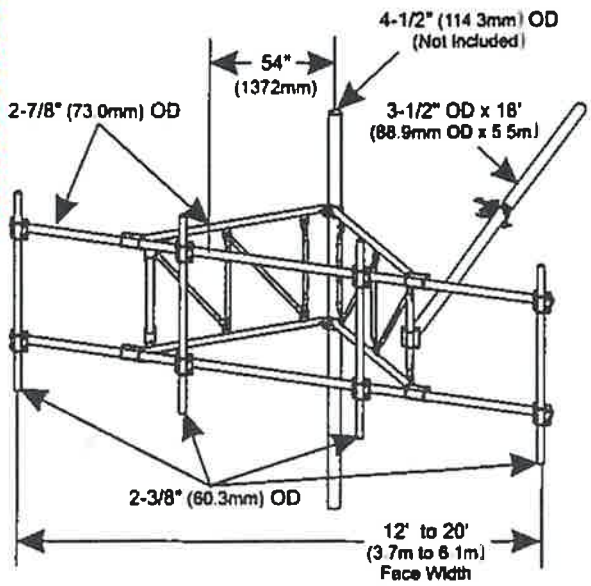
- **Design Criteria used for Proposed Antenna Assessment**
  - 2015 International Building Code (IBC) with 2018 State of Connecticut Building Code Amendments to the 2015 IBC.
  - Telecommunications Industry Association Design Standard TIA-222-G (Structural Standard for Antenna Supporting Structures and Antennas) with Addendum 2 (December 2009)
  - Verizon Antenna Mounting System Classification Standard (NSTD-445) (version Jan. 3 2017)
- **Design Calculation Applied for Antenna Assessment of Stress and of the Mount Classification listing required for Bare and Iced Mounts.**
  - Topographical Category of Structure = "Category 3" - Structure located on upper half of hill - wind speed-up considered
  - Crest Hill Height used for analysis --> 36 feet
  - Exposure Category of Structure = "Exposure C" - Open Terrain with scttered obstructions
  - Antenna supporting stresses checked through STAAD design program considering forces obtained from TIA-222-G Standard (V.asd)
  - Antenna supporting stresses checked through STAAD design program considering forces obtained from ASCE 7 2010 (V.ultimate)
  - Antenna mount classification for iced considerations following design criteria (design thickness per ASCE 7 2010 and TIA-222-G Standards).
    - *NOTE:* Calculation referenced to the use Serviceable Loads in the STAAD design program (not currently approved deisgn Standard) applied as a design and loading guidance for Serviceability/Maintenance work on mount not specifially identified per the TIA-222-G design Standard. Maintenance loads consist of a 500 lbf vertical load @ antenna mount pipes and 250lbf vertical load @ end of horizontal cantilevered member (Load Combination #5 & 6 within analysis herein).

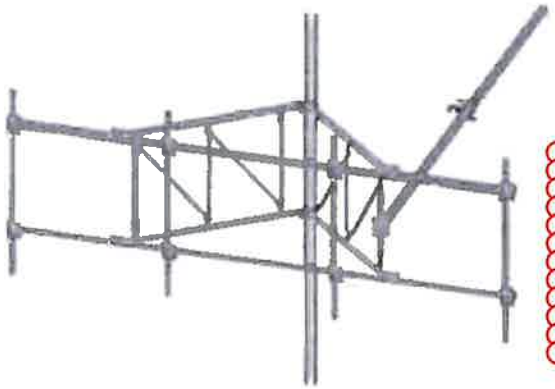
- **Antennas located in the Alpha/Beta Sector with an Antenna Centerline Elevation of 130'-0" Above Ground:**
  - 3 panel antennas per Sector on tower structure:
    - Antennas to remain:
      - (6) Decibel DB844H80-XY Panel Antennas
    - Removed existing antennas (to be removed and/or swapped for Proposed Antennas):
      - (3) Swedcom SLCP 2X6014 Panel Antennas
      - (3) Amphenol BXA-171063-8BF Panel Antennas
      - (3) Commscope HBXX-6516DS-A2M Panel Antennas (Leased for site)
      - (6) Commscope HBXX-6517DS-A2M Panel Antennas (Leased for site)
    - Proposed antennas (to be installed):
      - (6) Commscope JAHH-65B-R3B Panel Antennas (2 per Sector)
      - (3) Commscope BSAMNT-SBS-2-2 Panel Mount kit Assemblies for JAHH Panels
      - (3) Samsung 4x40_B2/B66 RRH Units
      - (3) Samsung 4x30_B13 RRH Units
      - (1) RFS OVP Box (1 Beta Sector)
      - (3) Commscope CBC78T-DS-43-2X Diplexer units

- **Antenna Mount Design consideration/conditions used for structural analysis and assessment of proposed antenna:**
  - For the purposes of design, the MTS Wireless Components Sector Frame SF-SP16-4-126 was considered for strength design for the antenna mount
  - The following image is a graphical representation of the Antenna Mount Frame with antenna pipe mounts on the existing tower leg as a reference for the STAAD Desgn Model used for Strength Design cases.
    - Wind loading considered the worst case surface are of contact considering Bare and Iced Antenna conditions
    - Load Combinations are in reference to the TIA-222-G Section 2.3.2 for Strength Design Load Combinations.

- **Calculated Load Combinations for Consideration (LRFD):**
  - **LC#1: 1.2 * Dead Load + 1.6 * Wind w/o ice load**
  - **LC#2: 0.9 * Dead Load + 1.6 * Wind w/o ice load**
  - **LC#3: 1.2 * Dead Load + 1.0 Dead Load (ice) + 1.0 * Wind with ice load**
  - **LC#4: 1.4 * Dead Load**
  - **LC#5: 1.2 * Dead Load + 1.5 Maintenance Load (500 lbf) on Antenna Mounting Pipe + 1.0 * Wind w/o ice load**
  - **LC#6: 1.2 Dead Load + 1.5 Maintance Load (250 lbf) Cantilever end of Mount Pipe Assembly**

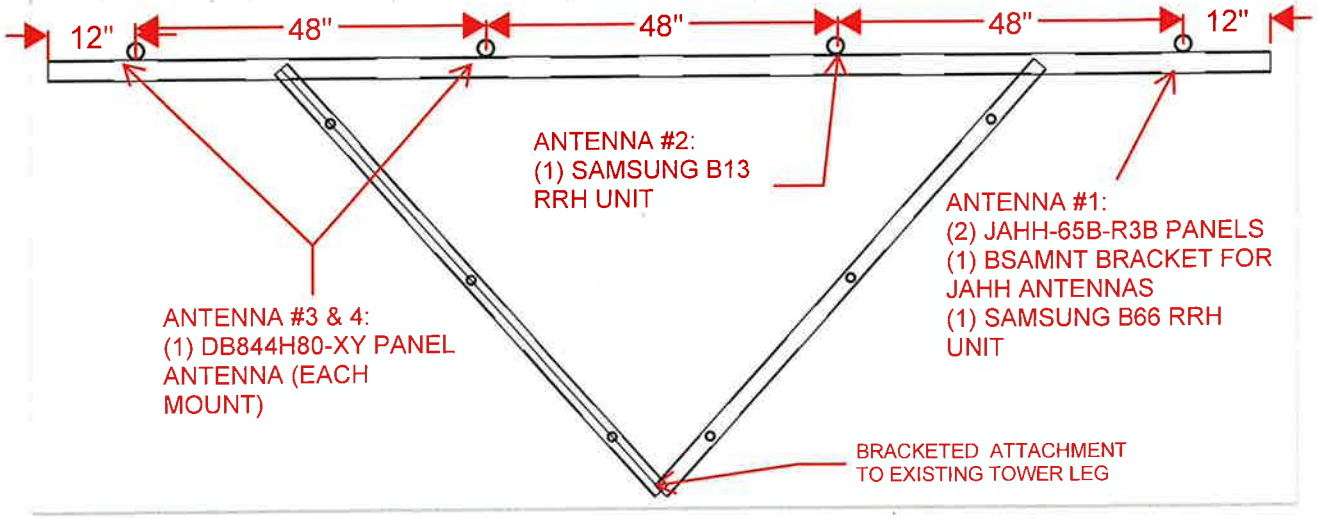
NOTE: ALL DIMENSIONS ARE FOR REFERECE AND SHALL BE VERIFIED BY THE RF ENGINEER PRIOR TO ANTENNA/EQUIPMENT INSTALLATION (IMAGE NOT TO SCALE)





MTS WIRELESS COMPONENTS ANTENNA FRAME. DIMENSIONS SHOWN ARE ASSUMED AND ARE REQUIRED TO BE FIELD VERIFIED PRIOR TO ANTENNA MODIFICATIONS. ANALYSIS MODELED FROM PART # SF-SP16-4-126 (MTS WIRELESS COMPONENTS PRODUCT CATALOG 2003 (PAGE 2). ANTENNA INVENTORY ASSUMED FOR FINAL CONDITIONS. RF ENGINEER SHALL VERIFY LOCATIONS PRIOR TO ASSEMBLY.

App.:	Lattice towers	**Mounts to:**	4-1/2" (114.3mm) OD
Size:	12' (3.7m) - 20' (6.1m) face	**Material:**	Hot dip galv. steel
Design:	Triangular w/ 54" (1372mm) standoff	**Incl.:**	Frame, u-bolts, 1 stiff arm
Feature:	Robust standoff frame	**Order Sep.:**	Avail. with or without pipe mounts



- **Determine Bare (no ice) Force Applied to Antenna (TIA-222-G Standard):**
  - TIA-222-G Section 2.6.6.2 - Design Wind Force on Appurtenances and Mount Frame:

$F_a := q_z \cdot G_h \cdot (EPA_A)$,where $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I$

,where $K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}}$ [TIA-222-G Section 2.6.5.2]

,where $z := 130ft$ Height above Ground Level (ft)

$z_g := 900ft$ [TIA-222-G Table 2-4 - Exposure Category "C"]

$\alpha := 9.5$ [TIA-222-G Table 2-4 - Exposure Category "C"]

$K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} = 1.337$

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ [TIA-222-G Section 2.6.5.2] ,where

$K_e := 1.0$ Terrain Constant - Exposure Category "C" [TIA-222-G Table 2-4]

$K_t := 0.53$ Topographic Constant - Topographic Category 3 [TIA-222-G Table 2-5]

$K_h := e^{\left(\frac{f \cdot z}{H}\right)}$,where

$f := 2.00$ Height Attenuation Factor [TIA-222-G; Table 2-5] Topographic Category 1

$H_t := 36ft$ Height of Crest above Surrounding Terrain

$K_h := e^{\left(\frac{f \cdot z}{H_t}\right)}$ $K_h = 1369.529$

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ $K_{zt} = 1.001$

$K_d := 0.85$ [TIA-222-G Table 2-2]

$V :=$ [Connecticut State Building Code 2018 - Appendix N and IBC 2015 Section 1609.1.1 - Exception 5 "Designs using TIA-222" applies for determination of Design WInd load obtained as "V.ult" are to be converted to "V.asd" when applying the TIA-222-G design Standard (under Section 1609.3) for Basic Wind Speed]

$V_{asd.1} := 94mph$ *NOTE: When considering amplified wind for Str Class 3, Wind speed calculates to 101 mph.*

$I := 1.15$ Importance Factor - Structure Class 3 [TIA-222-G Table 2-3] $I_{Cat} := 3$

$G_h := 1.0$ Apply Gh = 1.0 for Antenna Mount Frames

$$q_z := \left(0.00256 \cdot \frac{psf}{mph^2}\right) \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_{asd.1}^{\ 2} \cdot I$$

$q_z = 29.6 \cdot psf$

- Distributed Wind to Antenna Frame (design for lb / inch)

Effective Projected Area on Mount Pipe (Pound (force) per linear inch):

$F_a := q_z \cdot G_h \cdot (EPA_A)$ $EPA_A := C_a \cdot A_a$

$C_a := 1.2$ Round Surfaces (assuming Aspect Ratio > 25 (Conservative))

$Antenna_{frame.OD} := 2.8750in$ $Antenna_{frame.Length} := 168in$

$A_a := Antenna_{frame.OD} \cdot Antenna_{frame.Length}$ $EPA_A := C_a \cdot A_a$

$$\omega_{frame.width} := \frac{q_z \cdot G_h \cdot (EPA_A)}{Antenna_{frame.Length}}$$

$\omega_{frame.width} = 0.70908139 \cdot \frac{lbf}{in}$ Pounds (force) per in - distributed load for STAAD input

- Distributed Wind to Antenna on Mount Frame (design for lb / inch)

$C_a := 1.4$ Flat Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

Antenna #1a - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in)

$Antenna_{Height.1} := 72.0in$ $Antenna_{Width.1} := 13.8in$

$Antenna_{No.1} := C_a \cdot (Antenna_{Height.1} \cdot Antenna_{Width.1})$

$\omega_{frame.width.1} := \frac{Antenna_{No.1} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.1} = 2.26906045 \cdot \frac{lbf}{in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #1b - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in)

$Antenna_{Height.2} := 72in$ $Antenna_{Width.2} := 13.8in$

$Antenna_{No.2} := C_a \cdot (Antenna_{Height.2} \cdot Antenna_{Width.2})$

$\omega_{frame.width.2} := \frac{Antenna_{No.2} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.2} = 27.22872537 \cdot \frac{lbf}{ft}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #1mt - Shared Antenna Mount - BSAMNT-SBS-2-2 (Height = 746mm x Width 131mm)

$Antenna_{Height.3} := 746mm$ $Antenna_{Width.3} := 131mm$

$Antenna_{No.3} := C_a \cdot (Antenna_{Height.3} \cdot Antenna_{Width.3})$

$\omega_{frame.width.3} := \frac{2Antenna_{No.3} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.3} = 8.30210868 \cdot \frac{lbf}{ft}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #1rrh - 4x40 RRH B13A Unit (Height = 15.0in x Width 15.0in) - DO NOT INCLUDE, RRH UNIT SHIELDED BY BACK-TO-BACK JAHH PANEL ANTENNA UNITS!!!

$Antenna_{Height.4} := 15.0in$ $Antenna_{Width.4} := 15.0in$

$Antenna_{No.4} := C_a \cdot (Antenna_{Height.4} \cdot Antenna_{Width.4})$

$\omega_{frame.width.4} := \frac{Antenna_{No.4} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.4} = 6.16592513 \cdot \frac{lbf}{ft}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #2rrh - 4x40 RRH B66 Unit (Height = 25.8in x Width 11.8in)

$Antenna_{Height.5} := 25.8in$ $Antenna_{Width.5} := 11.8in$

$Antenna_{No.5} := C_a \cdot (Antenna_{Height.5} \cdot Antenna_{Width.5})$

$\omega_{frame.width.5} := \frac{Antenna_{No.5} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.5} = 8.34290776 \cdot \frac{lbf}{ft}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #3 - DB844H80-XY Panel Antenna (Height = 48in x Width 6.0in)

$Antenna_{Height.6} := 48in$ $Antenna_{Width.6} := 6in$

$Antenna_{No.6} := C_a \cdot (Antenna_{Height.6} \cdot Antenna_{Width.6})$

$\omega_{frame.width.6} := \frac{Antenna_{No.6} \cdot q_z \cdot G_h}{126in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width.6} = 7.89238416 \cdot \frac{lbf}{ft}$

Antenna #4 - DB844H80-XY Panel Antenna (Height = 48in x Width 6.0in)

$Antenna_{Height.7} := 48in$ $Antenna_{Width.7} := 6in$

$Antenna_{No.7} := C_a \cdot (Antenna_{Height.7} \cdot Antenna_{Width.7})$

$\omega_{frame.width.7} := \frac{Antenna_{No.7} \cdot q_z \cdot G_h}{126in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width.7} = 7.89238416 \cdot \frac{lbf}{ft}$

Distribution on Pipe Mount #1: $\omega_{frame.width.1} + \omega_{frame.width.2} + \omega_{frame.width.3} = 5.229963 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #2: $\omega_{frame.width.5} = 0.695242 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #3: $\omega_{frame.width.6} = 0.657699 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #4: $\omega_{frame.width.7} = 0.657699 \cdot \frac{lbf}{in}$

- Dead Load of Antennas, Connection Frame and Mount Pipe

Antenna #1 - JAHH-65B-R3B - Antenna (Weight)	$Antenna_{Weight.1} := 92.6lbf$
Antenna #2 - JAHH-65B-R3B - Antenna (Weight)	$Antenna_{Weight.2} := 92.6lbf$
Antenna #3 - BSAMNT-SBS-2-2 Bracket (Weight)	$Antenna_{Weight.3} := 67.4lbf$
RRH Unit #4 - B13 Unit (Weight)	$Antenna_{Weight.4} := 82.0lbf$
RRH Unit #5 - B66 Unit (Weight)	$Antenna_{Weight.5} := 57lbf$
Antenna #6 - DB844H80-XY Antenna (Weight)	$Antenna_{Weight.6} := 30lbf$
Antenna #7 - DB844H80-XY Antenna (Weight)	$Antenna_{Weight.7} := 30lbf$

Distribution on Pipe Mount #1: $Antenna_{Weight.1} + Antenna_{Weight.2} + Antenna_{Weight.3} + Antenna_{Weight.4} = 334.60 \cdot lbf$

Distribution on Pipe Mount #2: $Antenna_{Weight.5} = 57.00 \cdot lbf$

Distribution on Pipe Mount #3: $Antenna_{Weight.6} = 30.00 \cdot lbf$

Distribution on Pipe Mount #4: $Antenna_{Weight.7} = 30.00 \cdot lbf$

- **Determine Iced Forces Applied to Antenna (TIA-222-G Standard):**
  - TIA-222-G Section 2.6.6.2 - Design Wind Force on Appurtenances and Mount Frame:

$F_a := q_z \cdot G_h \cdot (EPA_A)$,where $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I$

,where $K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}}$ [TIA-222-G Section 2.6.5.2]

,where $z := 160ft$ Height above Ground Level (ft)

$z_g := 900ft$ [TIA-222-G Table 2-4 - Exposure Category "C"]

$\alpha := 9.5$ [TIA-222-G Table 2-4 - Exposure Category "C"]

$K_{t.min} := 0.53$ [TIA-222-G Table 2-5 - Topographic Category 3]

$K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} = 1.397$ $K_z = 1.397$

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ [TIA-222-G Section 2.6.5.2] ,where

$K_e := 1.0$ Terrain Constant - Exposure Category "C" [TIA-222-G Table 2-4]

$K_t := 0.53$ Topographic Constant - Topographic Category 3 [TIA-222-G Table 2-5]

$K_h := e^{\left(\frac{f \cdot z}{H}\right)}$,where

$f := 2.00$ Height Attenuation Factor [TIA-222-G; Table 2-5] Topographic Category 3

$H_t := 36ft$ Height of Crest above Surrounding Terrain

$K_h := e^{\left(\frac{f \cdot z}{H_t}\right)}$ $K_h = 7250.958$

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ $K_{zt} = 1.000$

$K_d := 0.85$ [TIA-222-G Table 2-2]

$V_{asd.2} := 50mph$ mph Ice - TIA-222-G Appendix #

$I := 1.0$ Importance Factor - Structure Class 3 [TIA-222-G Table 2-3]

$G_h := 1.0$ Apply Gh = 1.0 for Antenna Mount Frames

$$q_z := \left(0.00256 \cdot \frac{psf}{mph^2}\right) \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_{asd.2}^{\ 2} \cdot I$$

$q_z = 7.6 \cdot psf$

- Design Ice Thickness (TIA-222-G / ASCE 7):

$t_{iz} := 2.0 \cdot t_i \cdot I_{icc} \cdot K_{iz} \cdot K_{zt}^{\ 0.35}$,where $t_i := 0.75in$ inch

$I_{ice} := 1.250$ [TIA-222-G Table 2-3]

$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{\ 0.35}$ $K_{iz} := \left(\frac{z}{33ft}\right)^{0.10} = 1.2$

$t_{iz} = 2.196 \cdot in$ inch

- Area of Design Ice Thickness - for Weight:

Horizontal / Vertical Pipes (2-7/8" O.D.) $D_c := 2.875in$ inch

$A_{iz} := \pi \cdot t_{iz} \cdot (D_c + t_{iz})$ $A_{iz} = 35.0 \cdot in^2$ $inch^2$

- Design Ice Thickness - Weight:

$WT_{ice} := A_{iz} \cdot 56pcf \cdot (Antenna_{frame.Length} + 2 \cdot t_{iz}) = 195.4 \cdot lbf$ Lbf NOTE: "56" is in reference to the unit weight of ice at 56 pcf

- Distributed Wind to Antenna Frame (design for lb / inch)

Effective Projected Area on Mount Pipe (Pound (force) per linear inch):

$F_a := q_z \cdot G_h \cdot (EPA_A)$ $EPA_A := C_a \cdot A_a$

$C_a := 1.2$ Round Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

$Antenna_{frame.OD} := 2.8750in + 2 \cdot t_{iz}$ (inch) $Antenna_{frame.Length} := 168in + 2 \cdot t_{iz}$ (inch)

$A_a := Antenna_{frame.OD} \cdot Antenna_{frame.Length}$ $EPA_A := C_a \cdot A_a$

$$\omega_{frame.width} := \frac{q_z \cdot G_h \cdot (EPA_A)}{Antenna_{frame.Length}}$$

$\omega_{frame.width} = 0.46034420 \cdot \frac{lbf}{in}$ Pounds (force) per inch - distributed load for STAAD input

- Distributed Wind to Antenna on Mount Frame (design for lb / inch)

$C_a := 1.4$ Flat Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

Antenna #1a - JAHH-65B-R3B - Antenna (Height = 72.0 in x Width 13.8 in)

$Antenna_{Height.1} := 72in + 2 \cdot t_{iz}$ $Antenna_{Width.1} := 13.8in + 2 \cdot t_{iz}$ $Antenna_{No.1} := C_a \cdot (Antenna_{Height.1} \cdot Antenna_{Width.1})$

$\omega_{frame.width.1} := \frac{Antenna_{No.1} \cdot q_z \cdot G_h}{126in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width} = 0.46034420 \cdot \frac{lbf}{in}$

Antenna #1b - JAHH-65B-R3B - Antenna (Height = 72.0 in x Width 13.8 in)

$Antenna_{Height.2} := 72in + 2 \cdot t_{iz}$ $Antenna_{Width.2} := 13.8in + 2 \cdot t_{iz}$ $Antenna_{No.2} := C_a \cdot (Antenna_{Height.2} \cdot Antenna_{Width.2})$

$\omega_{frame.width.2} := \frac{Antenna_{No.2} \cdot q_z \cdot G_h}{126in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width} = 0.46034420 \cdot \frac{lbf}{in}$

Antenna #1mt - Shared Antenna Mount - BSAMNT-SBS-2-2 (Height = 746mm x Width 131mm)

$Antenna_{Height.3} := 746mm + 2 \cdot t_{iz}$ $Antenna_{Width.3} := 131mm + 2 \cdot t_{iz}$

$\omega_{frame.width.3} := \frac{2 Antenna_{No.3} \cdot q_z \cdot G_h}{126in}$

$Antenna_{No.3} := C_a \cdot (Antenna_{Height.3} \cdot Antenna_{Width.3})$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width} = 0.46034420 \cdot \frac{lbf}{in}$

Antenna #1rrh - 4x40 RRH B13A Unit (Height = 15.0in x Width 15.0in) - DO NOT INCLUDE, RRH UNIT SHIELDED BY BACK-TO-BACK JAHH PANEL ANTENNA UNITS!!!

$Antenna_{Height.4} := 15in + 2 \cdot t_{iz}$ $Antenna_{Width.4} := 15in + 2 \cdot t_{iz}$ $Antenna_{No.4} := C_a \cdot (Antenna_{Height.4} \cdot Antenna_{Width.4})$

$\omega_{frame.width.4} := \frac{Antenna_{No.4} \cdot q_z \cdot G_h}{126in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width} = 0.46034420 \cdot \frac{lbf}{in}$

Antenna #2rrh - 4x40 RRH B66 Unit (Height = 25.8in x Width 11.8in)

$Antenna_{Height.5} := 72in + 2 \cdot t_{iz}$ $Antenna_{Width.5} := 11.9in + 2 \cdot t_{iz}$ $Antenna_{No.5} := C_a \cdot (Antenna_{Height.5} \cdot Antenna_{Width.5})$

$\omega_{frame.width.5} := \frac{Antenna_{No.5} \cdot q_z \cdot G_h}{126in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width} = 0.46034420 \cdot \frac{lbf}{in}$

AECOM

				Page	of
Job	Greenwich, CT (180') SST - Antenna Mount	Project No.	VZ5-205	Sheet	10 of 16
Description	Mount Frame Analysis (TIA-222-G) Conditions	Computed by	MCD	Date	06/27/19
		Checked by		Date	

Antenna #3 - DB844H80-XY Panel (Height = 48.0 in x Width 6.0in)

$Antenna_{Height.6} := 48in + 2 \cdot t_{iz}$ $Antenna_{Width.6} := 6in + 2 \cdot t_{iz}$

$\omega_{frame.width.6} := \frac{Antenna_{No.6} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.6} = 0.31935417 \cdot \frac{lbf}{in}$

$Antenna_{No.6} := C_a \cdot (Antenna_{Height.6} \cdot Antenna_{Width.6})$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #4 - DB844H80-XY Panel (Height = 48.0 in x Width 6.0in)

$Antenna_{Height.7} := 48in + 2 \cdot t_{iz}$ $Antenna_{Width.7} := 6in + t_{iz}$

$\omega_{frame.width.7} := \frac{Antenna_{No.7} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.7} = 0.25187373 \cdot \frac{lbf}{in}$

$Antenna_{No.7} := C_a \cdot (Antenna_{Height.7} \cdot Antenna_{Width.7})$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Distribution on Pipe Mount #1: $\omega_{frame.width.1} + \omega_{frame.width.2} + \omega_{frame.width.3} = 2.008554 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #2: $\omega_{frame.width.5} = 0.730028 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #3: $\omega_{frame.width.6} = 0.319354 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #4: $\omega_{frame.width.7} = 0.251874 \cdot \frac{lbf}{in}$

NOTE; Above Distributions are considering wind applied to "design" ice thicknesses acting on exterior of appurtenances

- Design Ice Thickness - Weight: (Copied for Reference) (Antenna.frame.Length considering Ice build-up)

$WT_{ice} := A_{iz} \cdot 56pcf \cdot Antenna_{frame.Length}$ $WT_{ice} = 195.4 \cdot lbf$ Lbf

NOTE: "56" is in reference to the unit weight of ice at 56 pcf

"Point Load"

$\omega_{WT.ice.frame.width} := \frac{WT_{ice}}{Antenna_{frame.Length}} = 1.133577 \cdot \frac{lbf}{in}$

Lbf / in Distributed load of Ice on Antenna Frame

- Design Ice Thickness - Weight: (Volume Comparison from Ice to Antenna):

Antenna #1a - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in x Thickness 8.2in) (no ice)
Antenna (Height = 77.0in x Width 18.8in x Thickness 13.2in) (w/ ice)

$Antenna_{Ice.Volume.1} := 77in \cdot 18.8in \cdot 13.2in$ $Antenna_{No.Ice.Volume.1} := 72in \cdot 13.8in \cdot 8.2in$

$Weight_{Antenna.1} := (Antenna_{Ice.Volume.1} - Antenna_{No.Ice.Volume.1}) \cdot 56pcf = 355.2 \cdot lbf$ Lbf - "Point Load"

Antenna #1b - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in x Thickness 8.2in) (no ice)
Antenna (Height = 77.0in x Width 18.8in x Thickness 13.2in) (w/ ice)

$Antenna_{Ice.Volume.2} := 77in \cdot 18.8in \cdot 13.2in$ $Antenna_{No.Ice.Volume.2} := 72in \cdot 13.8in \cdot 8.2in$

$Weight_{Antenna.2} := (Antenna_{Ice.Volume.2} - Antenna_{No.Ice.Volume.2}) \cdot 56pcf = 355.2 \cdot lbf$ Lbf - "Point Load"

Antenna #1mnt - BSAMNT-SBS-2-2 - Antenna (Height = 746mm x Width 131mm x Thickness 80mm) (no ice)
Antenna (Height = 873mm x Width 258mm x Thickness 207mm)(w/ ice)

$Antenna_{Ice.Volume.3} := 873mm \cdot 258mm \cdot 207mm$ $Antenna_{No.Ice.Volume.3} := 746mm \cdot 131mm \cdot 80mm$

$Weight_{Antenna.3} := 2(Antenna_{Ice.Volume.3} - Antenna_{No.Ice.Volume.3}) \cdot 56pcf = 153.5 \cdot lbf$ Lbf - "Point Load"

Antenna #1rrh - 4x40 RRH B13A Unit (Height = 15.0in x Width 15.0in x Thickness 8.1in) (no ice)
Unit (Height = 20in x Width 20.0in x Thickness 13.1in) (w/ ice)

$Antenna_{Ice.Volume.4} := 20in \cdot 20in \cdot 13.1in$ $Antenna_{No.Ice.Volume.4} := 15in \cdot 15in \cdot 8.1in$

$Weight_{Antenna.4} := (Antenna_{Ice.Volume.4} - Antenna_{No.Ice.Volume.4}) \cdot 56pcf = 110.8 \cdot lbf$ Lbf - "Point Load"

Antenna #2rrh - 4x40 RRH B66 Unit (Height = 25.8in x Width 11.8in x Thickness 7.2in) (no ice)
Unit (Height = 30.8in x Width 16.8in x Thickness 12.2in) (w/ ice)

$Antenna_{Ice.Volume.5} := 30.8in \cdot 16.8in \cdot 12.2in$ $Antenna_{No.Ice.Volume.5} := 25.8in \cdot 11.8in \cdot 7.2in$

$Weight_{Antenna.5} := (Antenna_{Ice.Volume.5} - Antenna_{No.Ice.Volume.5}) \cdot 56pcf = 133.5 \cdot lbf$ Lbf - "Point Load"

- Design Ice Thickness - Weight: (Volume Comparison from Ice to Antenna Equipment - Applied to largest [point load - Conservative approach):

Antenna #3 - DB844H480-XY Panel Unit (Height = 48.0in x Width 6.0in x Thickness 8.5in) (no ice)
Unit (Height = 53.0in x Width 11.0in x Thickness 13.5in) (w/ ice)

$Equipment_{Ice.Volume.6} := 53in \cdot 11in \cdot 13.5in$ $Equipemnt_{No.Ice.Volume.6} := 48in \cdot 6in \cdot 8.5in$

$Weight_{Equipment.6} := (Equipment_{Ice.Volume.6} - Equipemnt_{No.Ice.Volume.6}) \cdot 56pcf = 175.7 \cdot lbf$ Lbf - "Point Load"

Antenna #4 DB844H480-XY Panel Unit (Height = 48.0in x Width 6.0in x Thickness 8.5in) (no ice)
Unit (Height = 53.0in x Width 11.0in x Thickness 13.5in) (w/ ice)

$Equipment_{Ice.Volume.7} := 53in \cdot 11in \cdot 13.5in$ $Equipemnt_{No.Ice.Volume.7} := 48in \cdot 6in \cdot 8.5in$

$Weight_{Equipment.7} := (Equipment_{Ice.Volume.7} - Equipemnt_{No.Ice.Volume.7}) \cdot 56pcf = 175.7 \cdot lbf$ Lbf - "Point Load"

- Ice Induced Dead Load of Antennas, Connection Frame and Mount Pipe

Antenna #1 - JAHH-65B-R3B - Antenna (Weight)	$Weight_{Antenna.1} = 355.2 \cdot lbf$
Antenna #2 - JAHH-65B-R3B - Antenna (Weight)	$Weight_{Antenna.2} = 355.2 \cdot lbf$
Antenna #3 - BSAMNT-SBS-2-2 Bracket (Weight)	$Weight_{Antenna.3} = 153.5 \cdot lbf$
RRH Unit #4 - B13 Unit (Weight)	$Weight_{Antenna.4} = 110.8 \cdot lbf$
RRH Unit #5 - B66 Unit (Weight)	$Weight_{Antenna.5} = 133.5 \cdot lbf$
Antenna #6 - DB844H80-XY Panel Antenna (Weight)	$Weight_{Equipment.6} = 175.7 \cdot lbf$
Antenna #7 - DB844H80-XY Panel Antenna (Weight)	$Weight_{Equipment.7} = 175.7 \cdot lbf$

- Ice Induced Dead Load of Antennas, Connection Frame and Mount Pipe - on Mounting Pipe

Distribution on Pipe Mount #1: $Weight_{Antenna.1} + Weight_{Antenna.2} + Weight_{Antenna.3} + Weight_{Antenna.4} = 974.659 \cdot lbf$

Distribution on Pipe Mount #2: $Weight_{Antenna.5} = 133.544444 \cdot lbf$

Distribution on Pipe Mount #3: $Weight_{Equipment.6} = 175.729167 \cdot lbf$

Distribution on Pipe Mount #4: $Weight_{Equipment.7} = 175.729167 \cdot lbf$

- **Determine Service/Maintenance .Force Applied to Antenna (TIA-222-G Standard):**
  - TIA-222-G Section 2.6.6.2 - Design Wind Force on Appurtenances and Mount Frame:

$F_a := q_z \cdot G_h \cdot (EPA_A)$,where $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I$

,where $K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}}$ [TIA-222-G Section 2.6.5.2]

,where $z := 130ft$ Height above Ground Level (ft)

$z_g := 900ft$ [TIA-222-G Table 2-4 - Exposure Category "C"]

$\alpha = 9.5$ [TIA-222-G Table 2-4 - Exposure Category "C"]

$K_z := 2.01 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} = 1.337$

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ [TIA-222-G Section 2.6.5.2] ,where

$K_e := 1.0$ Terrain Constant - Exposure Category "C" [TIA-222-G Table 2-4]

$K_t := 0.53$ Topographic Constant - Topographic Category 3 [TIA-222-G Table 2-5]

$K_h := e^{\left(\frac{f \cdot z}{H}\right)}$,where

$f := 2.00$ Height Attenuation Factor [TIA-222-G; Table 2-5] Topographic Category 3

$H_t := 36ft$ Height of Crest above Surrounding Terrain

$K_h := e^{\left(\frac{f \cdot z}{H_t}\right)}$ $K_h = 1369.529$ *NOTE: Values Manually input because of formula calculation inaccuracy*

$K_{zt} := \left(1 + \frac{K_e \cdot K_t}{K_h}\right)^2$ $K_{zt} = 1.001$

$K_d := 0.85$ [TIA-222-G Table 2-2]

$V_{asd} := 60mph$ mph - Service Loading (TIA-222-G Section 2.8.3)

$I := 1.0$ Importance Factor - Structure Class 3 [TIA-222-G Table 2-3]

$G_h := 1.0$ Apply Gh = 1.0 for Antenna Mount Frames

$$q_z := \left(0.00256 \cdot \frac{psf}{mph^2}\right) \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_{asd}^{\ 2} \cdot I$$

$q_z = 10.5 \cdot psf$ (psf)

- Distributed Wind to Antenna Frame (design for lb / inch)

Effective Projected Area on Mount Pipe (Pound (force) per linear inch):

$F_a := q_z \cdot G_h \cdot (EPA_A)$ $EPA_A := C_a \cdot A_a$

$C_a := 1.2$ Round Surfaces (assuming Aspect Ratio = 7 (slightly Conservative))

$Antenna_{frame.OD} := 2.8750in$ (inch) $Antenna_{frame.Length} := 168in$ (inch)

$A_a := Antenna_{frame.OD} \cdot Antenna_{frame.Length}$ $EPA_A := C_a \cdot A_a$

$$\omega_{frame.width} := \frac{q_z \cdot G_h \cdot (EPA_A)}{Antenna_{frame.Length}}$$

$\omega_{frame.width} = 0.25121470 \cdot \frac{lbf}{in}$ Pounds (force) per inch - distributed load for STAAD input

Antenna #1a - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in)

$Antenna_{Height.1} := 72.0in$ $Antenna_{Width.1} := 13.8in$

$Antenna_{No.1} := C_a \cdot (Antenna_{Height.1} \cdot Antenna_{Width.1})$

$\omega_{frame.width.1} := \frac{Antenna_{No.1} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.1} = 0.68904602 \cdot \frac{lbf}{in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #1b - JAHH-65B-R3B - Antenna (Height = 72.0in x Width 13.8in)

$Antenna_{Height.2} := 72in$ $Antenna_{Width.2} := 13.8in$

$Antenna_{No.2} := C_a \cdot (Antenna_{Height.2} \cdot Antenna_{Width.2})$

$\omega_{frame.width.2} := \frac{Antenna_{No.2} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.2} = 0.68904602 \cdot \frac{lbf}{in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #1mt - Shared Antenna Mount - BSAMNT-SBS-2-2 (Height = 746mm x Width 131mm)

$Antenna_{Height.3} := 746mm$ $Antenna_{Width.3} := 131mm$

$Antenna_{No.3} := C_a \cdot (Antenna_{Height.3} \cdot Antenna_{Width.3})$

$\omega_{frame.width.3} := \frac{2 Antenna_{No.3} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.3} = 0.21009191 \cdot \frac{lbf}{in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #1rrh - 4x40 RRH B13A Unit (Height = 15.0in x Width 15.0in) - DO NOT INCLUDE, RRH UNIT SHIELDED BY BACK-TO-BACK JAHH PANEL ANTENNA UNITS!!!

$Antenna_{Height.4} := 15.0in$ $Antenna_{Width.4} := 15.0in$

$Antenna_{No.4} := C_a \cdot (Antenna_{Height.4} \cdot Antenna_{Width.4})$

$\omega_{frame.width.4} := \frac{Antenna_{No.4} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.4} = 0.15603397 \cdot \frac{lbf}{in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #2rrh - 4x40 RRH B66 Unit (Height = 25.8in x Width 11.8in)

$Antenna_{Height.5} := 25.8in$ $Antenna_{Width.5} := 11.8in$

$Antenna_{No.5} := C_a \cdot (Antenna_{Height.5} \cdot Antenna_{Width.5})$

$\omega_{frame.width.5} := \frac{Antenna_{No.5} \cdot q_z \cdot G_h}{126in}$

$\omega_{frame.width.5} = 0.21112437 \cdot \frac{lbf}{in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

Antenna #3 - DB844H80-XY Panel (Height = 48.0in x Width =6.0in)

$Antenna_{Height.6} := 48.0in$ $Antenna_{Width.6} := 6.0in$

$Antenna_{No.6} := C_a \cdot (Antenna_{Height.6} \cdot Antenna_{Width.6})$

$\omega_{frame.width.6} := \frac{Antenna_{No.6} \cdot q_z \cdot G_h}{126in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width.6} = 0.19972348 \cdot \frac{lbf}{in}$

Antenna #4 - DB844H80-XY Panel (Height = 48.0in x Width =6.0in)

$Antenna_{Height.7} := 48.0in$ $Antenna_{Width.7} := 6.0in$

$Antenna_{No.7} := C_a \cdot (Antenna_{Height.7} \cdot Antenna_{Width.7})$

$\omega_{frame.width.7} := \frac{Antenna_{No.7} \cdot q_z \cdot G_h}{126in}$

Pounds (force) per foot - distributed load for STAAD input - pipe length assumed as 126" total length

$\omega_{frame.width.7} = 0.19972348 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #1: $\omega_{frame.width.1} + \omega_{frame.width.2} + \omega_{frame.width.3} = 1.588184 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #2: $\omega_{frame.width.5} = 0.211124 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #3: $\omega_{frame.width.6} = 0.199723 \cdot \frac{lbf}{in}$

Distribution on Pipe Mount #4: $\omega_{frame.width.7} = 0.199723 \cdot \frac{lbf}{in}$

- Dead Load of Antennas, Connection Frame and Mount Pipe

Antenna #1 - JAHH-65B-R3B - Antenna (Weight)	$Antenna_{Weight.1} := 92.6lbf$
Antenna #2 - JAHH-65B-R3B - Antenna (Weight)	$Antenna_{Weight.2} := 92.6lbf$
Antenna #3 - BSAMNT-SBS-2-2 Bracket (Weight)	$Antenna_{Weight.3} := 67.4lbf$
RRH Unit #4 - B13 Unit (Weight)	$Antenna_{Weight.4} := 82.0lbf$
RRH Unit #5 - B66 Unit (Weight)	$Antenna_{Weight.5} := 57lbf$
Antenna #6 - DB844H80-XY Panel (Weight)	$Antenna_{Weight.6} := 30lbf$
Antenna #7 - DB844H80-XY Panel (Weight)	$Antenna_{Weight.7} := 30lbf$

Distribution on Pipe Mount #1: $Antenna_{Weight.1} + Antenna_{Weight.2} + Antenna_{Weight.3} + Antenna_{Weight.4} = 334.60 \cdot lbf$

Distribution on Pipe Mount #2: $Antenna_{Weight.5} = 57.00 \cdot lbf$

Distribution on Pipe Mount #3: $Antenna_{Weight.6} = 30.00 \cdot lbf$

Distribution on Pipe Mount #4: $Antenna_{Weight.7} = 30.00 \cdot lbf$

VZW PROPOSED ANTENNA INVENTORY ON EXISISTING FRAME ANALYSIS

```
*****************************************************
*                                                   *
*           STAAD.Pro V8i SELECTseries6             *
*           Version  20.07.11.90                    *
*           Proprietary Program of                  *
*           Bentley Systems, Inc.                   *
*           Date=    JUN 27, 2019                   *
*           Time=    18: 8:32                       *
*                                                   *
*      USER ID: AECOM                               *
*****************************************************
```

```
    1. STAAD SPACE
INPUT FILE: P:\Projects\Telcom\StructuralsByLocation\Connecticut\GreenwichCSP#74\16-VZW Proposed on Ex.. .STD
    2. START JOB INFORMATION
    3. ENGINEER DATE 27-JUN-19
    4. ENGINEER NAME MCD
    5. END JOB INFORMATION
    6. INPUT WIDTH 79
    7. UNIT INCHES POUND
    8. JOINT COORDINATES
    9. 1 0 0 0; 2 12 0 0; 3 31.8756 0 0; 4 60 0 0; 5 108 0 0; 6 136.126 0 0
   10. 7 156 0 0; 8 168 0 0; 9 0 36 0; 10 12 36 0; 11 31.876 36 0; 12 60 36 0
   11. 13 108 36 0; 14 136.126 36 0; 15 156 36 0; 16 168 36 0; 17 38.5584 0 7.5144
   12. 18 57.9384 0 29.1252; 19 77.2764 0 50.736; 20 84 0 58.2504
   13. 21 90.7236 0 50.736; 22 110.064 0 29.1252; 23 129.401 0 7.5144
   14. 24 38.5584 36 7.5144; 25 57.9384 36 29.1252; 26 77.2764 36 50.736
   15. 27 84 36 58.2504; 28 90.7236 36 50.736; 29 110.063 36 29.1252
   16. 30 129.401 36 7.512; 31 12 -45 0; 32 12 81 0; 33 60 -45 0; 34 60 81 0
   17. 35 108 -45 0; 36 108 81 0; 37 156 -45 0; 38 156 81 0; 39 129.401 27 7.512
   18. 40 129.401 27 156
   19. MEMBER INCIDENCES
   20. 1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 5 6; 6 6 7; 7 7 8; 8 9 10; 9 10 11; 10 11 12
   21. 11 12 13; 12 13 14; 13 14 15; 14 15 16; 15 3 17; 16 17 18; 17 18 19; 18 19 20
   22. 19 20 21; 20 21 22; 21 22 23; 22 23 6; 23 11 24; 24 24 25; 25 25 26; 26 26 27
   23. 27 27 28; 28 28 29; 29 29 30; 30 30 14; 31 17 24; 32 17 25; 33 25 18; 34 18 26
   24. 35 26 19; 36 21 28; 37 28 22; 38 22 29; 39 29 23; 41 31 2; 42 2 10; 43 10 32
   25. 44 33 4; 45 4 12; 46 12 34; 47 35 5; 48 5 13; 49 13 36; 50 37 7; 51 7 15
   26. 52 15 38; 53 23 39; 54 39 30; 55 39 40
   27. DEFINE MATERIAL START
   28. ISOTROPIC STEEL
   29. E 2.9E+007
   30. POISSON 0.3
   31. DENSITY 0.283
   32. ALPHA 6E-006
   33. DAMP 0.03
   34. TYPE STEEL
   35. STRENGTH FY 35000 FU 58000 RY 1.5 RT 1.2
   36. END DEFINE MATERIAL
   37. MEMBER PROPERTY AMERICAN
   38. 1 TO 14 TABLE ST PIPS25
```

```
39. 15 TO 30 41 TO 52 55 TABLE ST PIPS20
40. 31 TO 39 53 54 TABLE ST PIPS10
41. CONSTANTS
42. MATERIAL STEEL ALL
43. SUPPORTS
44. 40 PINNED
45. 20 27 FIXED BUT MX MZ
46. LOAD 1 LOADTYPE NONE  TITLE SELFWEIGHT FRAME
47. SELFWEIGHT Y -1
48. LOAD 2 LOADTYPE NONE  TITLE ANTENNA WEIGHT (DL)
49. JOINT LOAD
50. 38 FY -334.6
51. 36 FY -57
52. 34 FY -30
53. 32 FY -30
54. LOAD 3 LOADTYPE NONE  TITLE ICE WEIGHT - FRAME (IL)
55. MEMBER LOAD
56. 1 TO 30 32 34 37 39 55 UNI GY -1.13358
57. LOAD 4 LOADTYPE NONE  TITLE ICE WEIGHT - ANTENNA (IL)
58. JOINT LOAD
59. 38 FY -974.659
60. 36 FY -133.544
61. 34 FY -175.729
62. 32 FY -175.729
63. LOAD 5 LOADTYPE NONE  TITLE WIND LOAD - FRAME (WL)
64. MEMBER LOAD
65. 1 TO 39 41 TO 54 UNI GZ 0.709081
66. LOAD 6 LOADTYPE NONE  TITLE WIND LOAD - ANTENNA (WL)
67. MEMBER LOAD
68. 50 TO 52 UNI GZ 5.22996
69. 47 TO 49 UNI GZ 0.695242
70. 44 TO 46 UNI GZ 0.657699
71. 41 TO 43 UNI GZ 0.657699
72. LOAD 7 LOADTYPE NONE  TITLE WIND ON ICE - FRAME (WLI)
73. MEMBER LOAD
74. 1 TO 39 41 TO 54 UNI GZ 0.460344
75. LOAD 8 LOADTYPE NONE  TITLE WIND ON ICE - ANTENNA (WLI)
76. MEMBER LOAD
77. 50 TO 52 UNI GZ 2.00855
78. 47 TO 49 UNI GZ 0.730028
79. 44 TO 46 UNI GZ 0.319354
80. 41 TO 43 UNI GZ 0.251874
81. LOAD 9 LOADTYPE NONE  TITLE MAINTENANCE LOAD - ANTENNA PIPE (LM)
82. JOINT LOAD
83. 38 FY -500
84. LOAD 10 LOADTYPE NONE  TITLE MAINTENANCE - FRAME PIPE (LM)
85. JOINT LOAD
86. 16 FY -250
87. LOAD 11 LOADTYPE NONE  TITLE SERVICE LAOD - FRAME (WM)
88. MEMBER LOAD
89. 1 TO 39 41 TO 54 UNI GZ 0.251215
90. LOAD 12 LOADTYPE NONE  TITLE SERVICE LOAD - ANTENNA (WM)
91. MEMBER LOAD
92. 50 TO 52 UNI GZ 1.58818
93. 47 TO 49 UNI GZ 0.211124
94. 44 TO 46 UNI GZ 0.199723
```

```
 95. 41 TO 43 UNI GZ 0.199723
 96. LOAD COMB 13 COMBINATION LOAD CASE 13
 97. 1 1.2 2 1.2 5 1.6 6 1.6
 98. LOAD COMB 14 COMBINATION LOAD CASE 14
 99. 1 0.9 2 0.9 5 1.6 6 1.6
100. LOAD COMB 15 COMBINATION LOAD CASE 15
101. 1 1.2 2 1.2 3 1.0 4 1.0 7 1.0 8 1.0
102. LOAD COMB 16 COMBINATION LOAD CASE 16
103. 1 1.4 2 1.4
104. LOAD COMB 17 COMBINATION LOAD CASE 17
105. 1 1.2 2 1.2 9 1.5 11 1.0
106. LOAD COMB 18 COMBINATION LOAD CASE 18
107. 1 1.2 2 1.2 10 1.5
108. ***
109. PERFORM ANALYSIS
```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS	40	NUMBER OF MEMBERS	54
NUMBER OF PLATES	0	NUMBER OF SOLIDS	0
NUMBER OF SURFACES	0	NUMBER OF SUPPORTS	3

SOLVER USED IS THE OUT-OF-CORE BASIC SOLVER

```
  ORIGINAL/FINAL BAND-WIDTH=    30/     9/     56 DOF
TOTAL      PRIMARY LOAD CASES =     12, TOTAL DEGREES OF FREEDOM =     229
TOTAL LOAD COMBINATION  CASES =      6  SO FAR.
  SIZE OF STIFFNESS MATRIX =        13 DOUBLE  KILO-WORDS
  REQRD/AVAIL. DISK SPACE  =     12.3/********* MB
```

```
110. LOAD LIST 13 TO 18
111. PARAMETER 1
112. CODE AISC UNIFIED 2010
113. METHOD LRFD
114. TRACK 1 MEMB 54
115. CHECK CODE ALL
```

STAAD.PRO CODE CHECKING - (AISC-360-10-LRFD) v1.4a
****

ALL UNITS ARE - POUN INCH (UNLESS OTHERWISE Noted)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.003	15
		0.00	33.14	120.98	12.00
2 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.096	13
		10.03 C	3937.16	331.32	19.88
3 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.062	15
		90.81 T	866.14	1847.05	0.00
4 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.102	13
		529.97 T	3000.85	1302.12	48.00
5 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.316	14
		602.61 T	10209.48	-3563.41	28.13
6 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.308	14
		136.62 C	12804.64	-820.35	0.00

7 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.003	15
		0.00	33.14	120.98	0.00
8 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.003	15
		0.00	33.14	120.98	12.00
9 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.093	13
		10.03 T	2692.22	1446.17	19.88
10 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.071	13
		340.54 T	407.50	2583.66	0.00
11 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.130	14
		271.69 T	3645.35	-2020.72	48.00
12 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.454	13
		226.18 T	12331.72	7738.82	28.13
13 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.350	13
		170.88 T	11941.46	3501.63	0.00

14 ST	PIPS25	(AISC SECTIONS)			
	PASS	Eq. H1-1b	0.102	18	
	0.00	0.00	4539.37	0.00	
15 ST	PIPS20	(AISC SECTIONS)			
	PASS	Eq. H1-1b	0.159	14	
	553.97 C	2806.17	661.19	0.00	
16 ST	PIPS20	(AISC SECTIONS)			
	PASS	Eq. H1-1b	0.096	13	
	866.93 C	1218.30	675.78	0.00	
17 ST	PIPS20	(AISC SECTIONS)			
	PASS	Eq. H1-1b	0.174	15	
	1850.09 C	349.84	-2963.66	29.00	
18 ST	PIPS20	(AISC SECTIONS)			
	PASS	Eq. H1-1b	0.204	15	
	1898.70 C	280.44	-3757.72	0.00	
19 ST	PIPS20	(AISC SECTIONS)			
	PASS	Eq. H1-1b	0.504	15	
	5469.39 C	-70.63	-9712.78	10.08	
20 ST	PIPS20	(AISC SECTIONS)			
	PASS	Eq. H1-1b	0.420	15	
	5352.63 C	-80.72	-7699.66	0.00	

21 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.270	15
		2781.97 C	941.25	5189.49	29.00
22 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.327	15
		658.89 C	1001.90	6542.06	0.00
23 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.199	13
		384.47 C	2284.72	-2187.98	0.00
24 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.065	14
		407.72 C	1283.06	-71.23	0.00
25 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.165	15
		471.74 T	-446.05	-3200.42	29.00
26 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.229	15
		1415.86 T	-721.49	-4079.77	0.00
27 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.560	15
		4996.86 T	468.26	-10723.90	10.08

28 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.410	15
		2345.64 T	558.41	-8084.04	0.00
29 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.328	14
		93.63 T	4881.96	-2661.42	29.00
30 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.363	13
		747.08 C	5566.10	2566.78	0.00
31 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.119	15
		394.62 C	342.63	232.25	0.00
32 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.125	15
		962.31 T	185.63	349.55	0.00
33 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-2	0.138	15
		947.67 C	245.12	401.97	36.00
34 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.205	15
		1429.67 T	612.57	295.54	0.00

35 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.477	15
		536.73 C	1782.82	801.74	36.00
36 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.562	15
		1501.98 C	1830.98	-972.63	0.00
37 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1a	0.394	15
		4060.56 T	-144.28	-671.76	0.00
38 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1a	0.355	15
		2904.44 C	307.28	-171.60	36.00
39 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1a	0.365	15
		3340.66 T	112.48	826.84	46.23
41 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.096	13
		15.59 T	2214.18	0.00	45.00
42 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.126	15
		101.19 C	955.66	1958.33	0.00

43 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.097	13
		51.59 C	2214.18	0.00	0.00
44 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.096	13
		15.59 T	2214.18	0.00	45.00
45 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.138	14
		1.69 C	1793.11	1393.47	36.00
46 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.097	13
		51.59 C	2214.18	0.00	0.00
47 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.099	13
		15.59 T	2275.00	0.00	45.00
48 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.180	13
		259.13 T	2481.62	-1574.75	0.00
49 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.100	13
		83.99 C	2275.00	0.00	0.00

50	ST	PIPS20	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.417	13
		15.59 T	9621.25	0.00	45.00
51	ST	PIPS20	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.539	15
		662.33 C	4226.79	-7961.04	0.00
52	ST	PIPS20	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.424	13
		417.11 C	9621.25	0.00	0.00
53	ST	PIPS10	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.706	13
		614.23 C	3369.58	535.11	27.00

STAAD.PRO CODE CHECKING - (AISC-360-10-LRFD) v1.4a
****

ALL UNITS ARE - POUN INCH (UNLESS OTHERWISE Noted)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
* 54	ST PIPS10	(AISC SECTIONS)			
		FAIL	Eq. H1-1b	1.171	13
		594.99 C	-5700.39	898.06	9.00

SLENDERNESS
Actual Slenderness Ratio : 21.394 L/C : 18
Allowable Slenderness Ratio : 200.000 LOC : 0.00

STRENGTH CHECKS
Critical L/C : 13 Ratio : 1.171(FAIL)
Loc : 9.00 Condition : Eq. H1-1b

DESIGN FORCES
Fx: 5.950E+02(C) Fy: -4.033E+01 Fz: -1.133E+03
Mx: 7.150E+02 My: -5.700E+03 Mz: 8.981E+02

CHECK FOR AXIAL TENSION

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Yield	0.00E+00	1.52E+04	0.000	Eq. D2-1	13	0.00
Rupture	0.00E+00	2.04E+04	0.000	Eq. D2-2	13	0.00

CHECK FOR AXIAL COMPRESSION

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Maj Buck	1.31E+03	1.48E+04	0.088	Eq. E3-1	15	0.00
Min Buck	1.31E+03	1.48E+04	0.088	Eq. E3-1	15	0.00

CHECK FOR SHEAR

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Local-Z	1.14E+03	4.56E+03	0.251	Eq. G6-1	13	0.00
Local-Y	-5.79E+01	4.56E+03	0.013	Eq. G6-1	15	0.00

STAAD.PRO CODE CHECKING - (AISC-360-10-LRFD) v1.4a
****

ALL UNITS ARE - POUN INCH (UNLESS OTHERWISE Noted)

CHECK FOR TORSION					
	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
	7.15E+02	5.42E+03	0.132	Eq. H3-1	13	0.00

CHECK FOR BENDING-YIELDING					
	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Major	-1.11E+03	5.73E+03	0.194	Eq. F8-1	15	9.00
Minor	-5.70E+03	5.73E+03	0.994	Eq. F8-1	13	9.00

CHECK FOR FLEXURE TENS/COMP INTERACTION				
	RATIO	CRITERIA	L/C	LOC
Flexure Comp	1.171	Eq. H1-1b	13	9.00
Flexure Tens	1.151	Eq. H1-1b	13	9.00

55 ST PIPS20 (AISC SECTIONS)
PASS Eq. H1-1a 0.297 13
1346.14 C -665.54 -1594.85 37.12

116. FINISH

********** END OF THE STAAD.Pro RUN **********

**** DATE= JUN 27,2019 TIME= 18: 8:40 ****

```
************************************************************
*   For technical assistance on STAAD.Pro, please visit    *
*   http://selectservices.bentley.com/en-US/               *
*                                                          *
*   Details about additional assistance from               *
*   Bentley and Partners can be found at program menu      *
*   Help->Technical Support                                *
*                                                          *
*      Copyright (c) 1997-2016 Bentley Systems, Inc.       *
*               http://www.bentley.com                     *
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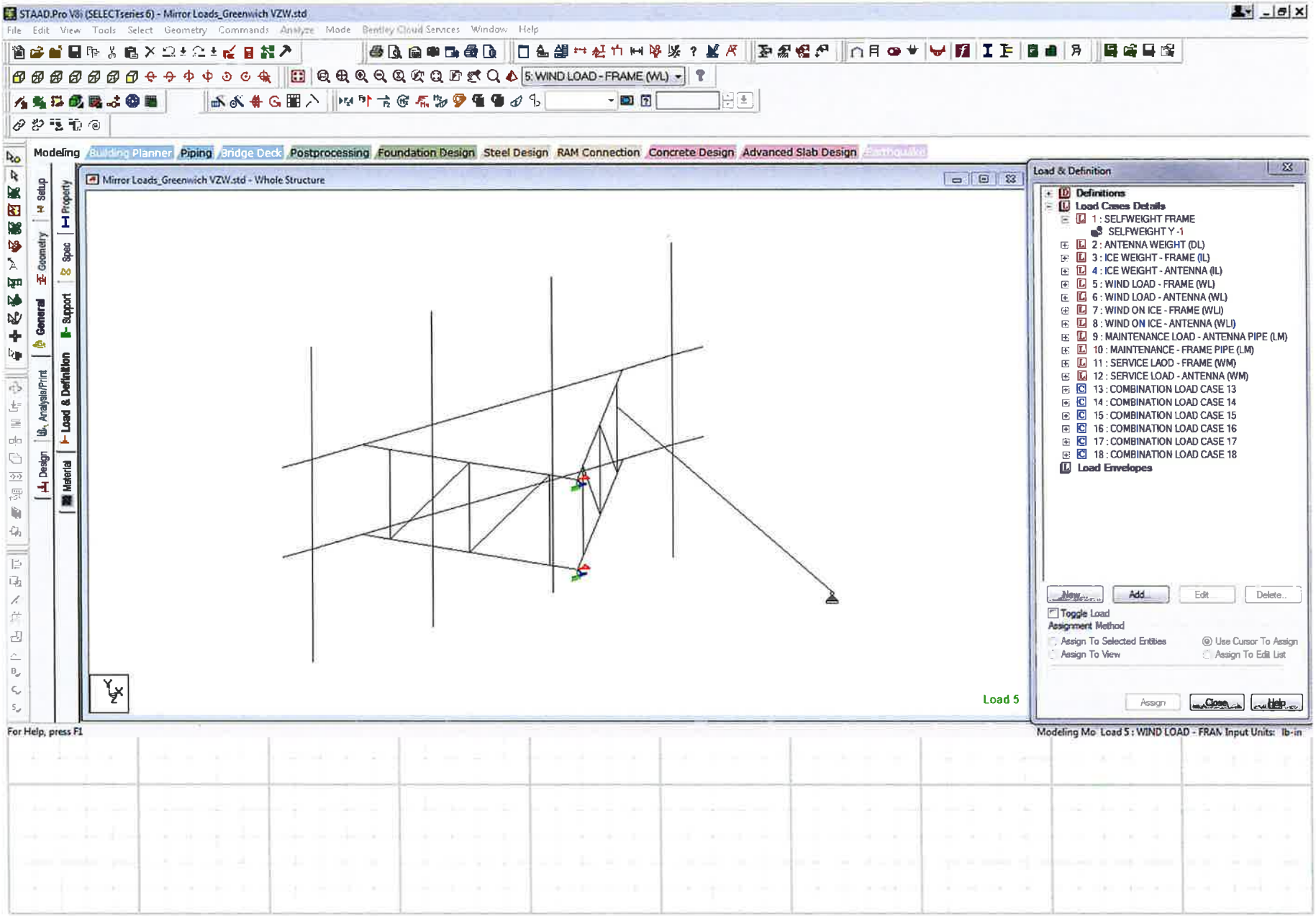
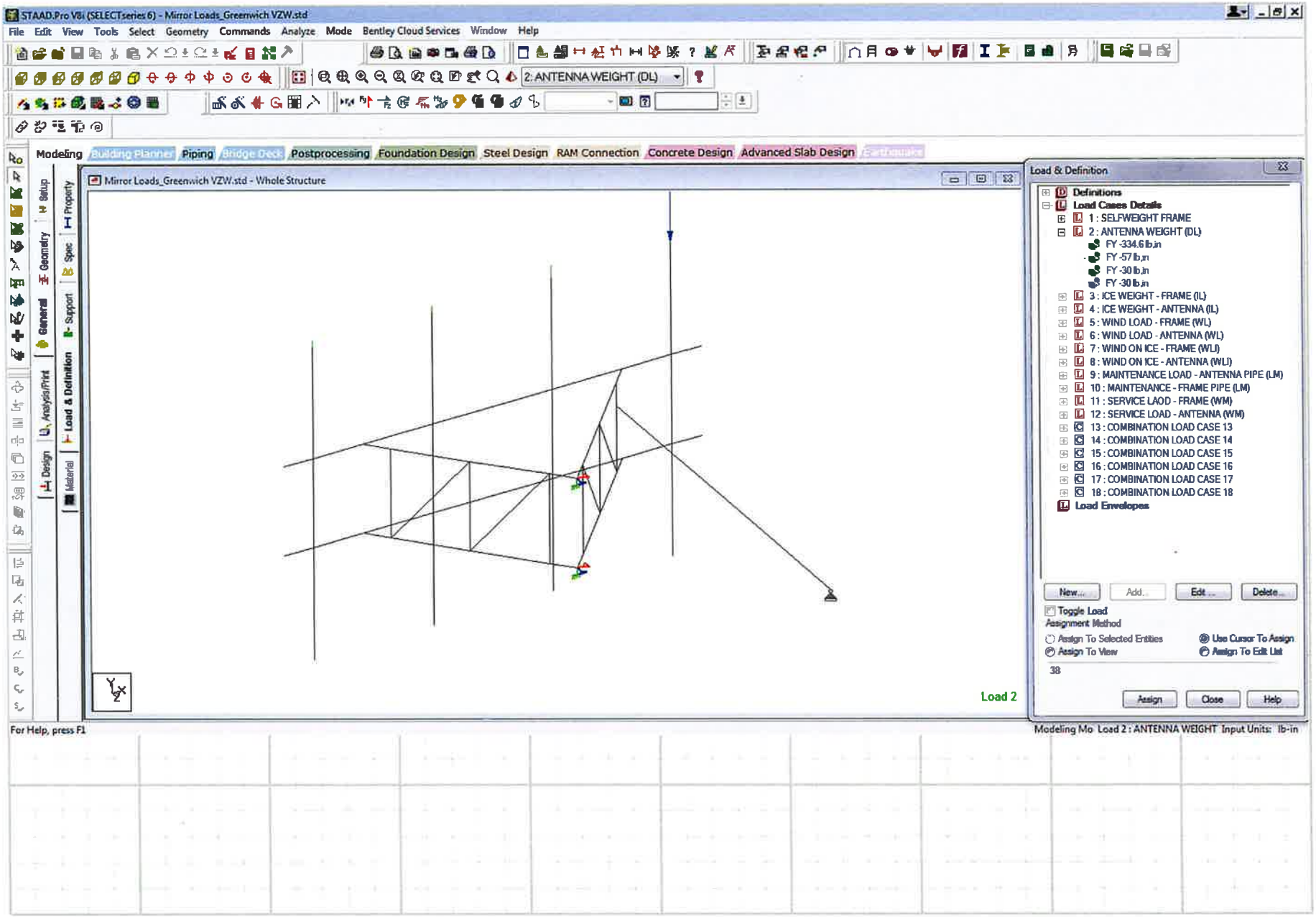
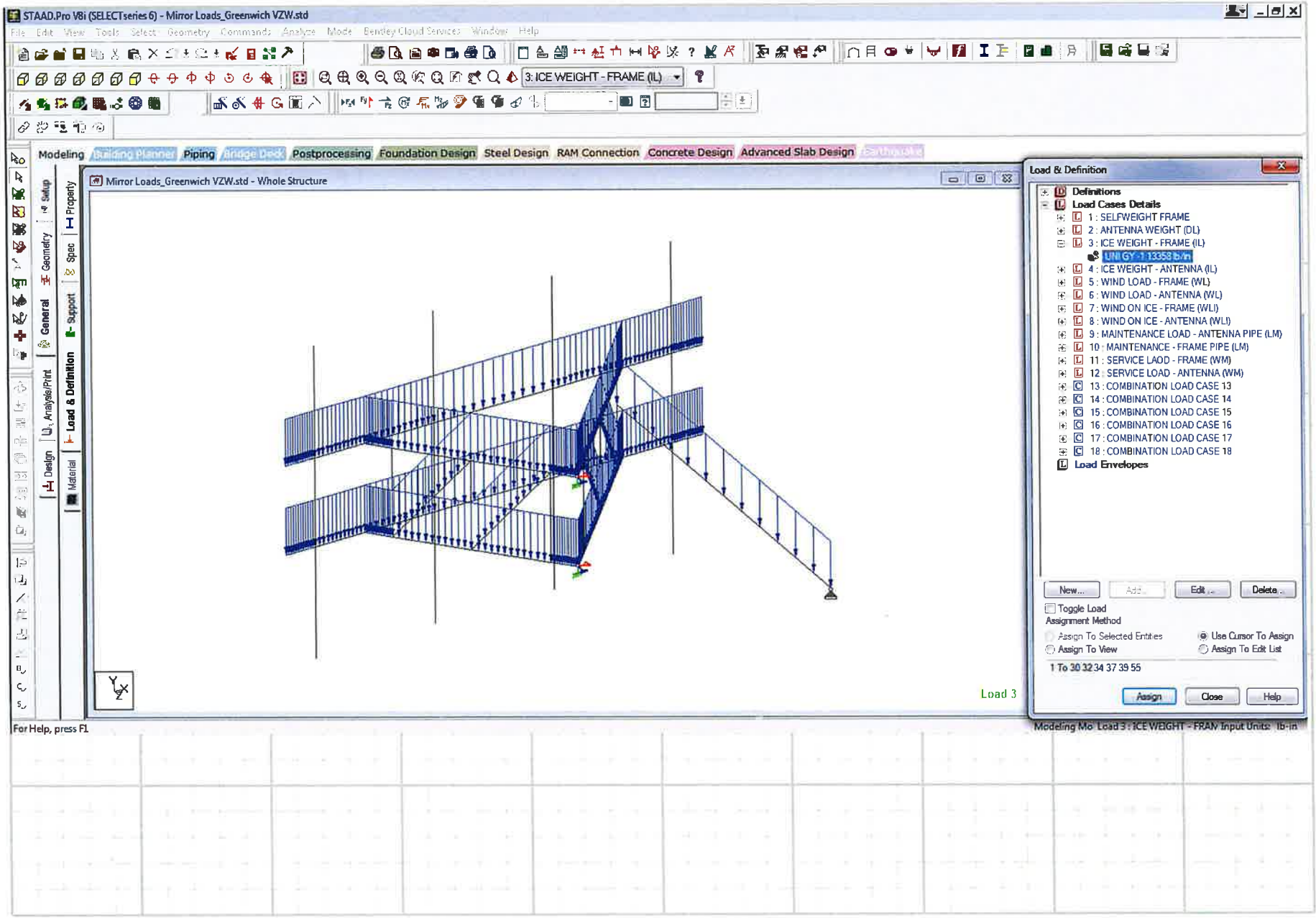
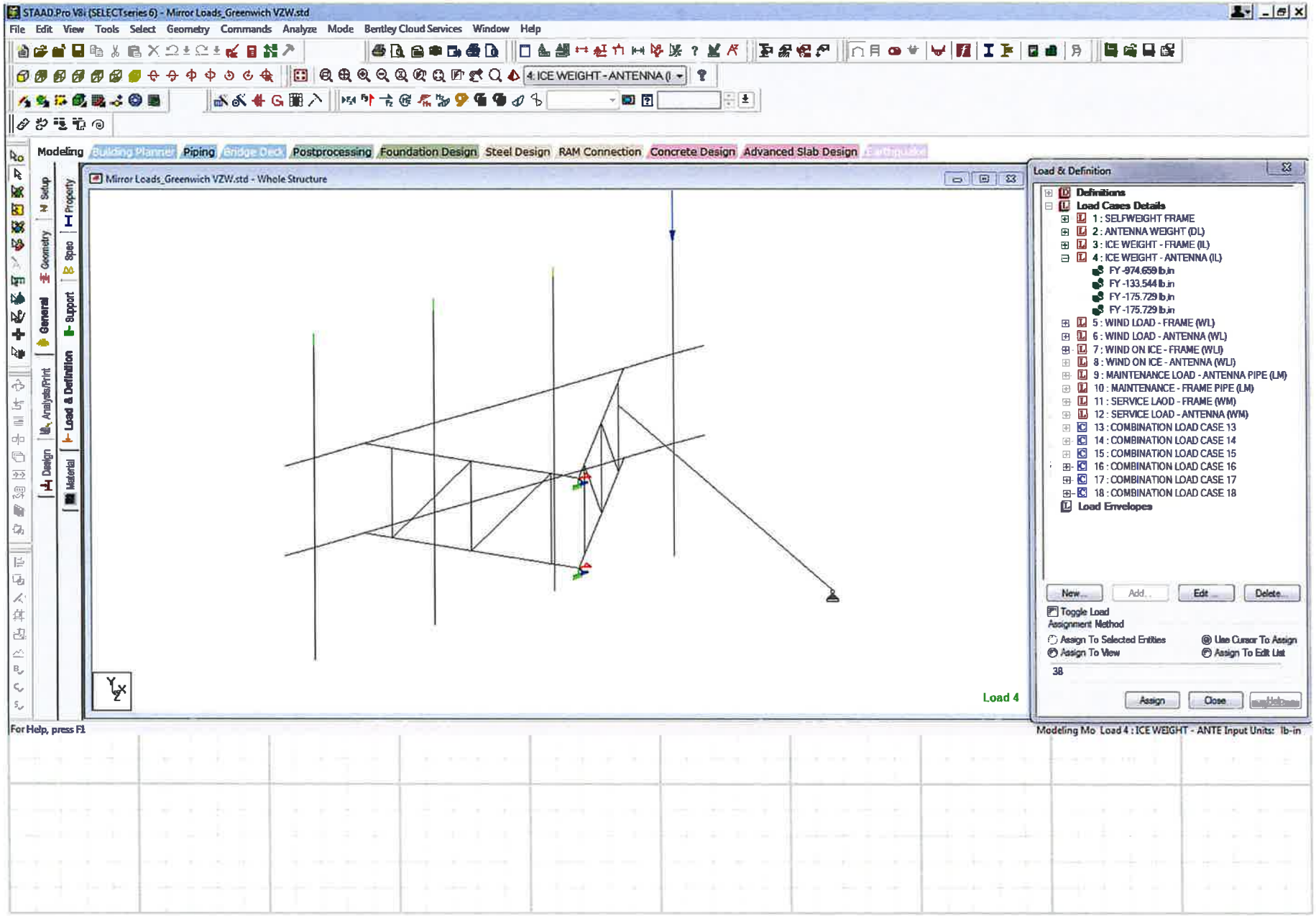
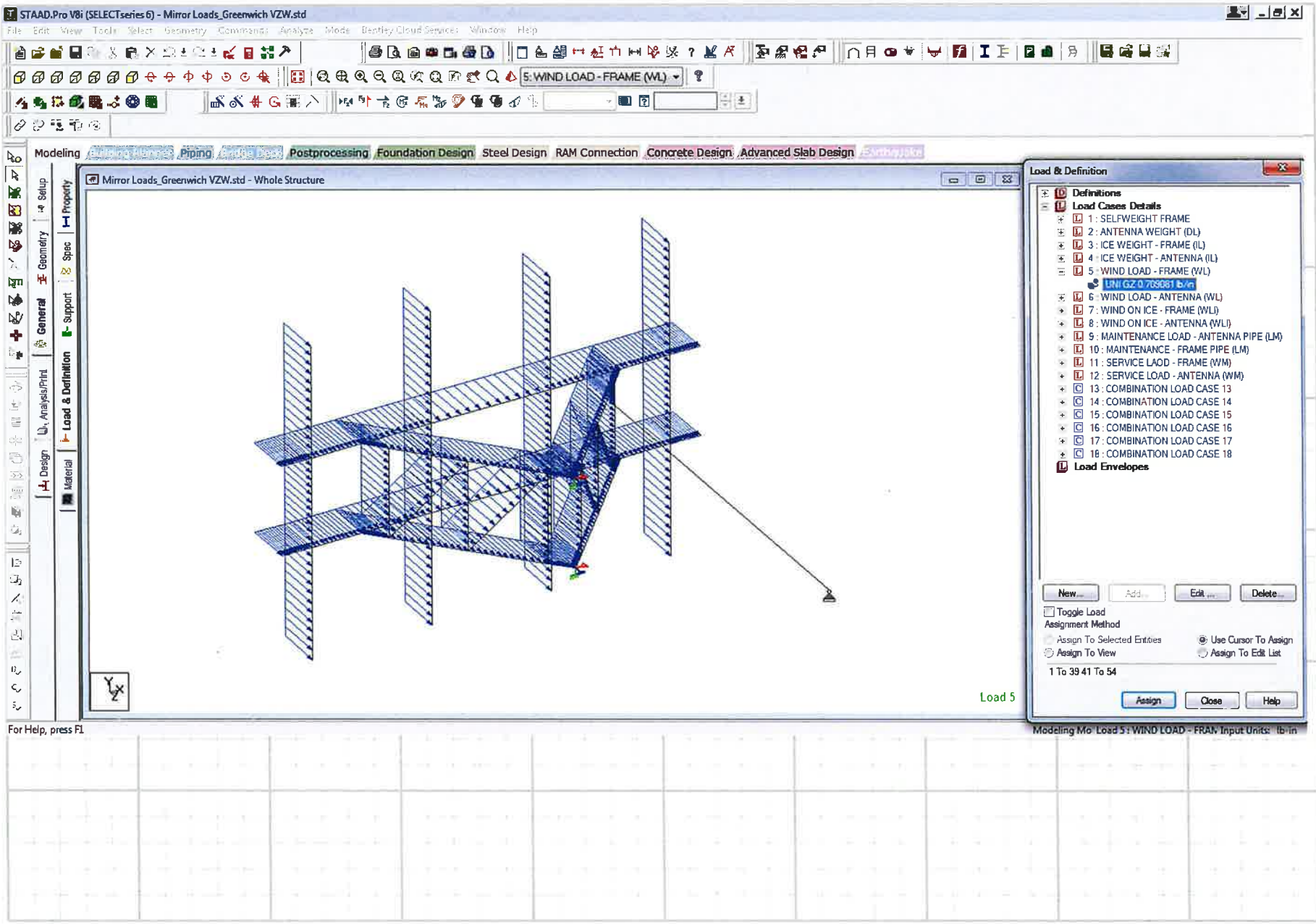
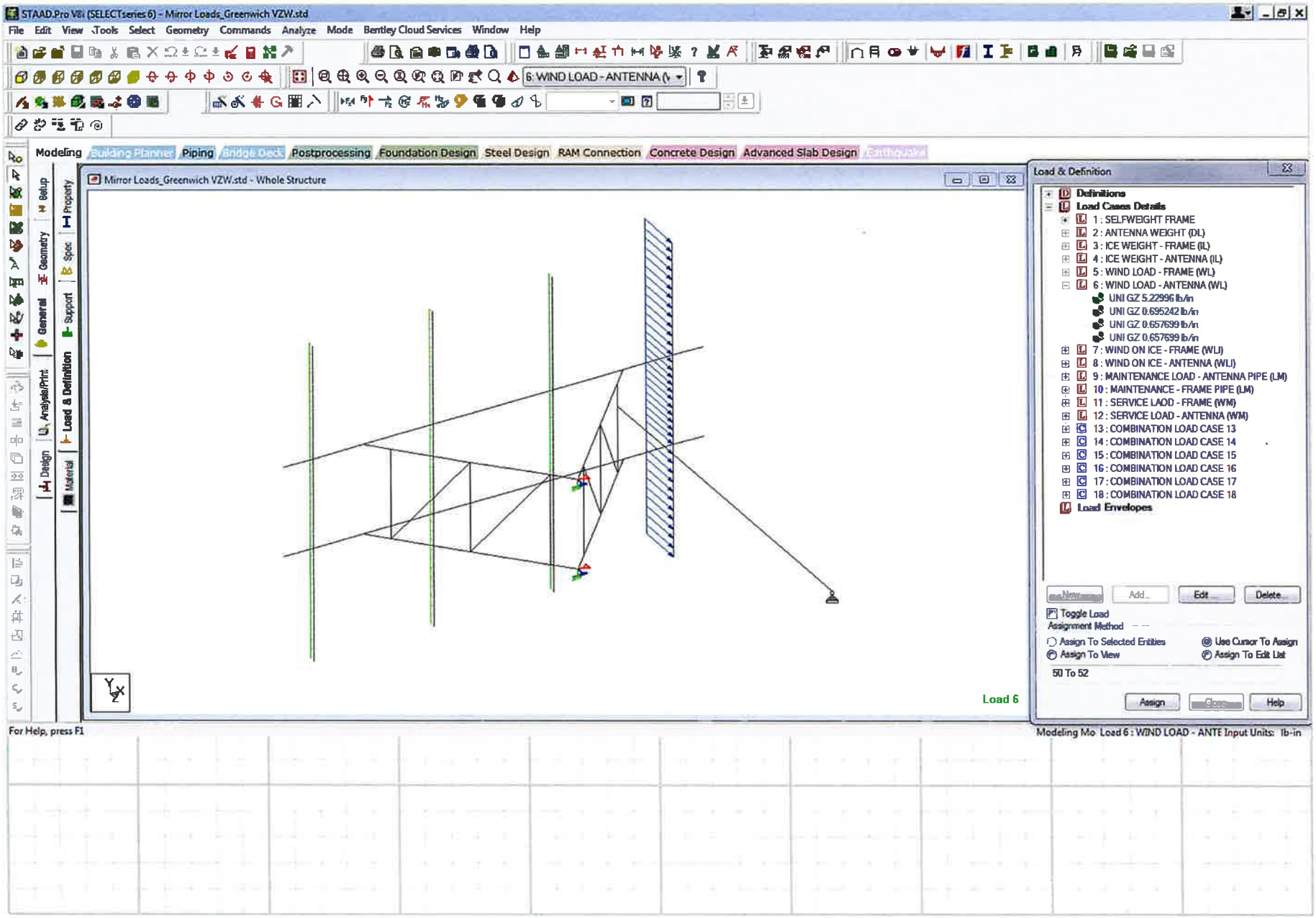

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
5: WIND LOAD - FRAME (WL)
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake
Setup Geometry General Property Spec Support Load & Definition Material Design Analysis/Print
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 5
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
SELFWEIGHT Y -1
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add Edit Delete...
Toggle Load
Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
Assign Close Help
For Help, press F1
Modeling Mo Load 5 : WIND LOAD - FRAM Input Units: lb-in

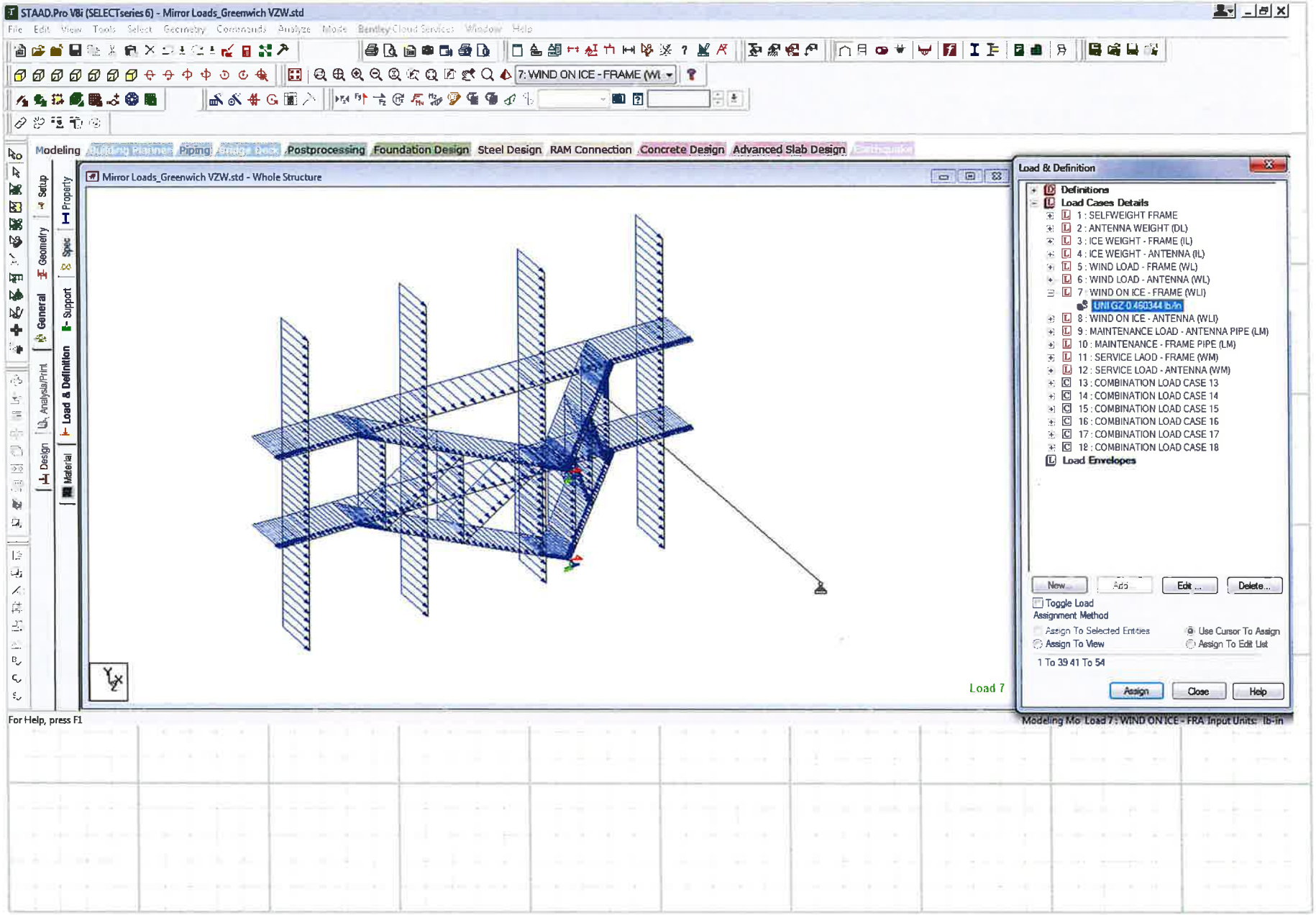

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
2: ANTENNA WEIGHT (DL)
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 2
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
FY -334.6 lb,in
FY -57 lb,in
FY -30 lb,in
FY -30 lb,in
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Assign To View
Use Cursor To Assign
Assign To Edit List
38
Assign Close Help
For Help, press F1
Modeling Mo Load 2 : ANTENNA WEIGHT Input Units: lb-in

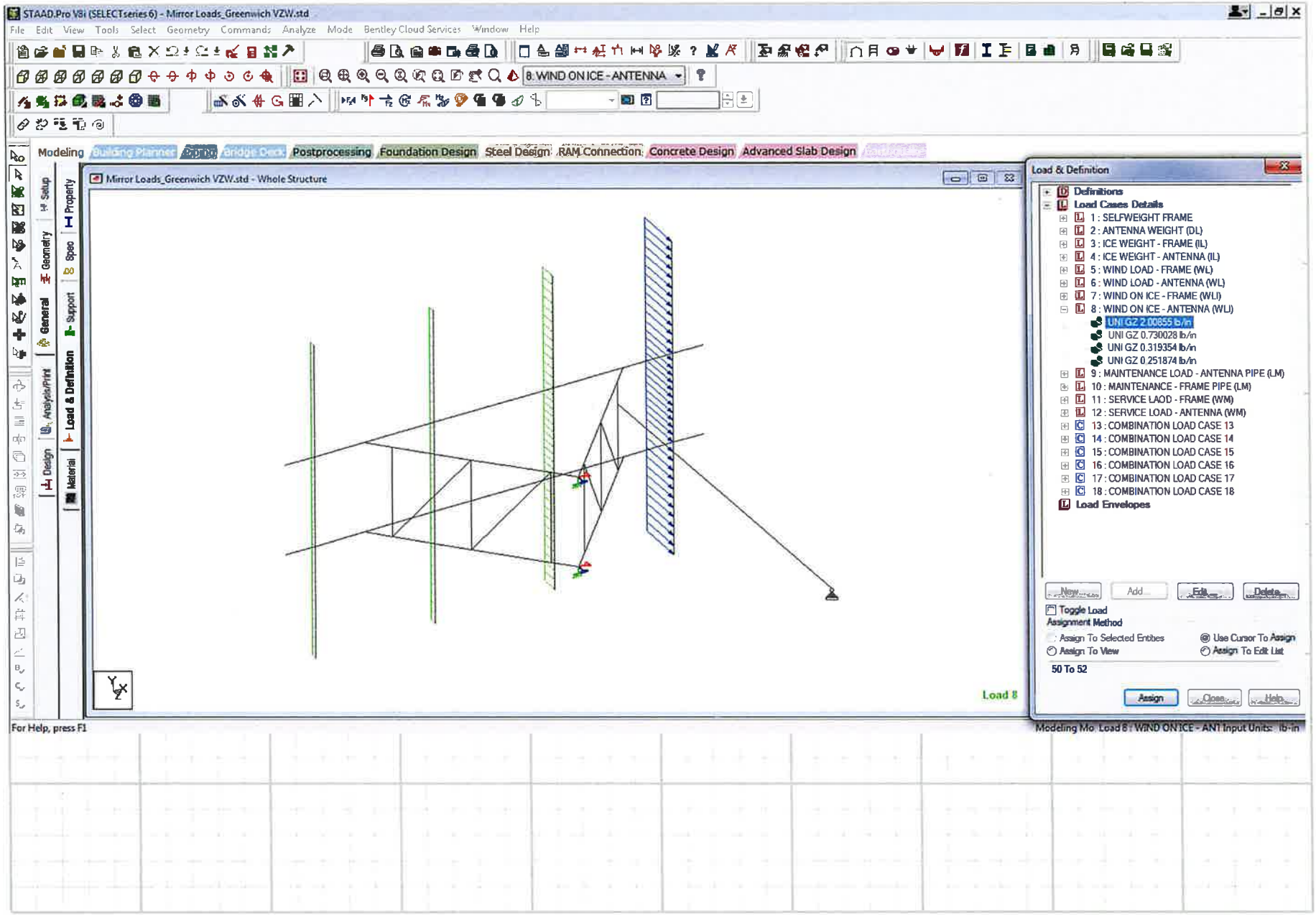

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
3: ICE WEIGHT - FRAME (IL)
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Property Spec Support Load & Definition Material Design Analysis/Print
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 3
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
UNI GY -1.3358 lb/in
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
1 To 30 32 34 37 39 55
Assign Close Help
For Help, press F1
Modeling Mo Load 3 : ICE WEIGHT - FRAM Input Units: lb-in

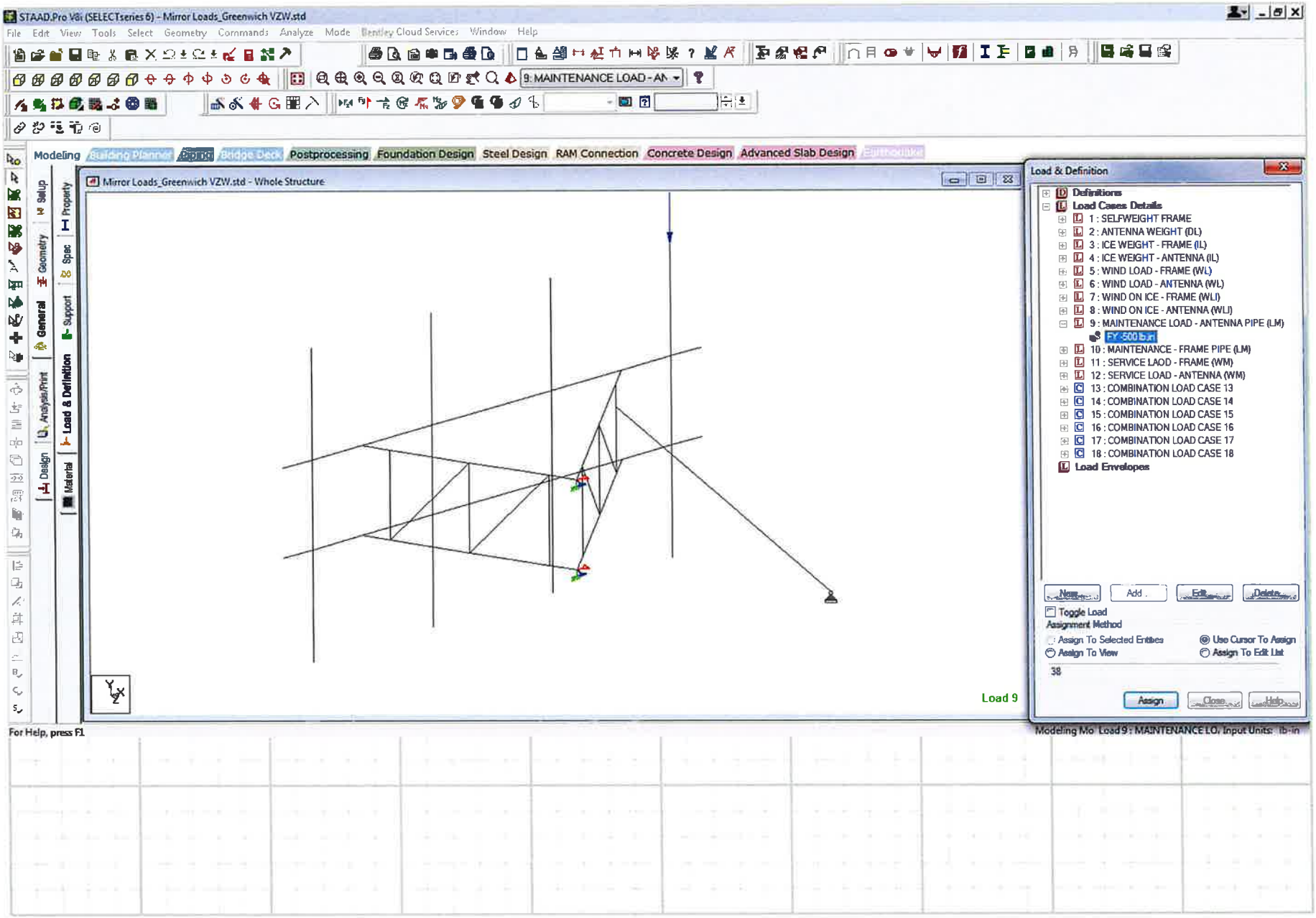

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
4: ICE WEIGHT - ANTENNA (I
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Mirror Loads_Greenwich VZW.std - Whole Structure
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
FY -974.659 lb.in
FY -133.544 lb.in
FY -175.729 lb.in
FY -175.729 lb.in
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
38
Assign Close
Load 4
For Help, press F1
Modeling Mo Load 4 : ICE WEIGHT - ANTE Input Units: lb-in

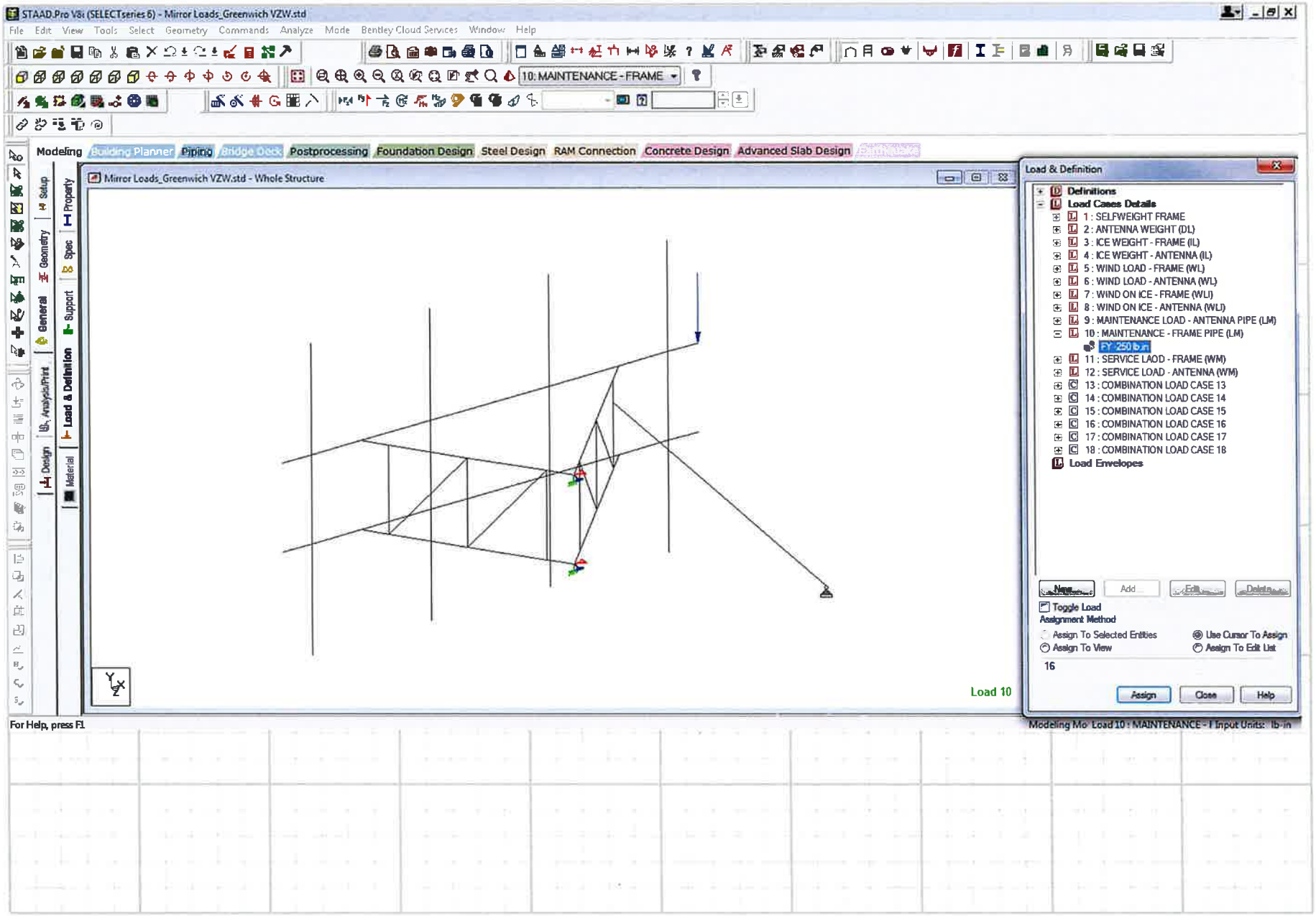

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
5: WIND LOAD - FRAME (WL)
Modeling
Postprocessing
Foundation Design
Steel Design
RAM Connection
Concrete Design
Advanced Slab Design
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 5
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
UNI GZ 0.703081 lb/in
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New...
Add...
Edit...
Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
1 To 39 41 To 54
Assign
Close
Help
For Help, press F1
Modeling Mo Load 5 : WIND LOAD - FRAM Input Units: lb-in

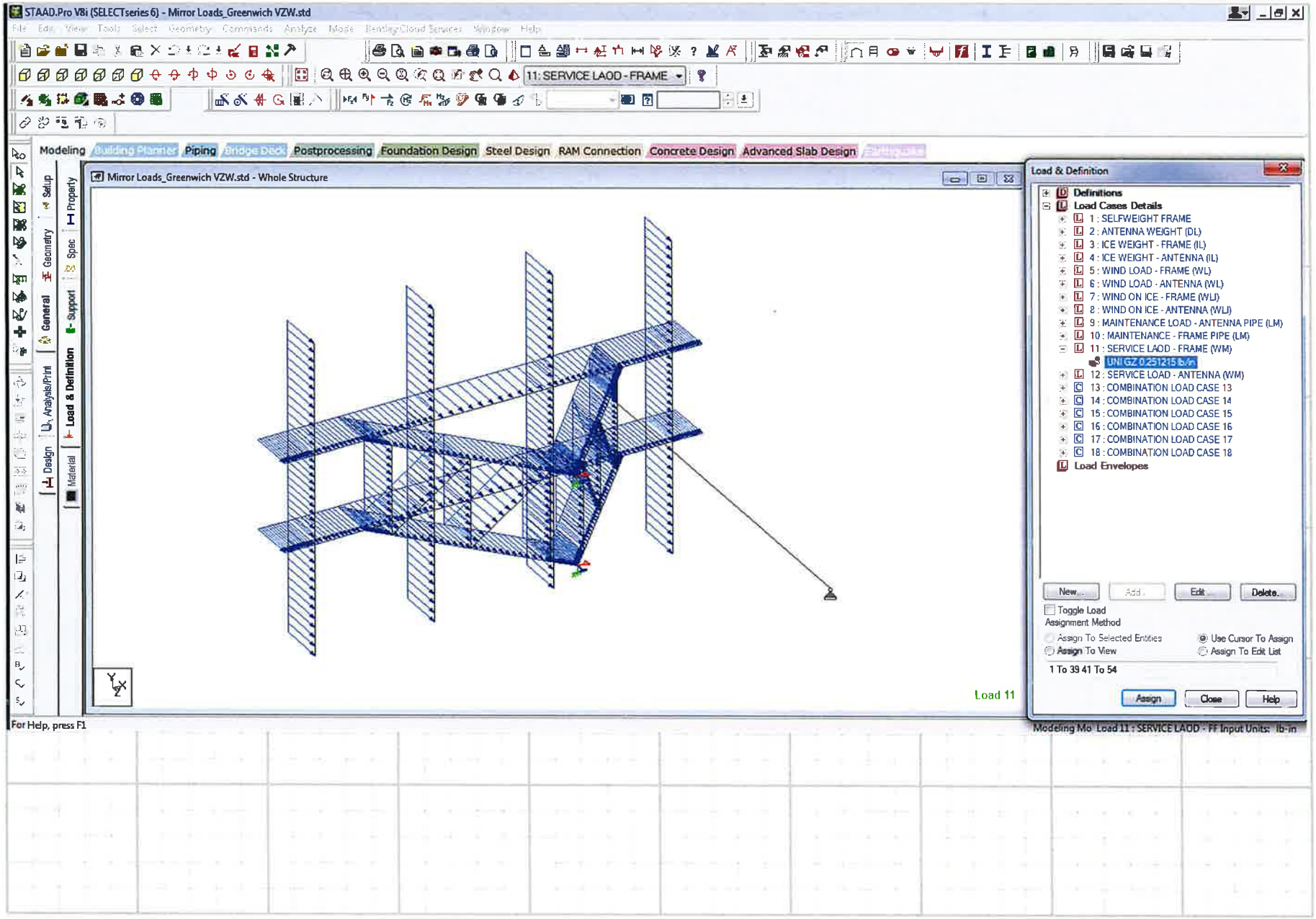

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
6: WIND LOAD - ANTENNA (
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 6
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
UNI GZ 5.22996 lb/in
UNI GZ 0.695242 lb/in
UNI GZ 0.657699 lb/in
UNI GZ 0.657699 lb/in
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
50 To 52
Assign Close Help
For Help, press F1
Modeling Mo Load 6 : WIND LOAD - ANTE Input Units: lb-in

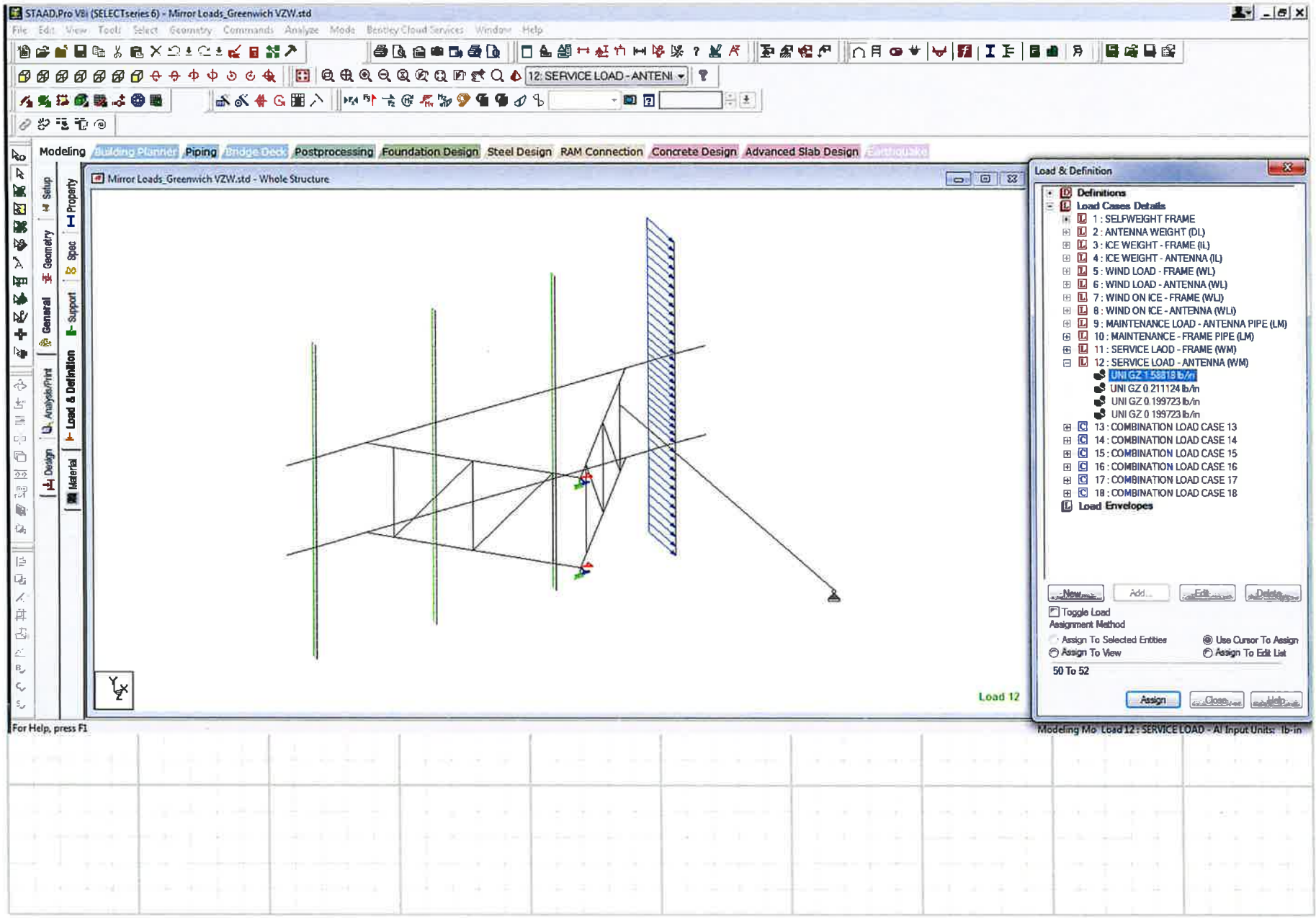

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
7: WIND ON ICE - FRAME (WI
Modeling Modeling Piping Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Load & Definition Analysis/Print Design Material
Property Spec Support
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 7
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
UNI GZ 0.460344 lb/in
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add Edit ... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
1 To 39 41 To 54
Assign Close Help
For Help, press F1
Modeling Mo Load 7 : WIND ON ICE - FRA Input Units: lb-in

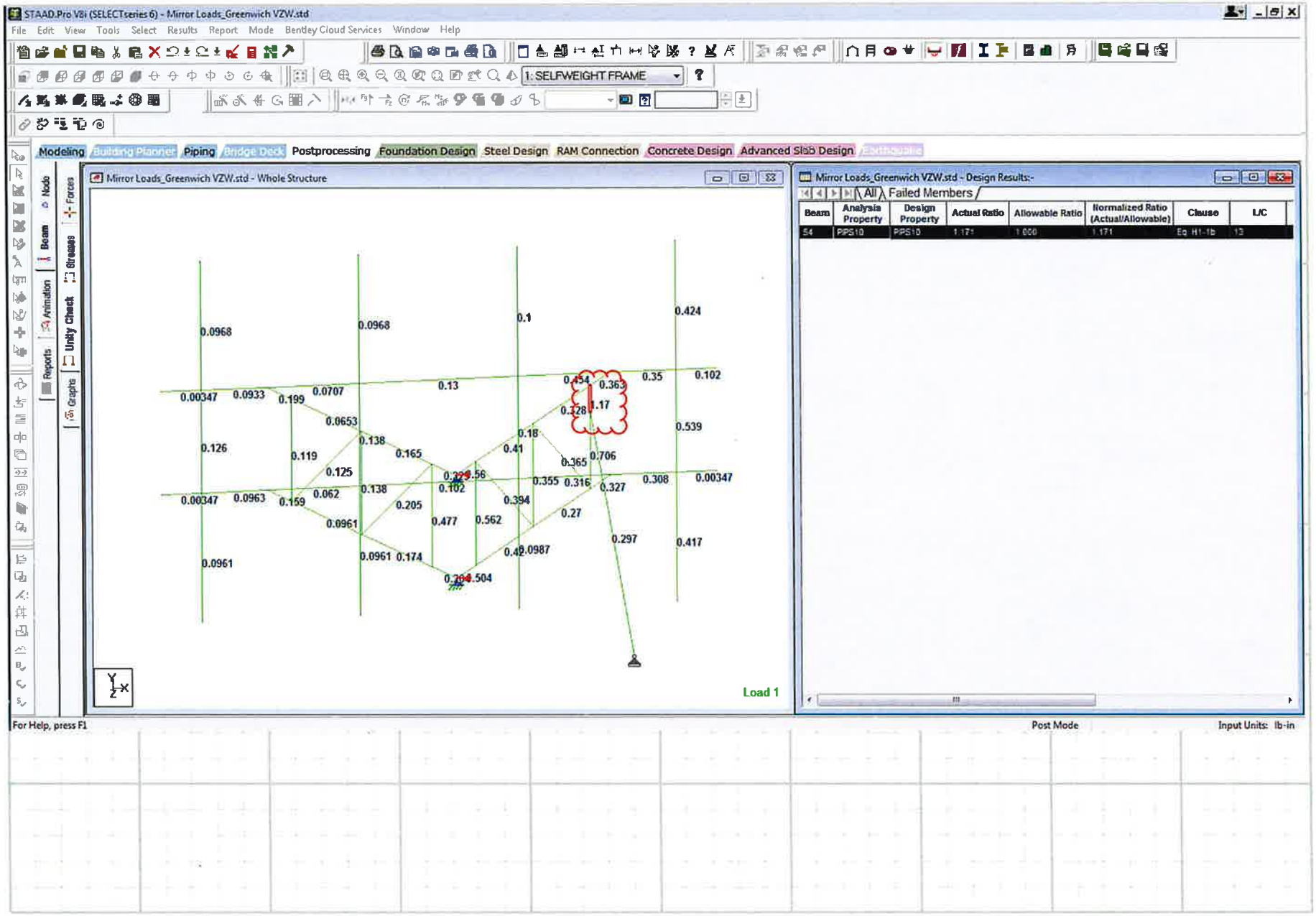

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
8: WIND ON ICE - ANTENNA
Modeling Building Planner Bridge Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 8
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
UNI GZ 2.00855 lb/in
UNI GZ 0.730028 lb/in
UNI GZ 0.319354 lb/in
UNI GZ 0.251874 lb/in
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
50 To 52
Assign Close Help
For Help, press F1
Modeling Mo Load 8 : WIND ON ICE - ANT Input Units: lb-in

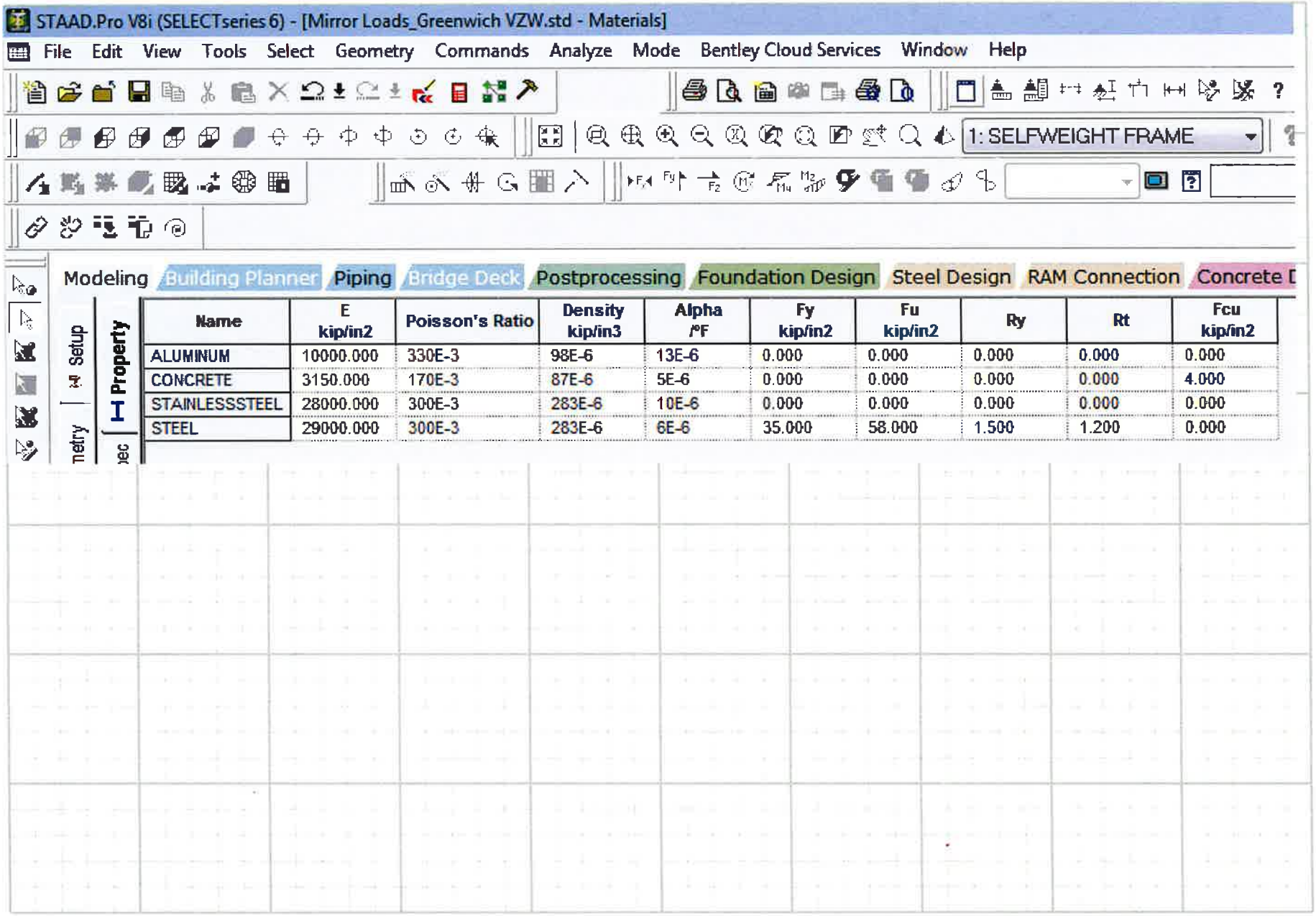

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
9: MAINTENANCE LOAD - AN
Modeling Building Planner Aqua Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 9
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
FY -500 lb,in
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
38
Assign Close Help
For Help, press F1
Modeling Mo Load 9 : MAINTENANCE LO Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
10: MAINTENANCE - FRAME
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Load & Definition Design Property Spec Support Material
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 10
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
FY -250 lb-in
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New Add Edit Delete
Toggle Load
Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
16
Assign Close Help
For Help, press F1
Modeling Mo Load 10 : MAINTENANCE - F Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
11: SERVICE LAOD - FRAME
Modeling
Building Planner
Piping
Bridge Deck
Postprocessing
Foundation Design
Steel Design
RAM Connection
Concrete Design
Advanced Slab Design
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 11
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
UNI GZ 0.251215 lb/in
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New...
Add...
Edit...
Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
1 To 39 41 To 54
Assign
Close
Help
For Help, press F1
Modeling Mo
Load 11 : SERVICE LAOD - FF Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
12: SERVICE LOAD - ANTENI
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 12
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
UNI GZ 1.58818 lb/in
UNI GZ 0.211124 lb/in
UNI GZ 0.199723 lb/in
UNI GZ 0.199723 lb/in
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
50 To 52
Assign Close Help
For Help, press F1
Modeling Mo Load 12 : SERVICE LOAD - AI Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - Mirror Loads_Greenwich VZW.std
File Edit View Tools Select Results Report Mode Bentley Cloud Services Window Help
1: SELFWEIGHT FRAME
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Node Beam Animation Reports Forces Stresses Unity Check Graphs
Mirror Loads_Greenwich VZW.std - Whole Structure
Load 1
Mirror Loads_Greenwich VZW.std - Design Results:-
All Failed Members
Beam | Analysis Property | Design Property | Actual Ratio | Allowable Ratio | Normalized Ratio (Actual/Allowable) | Clause | L/C
54 | PIPS10 | PIPS10 | 1.171 | 1.000 | 1.171 | Eq. H1-1b | 13
For Help, press F1
Post Mode
Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - [Mirror Loads_Greenwich VZW.std - Materials]
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
1: SELFWEIGHT FRAME
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete D
Setup
Property
Name | E kip/in2 | Poisson's Ratio | Density kip/in3 | Alpha /°F | Fy kip/in2 | Fu kip/in2 | Ry | Rt | Fcu kip/in2
ALUMINUM | 10000.000 | 330E-3 | 98E-6 | 13E-6 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000
CONCRETE | 3150.000 | 170E-3 | 87E-6 | 5E-6 | 0.000 | 0.000 | 0.000 | 0.000 | 4.000
STAINLESSSTEEL | 28000.000 | 300E-3 | 283E-6 | 10E-6 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000
STEEL | 29000.000 | 300E-3 | 283E-6 | 6E-6 | 35.000 | 58.000 | 1.500 | 1.200 | 0.000

VZW PROPOSED ANTENNA INVENTORY ON ADJUSTED ARM - FRAME ANALYSIS "CONTIGENT PASS RESULT"

```
**************************************************
*                                                *
*          STAAD.Pro V8i SELECTseries6           *
*          Version  20.07.11.90                  *
*          Proprietary Program of                *
*          Bentley Systems, Inc.                 *
*          Date=    JUN 27, 2019                 *
*          Time=    18:42:19                     *
*                                                *
*      USER ID: AECOM                            *
**************************************************
```

```
    1. STAAD SPACE
INPUT FILE: P:\Projects\Telcom\StructuralsByLocation\Connecticut\GreenwichCSP#74\16-VZW Proposed on Ex.. .STD
    2. START JOB INFORMATION
    3. ENGINEER DATE 27-JUN-19
    4. ENGINEER NAME MCD
    5. END JOB INFORMATION
    6. INPUT WIDTH 79
    7. UNIT INCHES POUND
    8. JOINT COORDINATES
    9. 1 0 0 0; 2 12 0 0; 3 31.8756 0 0; 4 60 0 0; 5 108 0 0; 6 136.126 0 0
   10. 7 156 0 0; 8 168 0 0; 9 0 36 0; 10 12 36 0; 11 31.876 36 0; 12 60 36 0
   11. 13 108 36 0; 14 136.126 36 0; 15 156 36 0; 16 168 36 0; 17 38.5584 0 7.5144
   12. 18 57.9384 0 29.1252; 19 77.2764 0 50.736; 20 84 0 58.2504
   13. 21 90.7236 0 50.736; 22 110.064 0 29.1252; 23 129.401 0 7.5144
   14. 24 38.5584 36 7.5144; 25 57.9384 36 29.1252; 26 77.2764 36 50.736
   15. 27 84 36 58.2504; 28 90.7236 36 50.736; 29 110.063 36 29.1252
   16. 30 129.401 36 7.512; 31 12 -45 0; 32 12 81 0; 33 60 -45 0; 34 60 81 0
   17. 35 108 -45 0; 36 108 81 0; 37 156 -45 0; 38 156 81 0; 40 146.004 36 156
   18. 41 146.004 36 0
   19. MEMBER INCIDENCES
   20. 1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 5 6; 6 6 7; 7 7 8; 8 9 10; 9 10 11; 10 11 12
   21. 11 12 13; 12 13 14; 14 15 16; 15 3 17; 16 17 18; 17 18 19; 18 19 20; 19 20 21
   22. 20 21 22; 21 22 23; 22 23 6; 23 11 24; 24 24 25; 25 25 26; 26 26 27; 27 27 28
   23. 28 28 29; 29 29 30; 30 30 14; 31 17 24; 32 17 25; 33 25 18; 34 18 26; 35 26 19
   24. 36 21 28; 37 28 22; 38 22 29; 39 29 23; 41 31 2; 42 2 10; 43 10 32; 44 33 4
   25. 45 4 12; 46 12 34; 47 35 5; 48 5 13; 49 13 36; 50 37 7; 51 7 15; 52 15 38
   26. 53 23 30; 54 40 41; 55 14 41; 56 41 15
   27. DEFINE MATERIAL START
   28. ISOTROPIC STEEL
   29. E 2.9E+007
   30. POISSON 0.3
   31. DENSITY 0.283
   32. ALPHA 6E-006
   33. DAMP 0.03
   34. TYPE STEEL
   35. STRENGTH FY 35000 FU 58000 RY 1.5 RT 1.2
   36. END DEFINE MATERIAL
   37. MEMBER PROPERTY AMERICAN
   38. 1 TO 12 14 55 56 TABLE ST PIPS25
```

```
39. 15 TO 30 41 TO 52 54 TABLE ST PIPS20
40. 31 TO 39 53 TABLE ST PIPS10
41. CONSTANTS
42. MATERIAL STEEL ALL
43. SUPPORTS
44. 40 PINNED
45. 20 27 FIXED BUT MX MZ
46. LOAD 1 LOADTYPE NONE  TITLE SELFWEIGHT FRAME
47. SELFWEIGHT Y -1
48. LOAD 2 LOADTYPE NONE  TITLE ANTENNA WEIGHT (DL)
49. JOINT LOAD
50. 38 FY -334.6
51. 36 FY -57
52. 34 FY -30
53. 32 FY -30
54. LOAD 3 LOADTYPE NONE  TITLE ICE WEIGHT - FRAME (IL)
55. MEMBER LOAD
56. 1 TO 12 14 TO 30 32 34 37 39 54 TO 56 UNI GY -1.13358
57. LOAD 4 LOADTYPE NONE  TITLE ICE WEIGHT - ANTENNA (IL)
58. JOINT LOAD
59. 38 FY -974.659
60. 36 FY -133.544
61. 34 FY -175.729
62. 32 FY -175.729
63. LOAD 5 LOADTYPE NONE  TITLE WIND LOAD - FRAME (WL)
64. MEMBER LOAD
65. 1 TO 12 14 TO 39 41 TO 53 55 56 UNI GZ 0.709081
66. LOAD 6 LOADTYPE NONE  TITLE WIND LOAD - ANTENNA (WL)
67. MEMBER LOAD
68. 50 TO 52 UNI GZ 5.22996
69. 47 TO 49 UNI GZ 0.695242
70. 44 TO 46 UNI GZ 0.657699
71. 41 TO 43 UNI GZ 0.657699
72. LOAD 7 LOADTYPE NONE  TITLE WIND ON ICE - FRAME (WLI)
73. MEMBER LOAD
74. 1 TO 12 14 TO 39 41 TO 53 55 56 UNI GZ 0.460344
75. LOAD 8 LOADTYPE NONE  TITLE WIND ON ICE - ANTENNA (WLI)
76. MEMBER LOAD
77. 50 TO 52 UNI GZ 2.00855
78. 47 TO 49 UNI GZ 0.730028
79. 44 TO 46 UNI GZ 0.319354
80. 41 TO 43 UNI GZ 0.251874
81. LOAD 9 LOADTYPE NONE  TITLE MAINTENANCE LOAD - ANTENNA PIPE (LM)
82. JOINT LOAD
83. 38 FY -500
84. LOAD 10 LOADTYPE NONE  TITLE MAINTENANCE - FRAME PIPE (LM)
85. JOINT LOAD
86. 16 FY -250
87. LOAD 11 LOADTYPE NONE  TITLE SERVICE LAOD - FRAME (WM)
88. MEMBER LOAD
89. 1 TO 12 14 TO 39 41 TO 53 55 56 UNI GZ 0.251215
90. LOAD 12 LOADTYPE NONE  TITLE SERVICE LOAD - ANTENNA (WM)
91. MEMBER LOAD
92. 50 TO 52 UNI GZ 1.58818
93. 47 TO 49 UNI GZ 0.211124
94. 44 TO 46 UNI GZ 0.199723
```

```
 95. 41 TO 43 UNI GZ 0.199723
 96. LOAD COMB 13 COMBINATION LOAD CASE 13
 97. 1 1.2 2 1.2 5 1.6 6 1.6
 98. LOAD COMB 14 COMBINATION LOAD CASE 14
 99. 1 0.9 2 0.9 5 1.6 6 1.6
100. LOAD COMB 15 COMBINATION LOAD CASE 15
101. 1 1.2 2 1.2 3 1.0 4 1.0 7 1.0 8 1.0
102. LOAD COMB 16 COMBINATION LOAD CASE 16
103. 1 1.4 2 1.4
104. LOAD COMB 17 COMBINATION LOAD CASE 17
105. 1 1.2 2 1.2 9 1.5 11 1.0
106. LOAD COMB 18 COMBINATION LOAD CASE 18
107. 1 1.2 2 1.2 10 1.5
108. ***
109. PERFORM ANALYSIS
```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS	40	NUMBER OF MEMBERS	54
NUMBER OF PLATES	0	NUMBER OF SOLIDS	0
NUMBER OF SURFACES	0	NUMBER OF SUPPORTS	3

SOLVER USED IS THE OUT-OF-CORE BASIC SOLVER

```
  ORIGINAL/FINAL BAND-WIDTH=    30/     8/     54 DOF
TOTAL      PRIMARY LOAD CASES =    12, TOTAL DEGREES OF FREEDOM =     229
TOTAL LOAD COMBINATION  CASES =     6  SO FAR.
  SIZE OF STIFFNESS MATRIX =       13 DOUBLE  KILO-WORDS
  REQRD/AVAIL. DISK SPACE  =     12.3/********* MB
```

```
110. LOAD LIST 13 TO 18
111. PARAMETER 1
112. CODE AISC UNIFIED 2010
113. METHOD LRFD
114. TRACK 1 MEMB 36
115. CHECK CODE ALL
```

STAAD.PRO CODE CHECKING - (AISC-360-10-LRFD) v1.4a
****

ALL UNITS ARE - POUN INCH (UNLESS OTHERWISE Noted)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
1 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.003	15
		0.00	33.14	120.98	12.00
2 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.105	13
		7.90 T	3974.28	684.67	19.88
3 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.090	13
		492.55 T	2830.86	974.16	0.00
4 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.090	15
		14.53 T	-940.09	3031.56	48.00
5 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.274	15
		37.34 C	3855.28	8279.88	28.13
6 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.257	15
		480.10 C	4575.65	6627.11	0.00

7	ST	PIPS25	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.003	15
		0.00	33.14	120.98	0.00
8	ST	PIPS25	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.003	15
		0.00	33.14	120.98	12.00
9	ST	PIPS25	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.099	13
		7.90 C	2655.09	1738.39	19.88
10	ST	PIPS25	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.130	13
		299.27 T	2475.90	3155.08	0.00
11	ST	PIPS25	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.070	15
		272.06 T	-701.35	2311.95	48.00
12	ST	PIPS25	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.260	15
		323.93 T	-386.69	10994.38	28.13
14	ST	PIPS25	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.102	18
		0.00	0.00	4539.37	0.00

15 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.095	15
		258.61 C	-245.63	1946.20	10.06
16 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.068	15
		908.42 C	-388.48	1190.72	0.00
17 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.168	15
		1848.00 C	921.93	-2949.13	29.00
18 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.228	15
		1896.38 C	853.91	-3739.28	0.00
19 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.510	15
		5578.97 C	-306.60	-9812.35	10.08
20 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.426	15
		5461.24 C	-322.40	-7783.19	0.00
21 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.263	15
		2876.68 C	385.29	4998.15	29.00

22 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.329	15
		626.17 C	363.98	7236.05	0.00
23 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.117	13
		424.40 C	179.19	-2524.09	0.00
24 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.059	15
		125.61 C	-176.71	1177.16	0.00
25 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.151	15
		449.55 T	151.85	-3175.38	29.00
26 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.200	15
		1389.57 T	-98.09	-4047.49	0.00
27 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.558	15
		5091.15 T	364.17	-10750.41	10.08
28 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.407	15
		2424.20 T	475.53	-8079.27	0.00

29	ST	PIPS20	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.227	15
		317.15 T	-459.07	4684.73	29.00
30	ST	PIPS20	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.311	15
		250.37 T	-288.35	-6812.12	10.08
31	ST	PIPS10	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.119	15
		394.37 C	342.53	227.87	0.00
32	ST	PIPS10	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.122	15
		957.35 T	172.23	348.40	0.00
33	ST	PIPS10	(AISC SECTIONS)		
		PASS	Eq. H1-2	0.138	15
		943.23 C	252.54	408.36	36.00
34	ST	PIPS10	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.207	15
		1423.61 T	621.82	294.68	0.00
35	ST	PIPS10	(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.480	15
		541.98 C	1789.75	815.33	36.00

STAAD.PRO CODE CHECKING - (AISC-360-10-LRFD) v1.4a
****

ALL UNITS ARE - POUN INCH (UNLESS OTHERWISE Noted)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
36	ST PIPS10	(AISC SECTIONS)			
		PASS	Eq. H1-1b	0.567	15
		1519.94 C	1832.40	-995.09	0.00

SLENDERNESS
Actual Slenderness Ratio : 85.576 L/C : 18
Allowable Slenderness Ratio : 200.000 LOC : 0.00

STRENGTH CHECKS
Critical L/C : 15 Ratio : 0.567(PASS)
Loc : 0.00 Condition : Eq. H1-1b

DESIGN FORCES
Fx: 1.520E+03(C) Fy: -5.619E+01 Fz: -1.077E+02
Mx: 1.580E+01 My: 1.832E+03 Mz: -9.951E+02

CHECK FOR AXIAL TENSION

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Yield	0.00E+00	1.52E+04	0.000	Eq. D2-1	13	0.00
Rupture	0.00E+00	2.04E+04	0.000	Eq. D2-2	13	0.00

CHECK FOR AXIAL COMPRESSION

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Maj Buck	1.52E+03	1.03E+04	0.147	Eq. E3-1	15	0.00
Min Buck	1.52E+03	1.03E+04	0.147	Eq. E3-1	15	0.00

CHECK FOR SHEAR

	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Local-Z	1.08E+02	4.56E+03	0.024	Eq. G6-1	15	0.00
Local-Y	-5.62E+01	4.56E+03	0.012	Eq. G6-1	15	0.00

STAAD.PRO CODE CHECKING - (AISC-360-10-LRFD) v1.4a
****

ALL UNITS ARE - POUN INCH (UNLESS OTHERWISE Noted)

CHECK FOR TORSION					
FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
2.75E+01	5.42E+03	0.005	Eq. H3-1	17	0.00

CHECK FOR BENDING-YIELDING					
	FORCE	CAPACITY	RATIO	CRITERIA	L/C	LOC
Major	-1.03E+03	5.73E+03	0.179	Eq. F8-1	15	36.00
Minor	1.83E+03	5.73E+03	0.320	Eq. F8-1	15	0.00

CHECK FOR FLEXURE TENS/COMP INTERACTION				
	RATIO	CRITERIA	L/C	LOC
Flexure Comp	0.567	Eq. H1-1b	15	0.00
Flexure Tens	0.493	Eq. H1-1b	15	0.00

37 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1a	0.399	15
	4083.50 T		-155.63	-684.30	0.00
38 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1a	0.361	15
	2907.32 C		289.12	-227.48	36.00
39 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1a	0.354	15
	3404.87 T		39.97	799.93	46.23
41 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.096	13
	15.59 T		2214.18	0.00	45.00

42 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.125	15
		100.97 C	921.54	1961.49	0.00
43 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.097	13
		51.59 C	2214.18	0.00	0.00
44 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.096	13
		15.59 T	2214.18	0.00	45.00
45 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.190	14
		12.27 T	2330.60	-2051.32	0.00
46 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.097	13
		51.59 C	2214.18	0.00	0.00
47 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.099	13
		15.59 T	2275.00	0.00	45.00
48 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.256	13
		130.76 T	3458.28	-2410.92	0.00

49 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.100	13
		83.99 C	2275.00	0.00	0.00
50 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.417	13
		15.59 T	9621.25	0.00	45.00
51 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.540	15
		703.17 C	3678.39	-8511.02	0.00
52 ST	PIPS20		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.424	13
		417.11 C	9621.25	0.00	0.00
53 ST	PIPS10		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.425	15
		1442.85 C	1017.48	-1019.29	0.00
54 ST	PIPS20		(AISC SECTIONS)		
		PASS	Sec. E1	0.184	13
		1069.81 C	0.00	0.00	0.00
55 ST	PIPS25		(AISC SECTIONS)		
		PASS	Eq. H1-1b	0.186	15
		479.19 T	-675.04	7375.17	0.00

```
  56 ST   PIPS25                  (AISC SECTIONS)
                     PASS   Eq. H1-1b            0.207        15
                 480.10 T       316.55       -8651.67       10.00

116. FINISH

          ********** END OF THE STAAD.Pro RUN **********

            **** DATE= JUN 27,2019   TIME= 18:42:28 ****

      ************************************************************
      *   For technical assistance on STAAD.Pro, please visit    *
      *   http://selectservices.bentley.com/en-US/               *
      *                                                          *
      *   Details about additional assistance from               *
      *   Bentley and Partners can be found at program menu      *
      *   Help->Technical Support                                *
      *                                                          *
      *      Copyright (c) 1997-2016 Bentley Systems, Inc.       *
      *                http://www.bentley.com                    *
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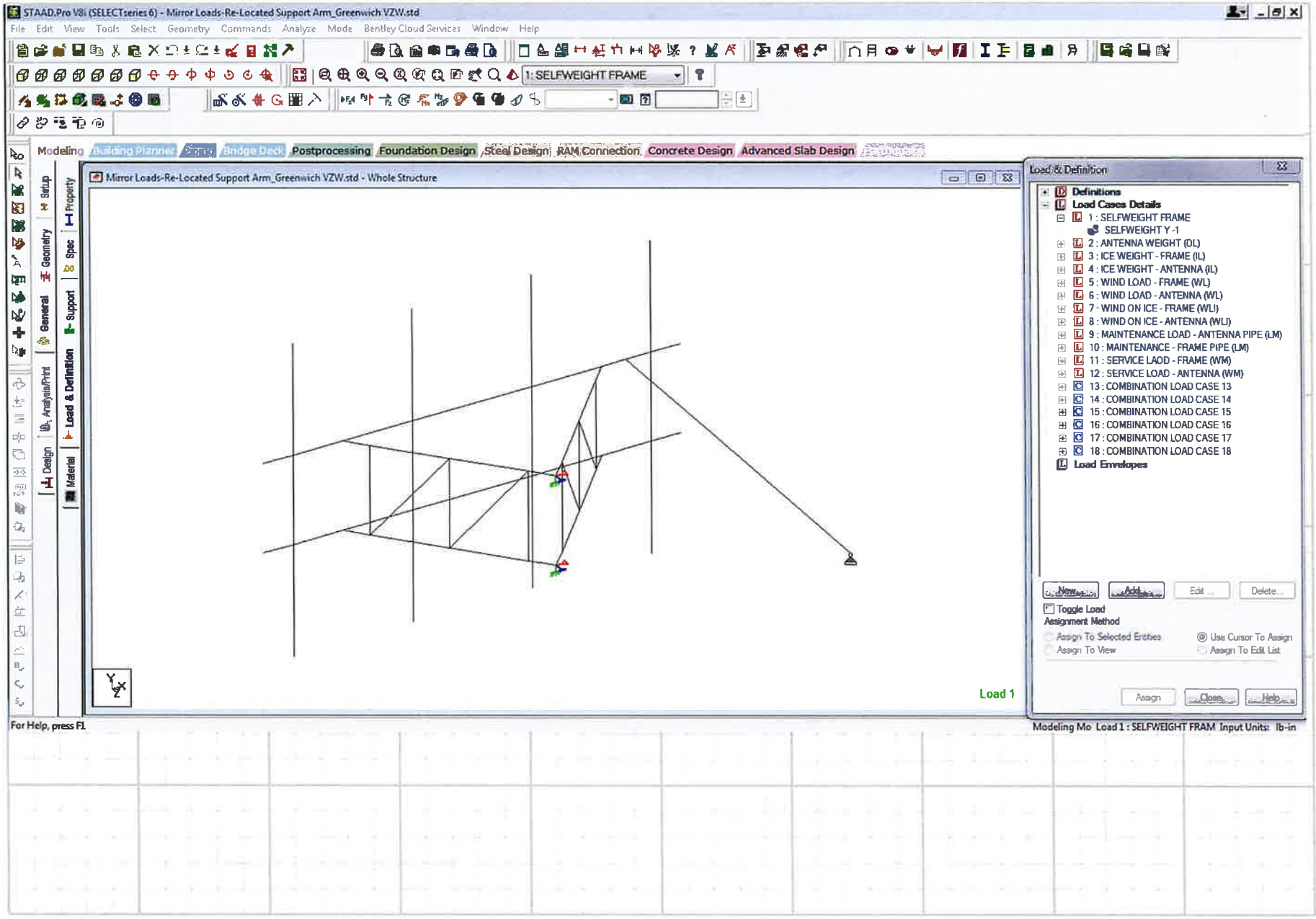
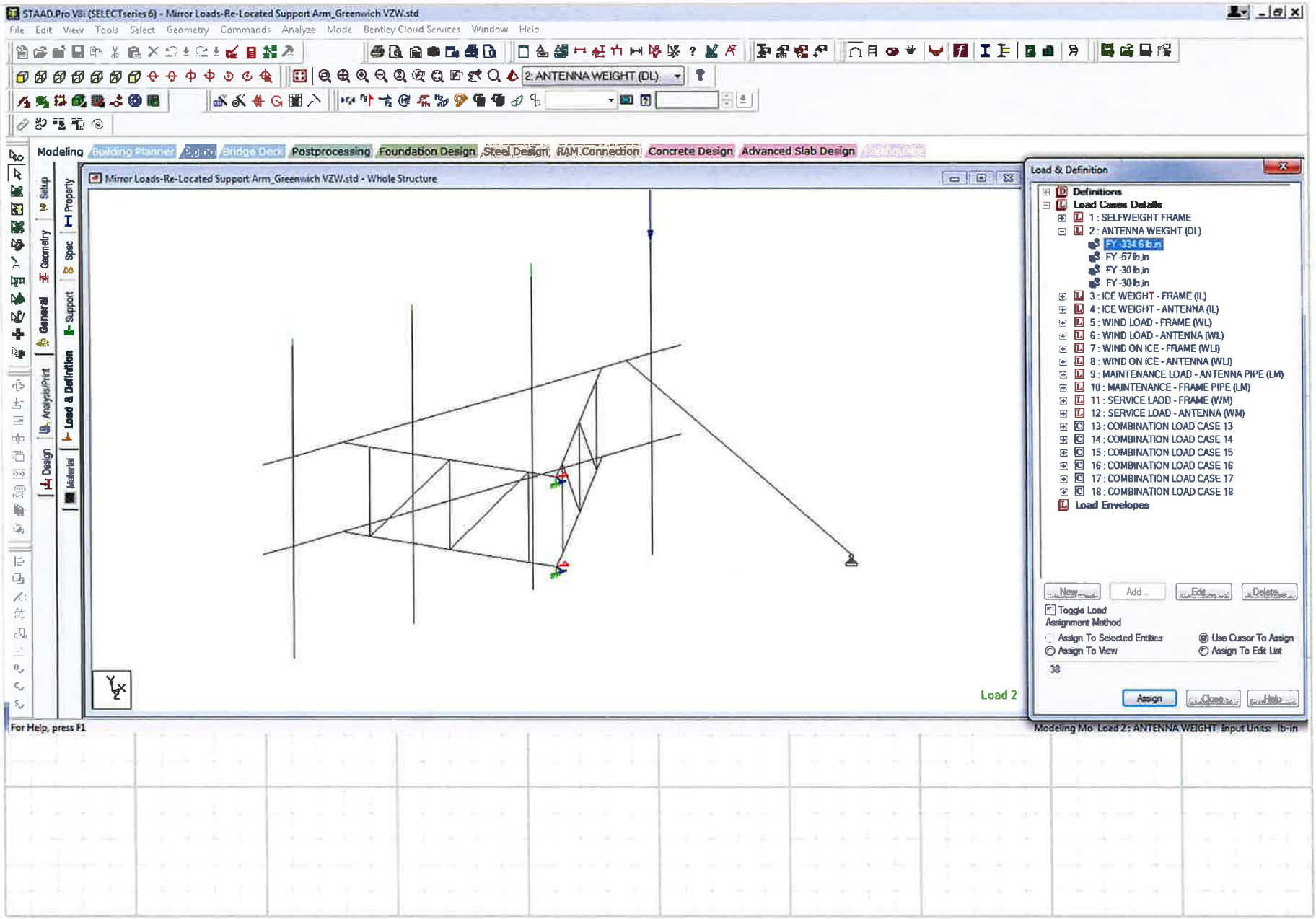
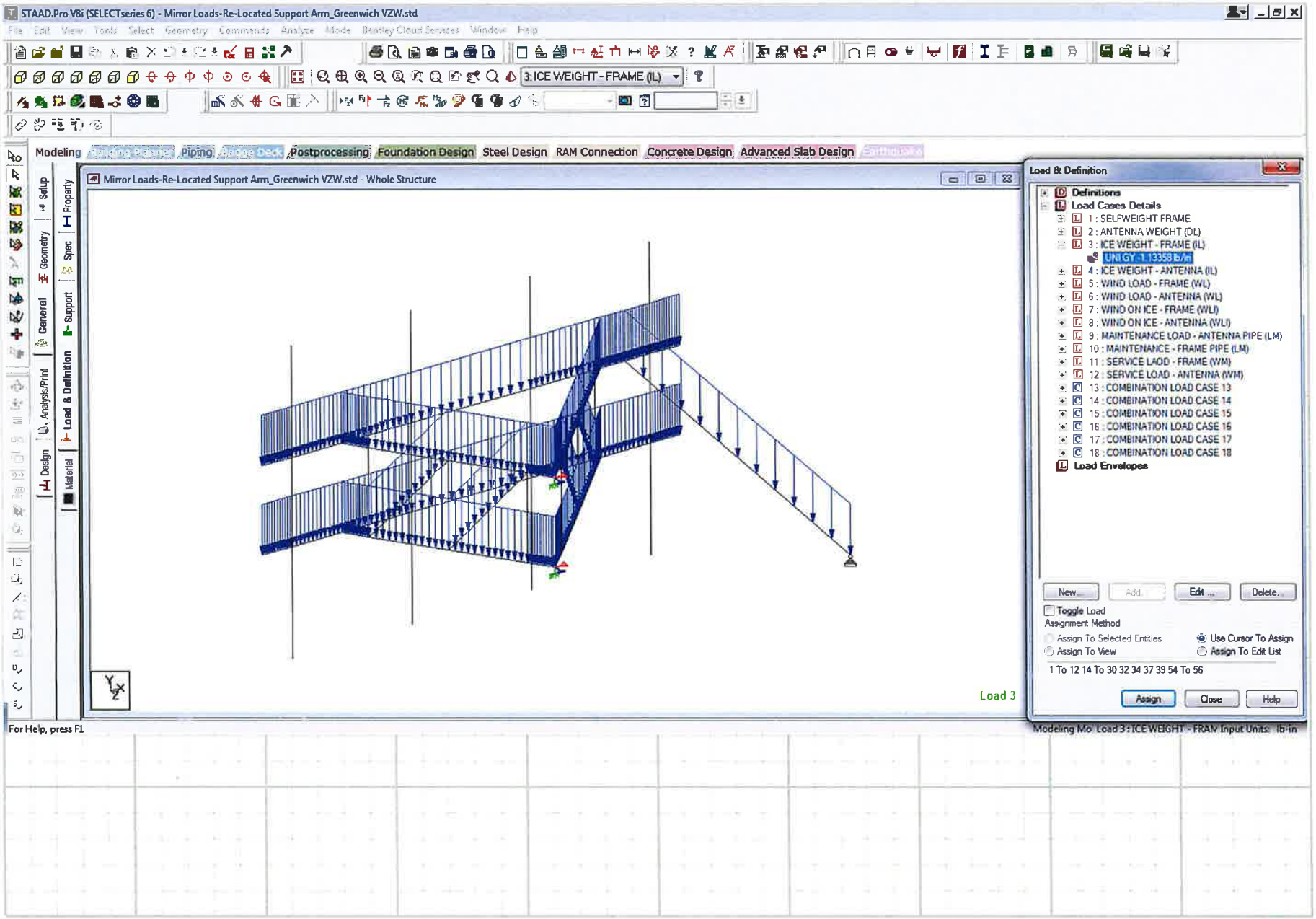
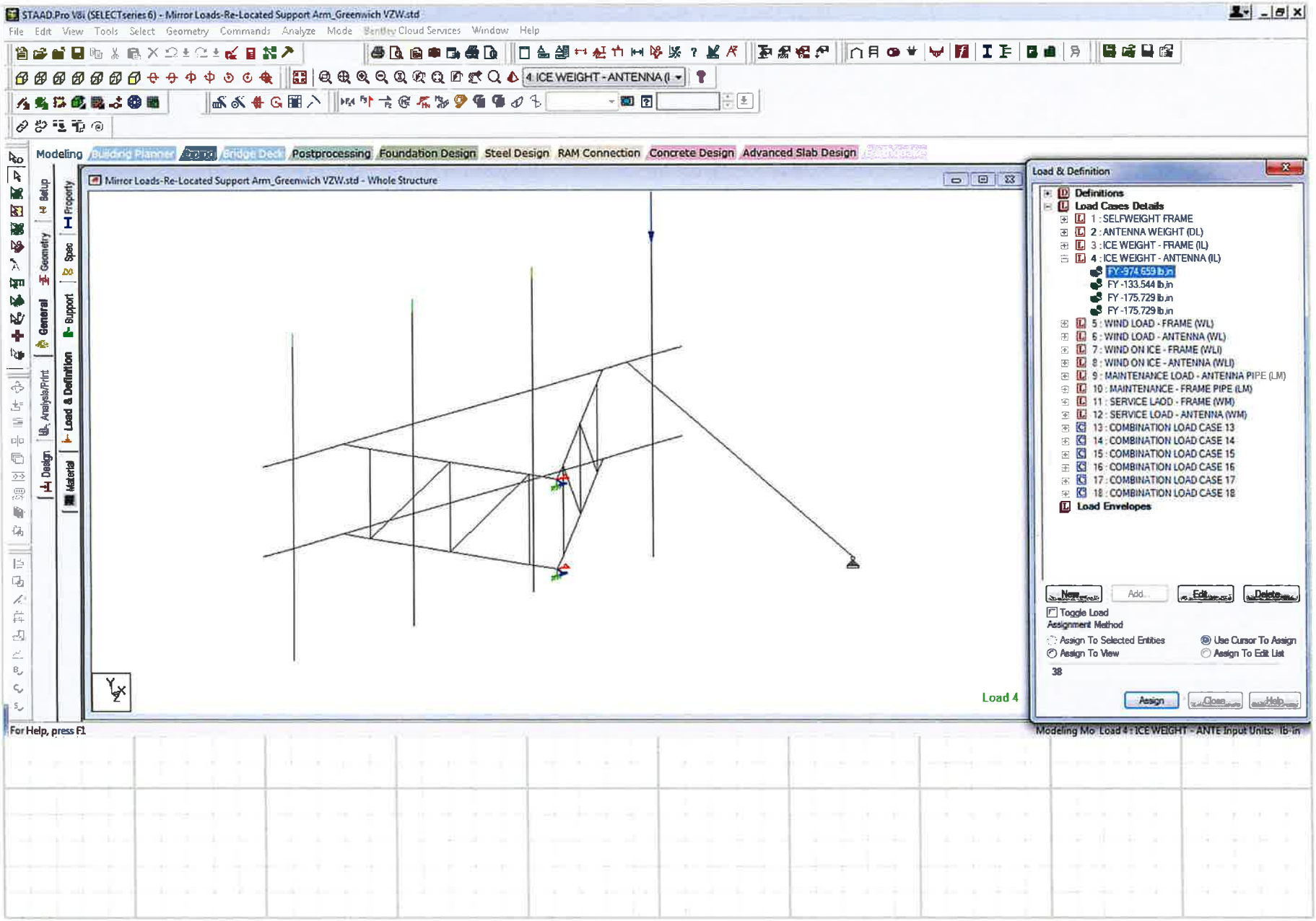
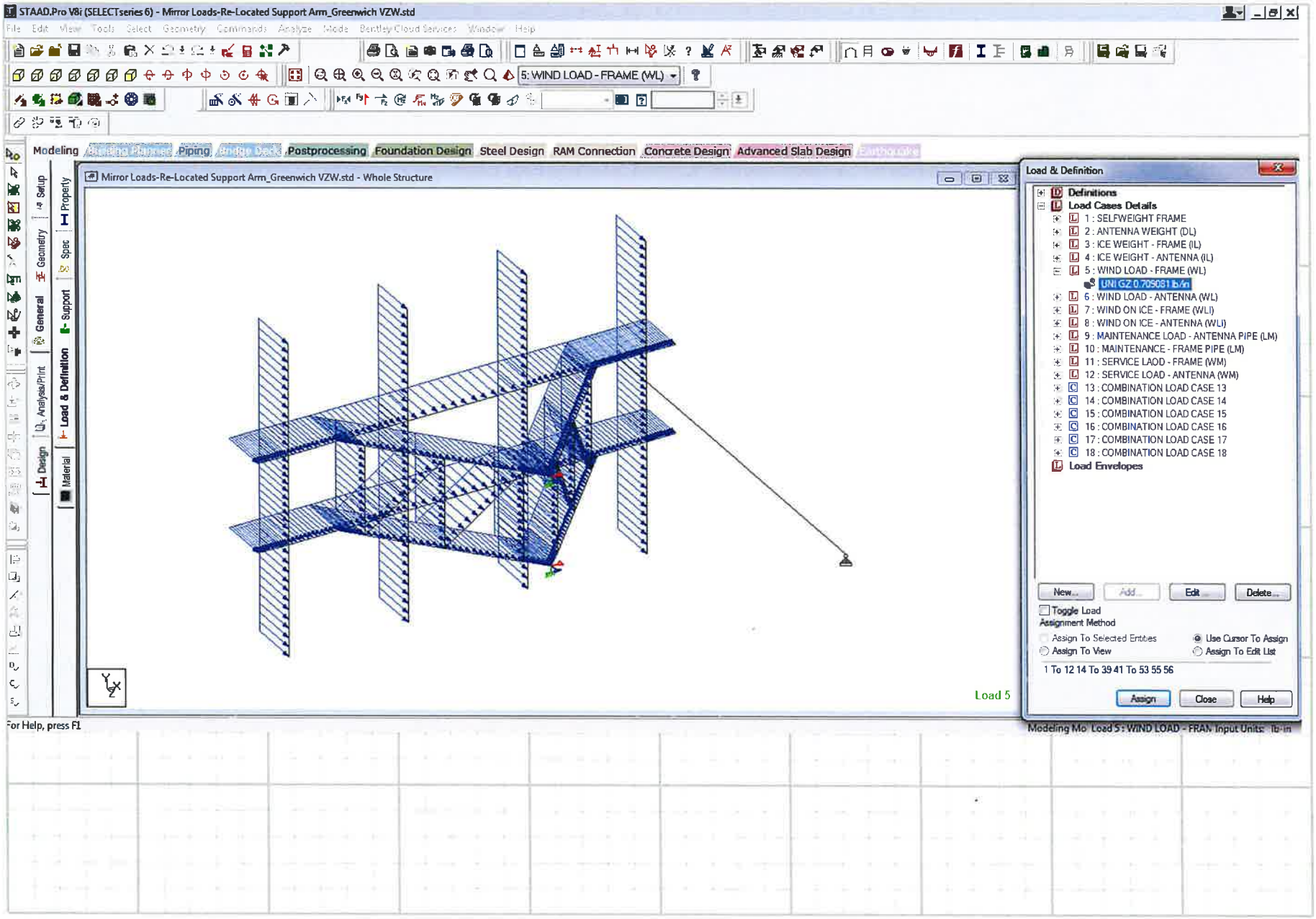
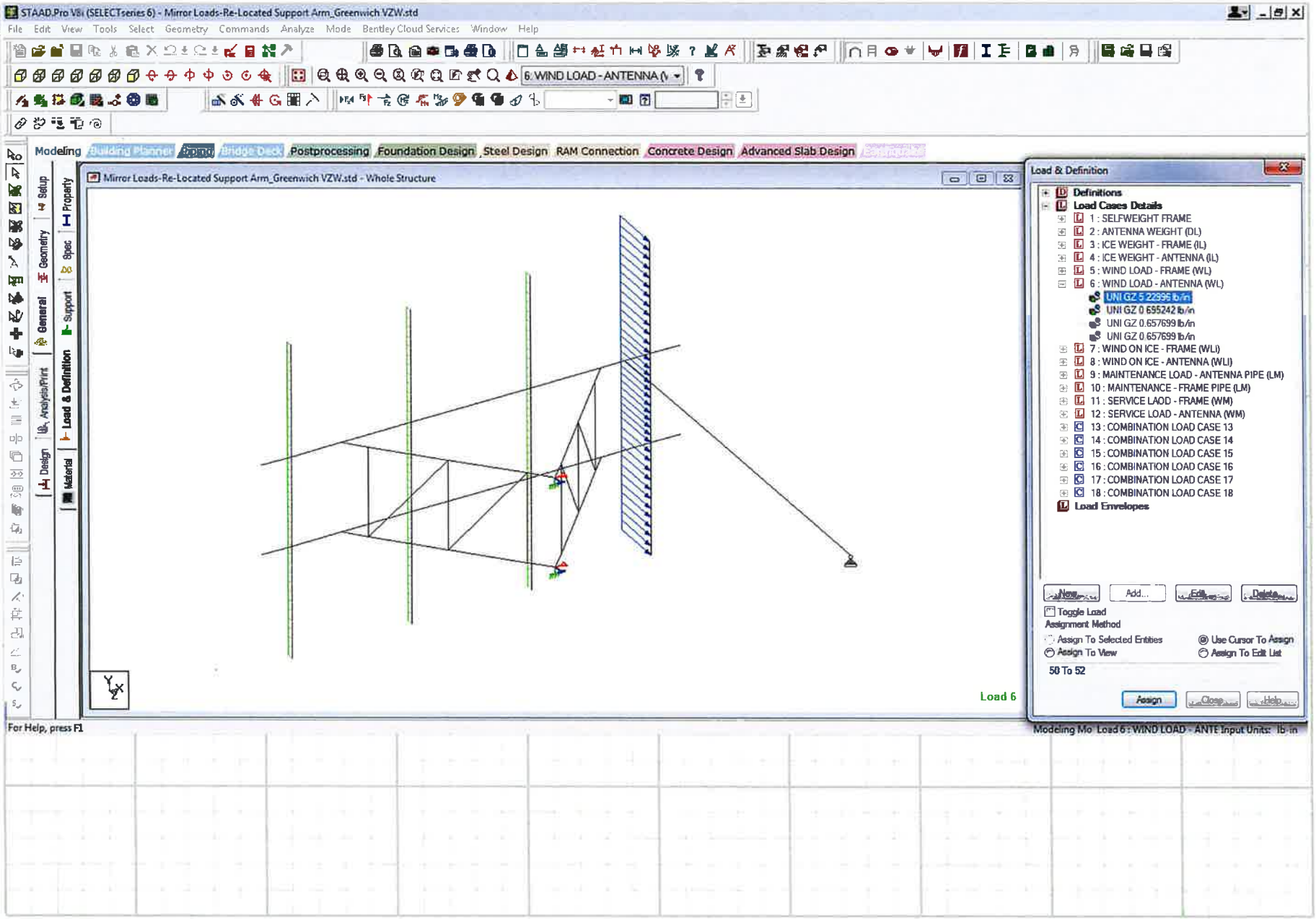

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
1: SELFWEIGHT FRAME
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 1
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
SELFWEIGHT Y -1
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
Assign Close Help
For Help, press F1
Modeling Mo Load 1 : SELFWEIGHT FRAM Input Units: lb-in

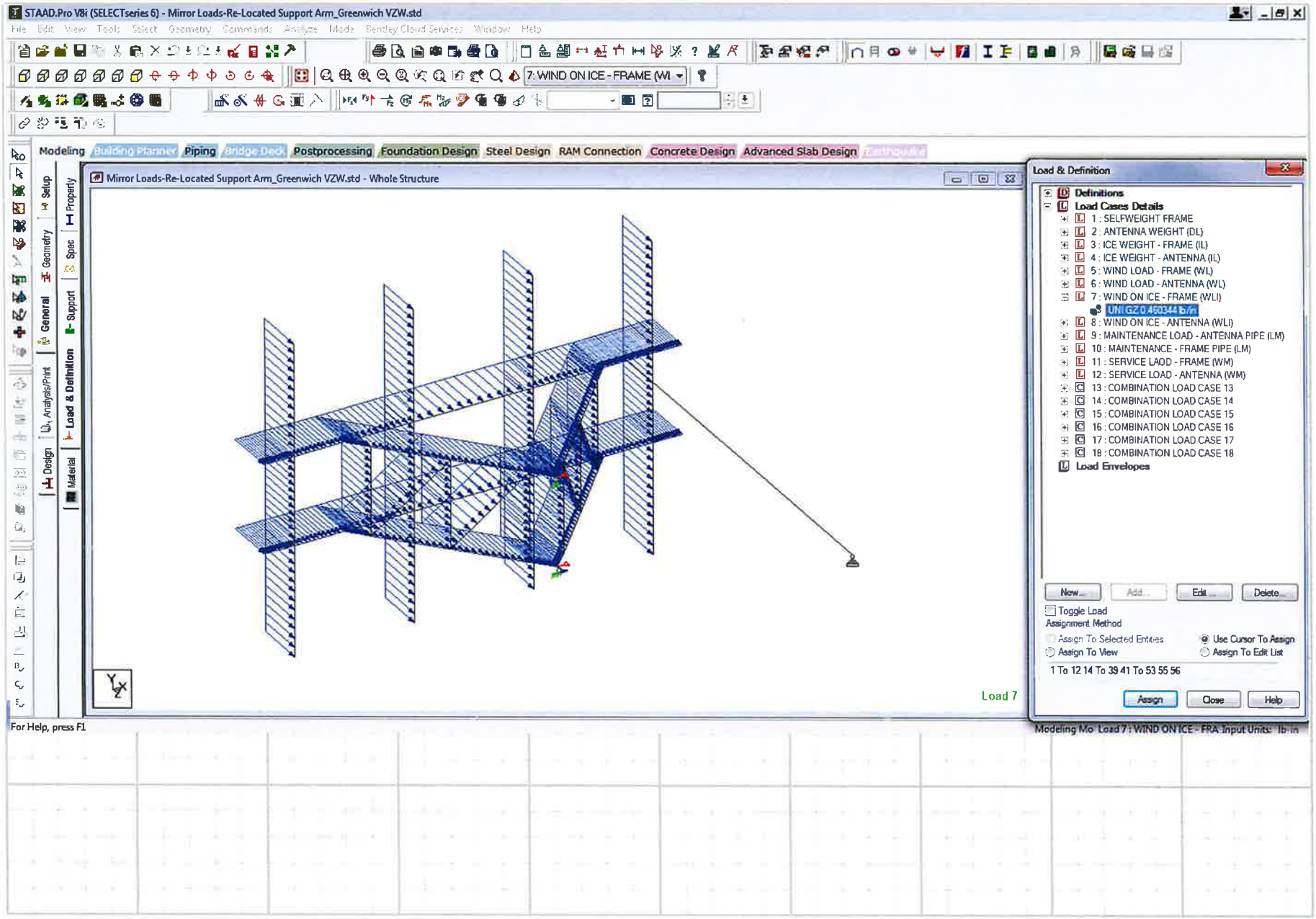

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
2: ANTENNA WEIGHT (DL)
Modeling Building Planner Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 2
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
FY -334.6 lb.in
FY -57 lb.in
FY -30 lb.in
FY -30 lb.in
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
38
Assign Close Help
For Help, press F1
Modeling Mo Load 2 : ANTENNA WEIGHT Input Units: lb-in

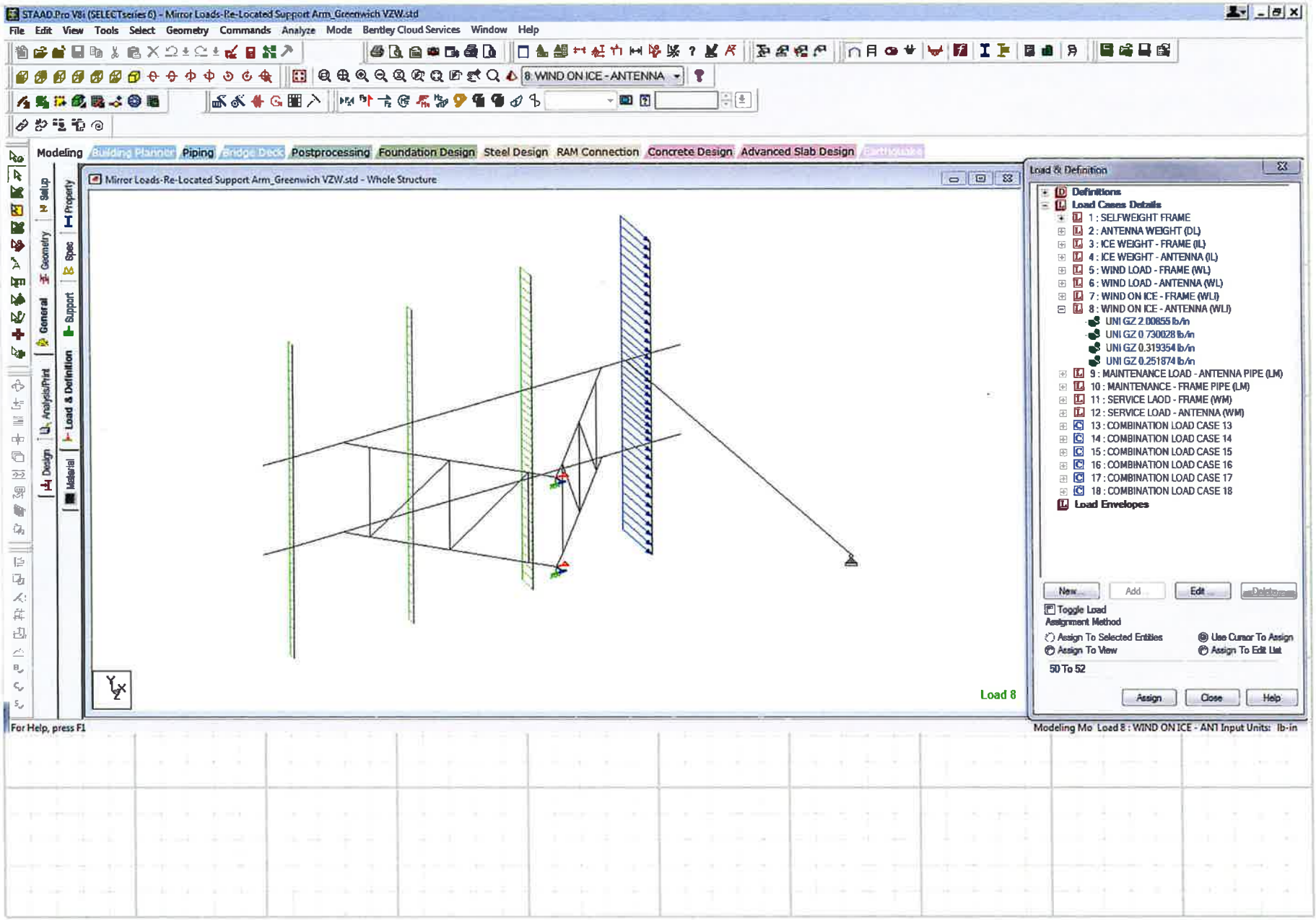

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
3: ICE WEIGHT - FRAME (IL)
Modeling
Postprocessing
Foundation Design
Steel Design
RAM Connection
Concrete Design
Advanced Slab Design
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 3
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
UNI GY -1.13358 lb/in
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New...
Add...
Edit ...
Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
1 To 12 14 To 30 32 34 37 39 54 To 56
Assign
Close
Help
For Help, press F1
Modeling Mo Load 3 : ICE WEIGHT - FRAM Input Units: lb-in

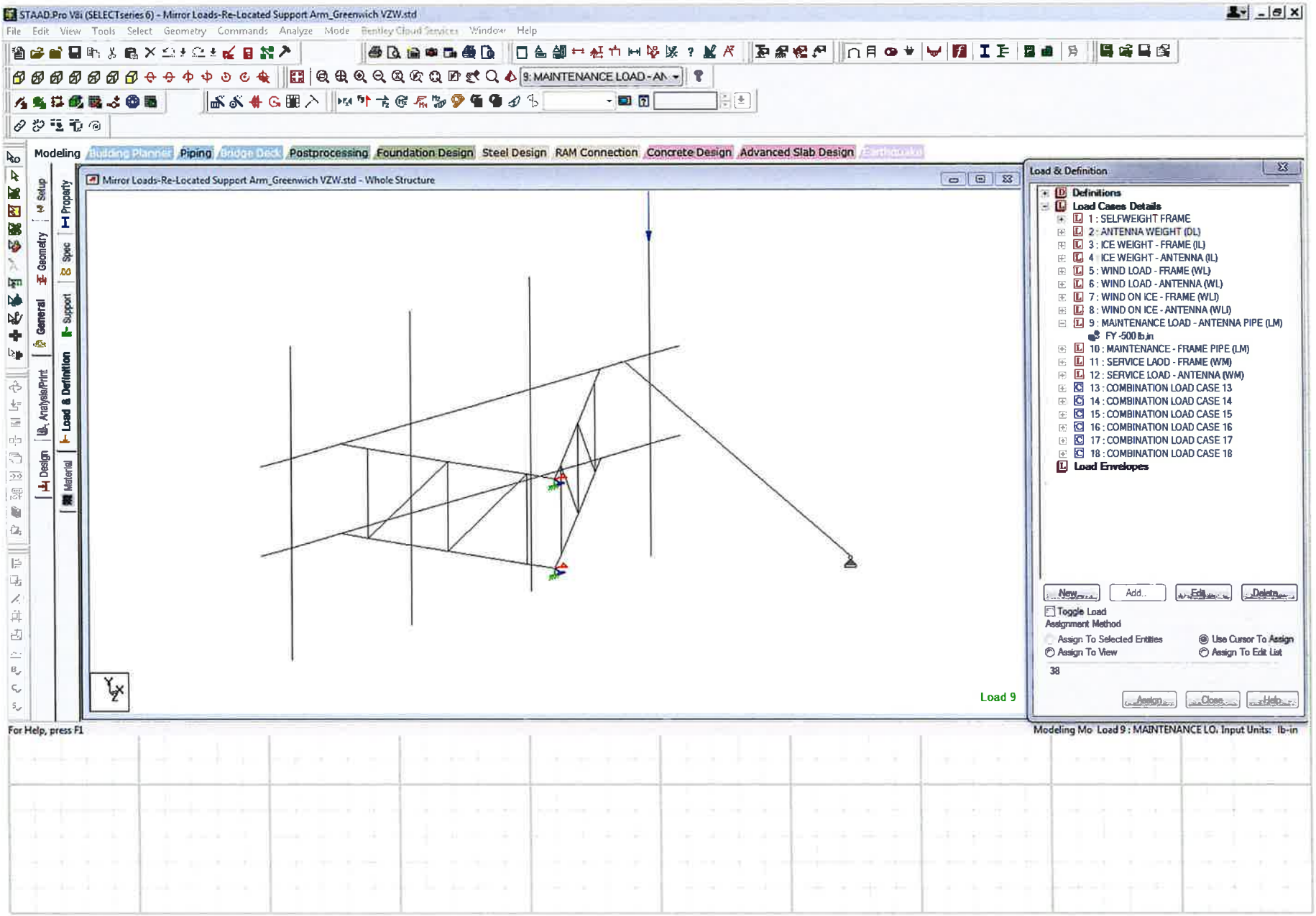

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
4: ICE WEIGHT - ANTENNA (I
Modeling Building Planner Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Property Spec Support Load & Definition Analysis/Print Design Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 4
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
FY -974.659 lb,in
FY -133.544 lb,in
FY -175.729 lb,in
FY -175.729 lb,in
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New
Add...
Edit
Delete
Toggle Load
Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
38
Assign
Close
Help
For Help, press F1
Modeling Mo Load 4 : ICE WEIGHT - ANTE Input Units: lb-in

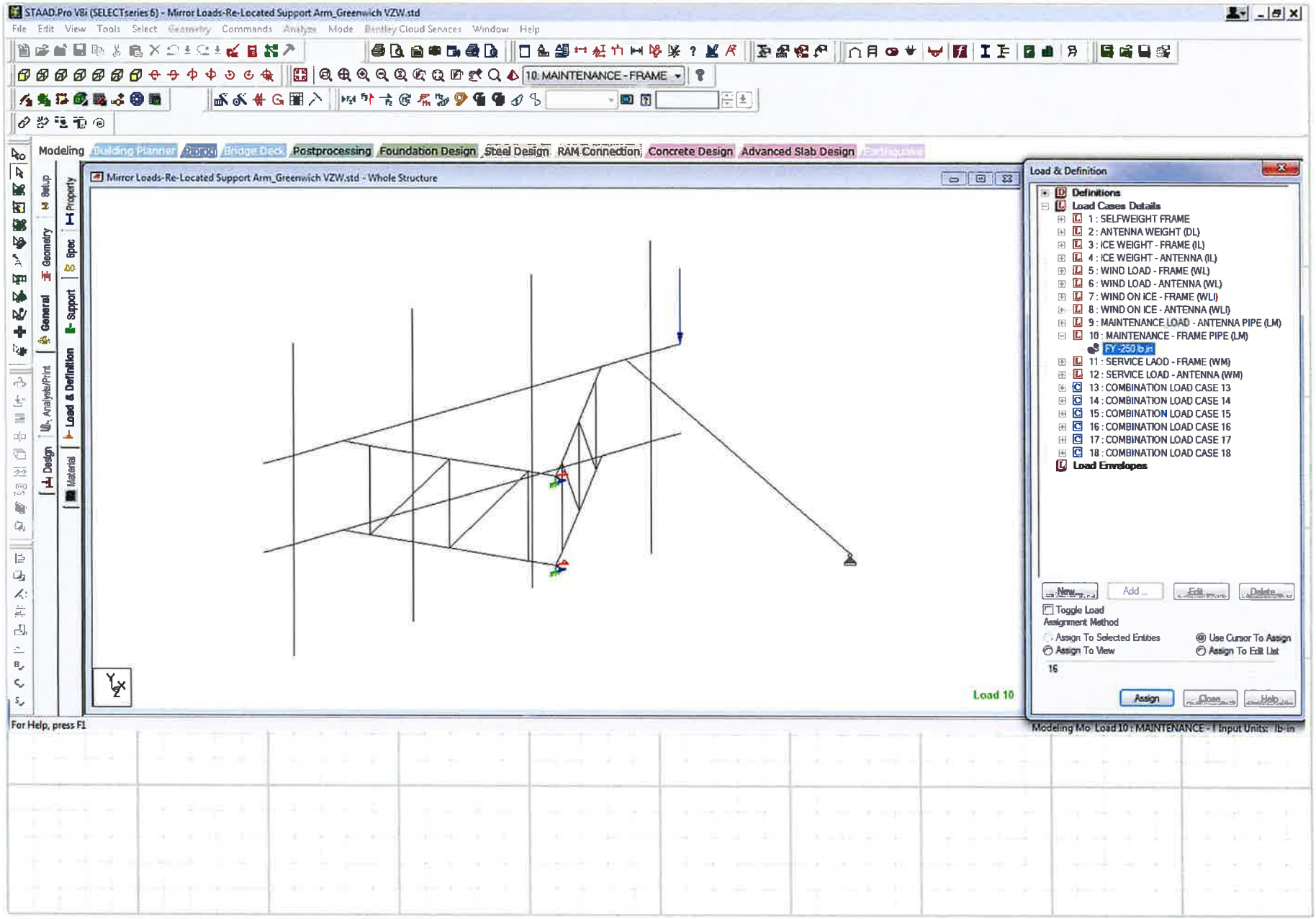

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
5: WIND LOAD - FRAME (WL)
Modeling
Postprocessing
Foundation Design
Steel Design
RAM Connection
Concrete Design
Advanced Slab Design
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
UNI GZ 0.709081 lb/in
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New...
Add...
Edit...
Delete...
Toggle Load
Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
1 To 12 14 To 39 41 To 53 55 56
Assign
Close
Help
Load 5
For Help, press F1

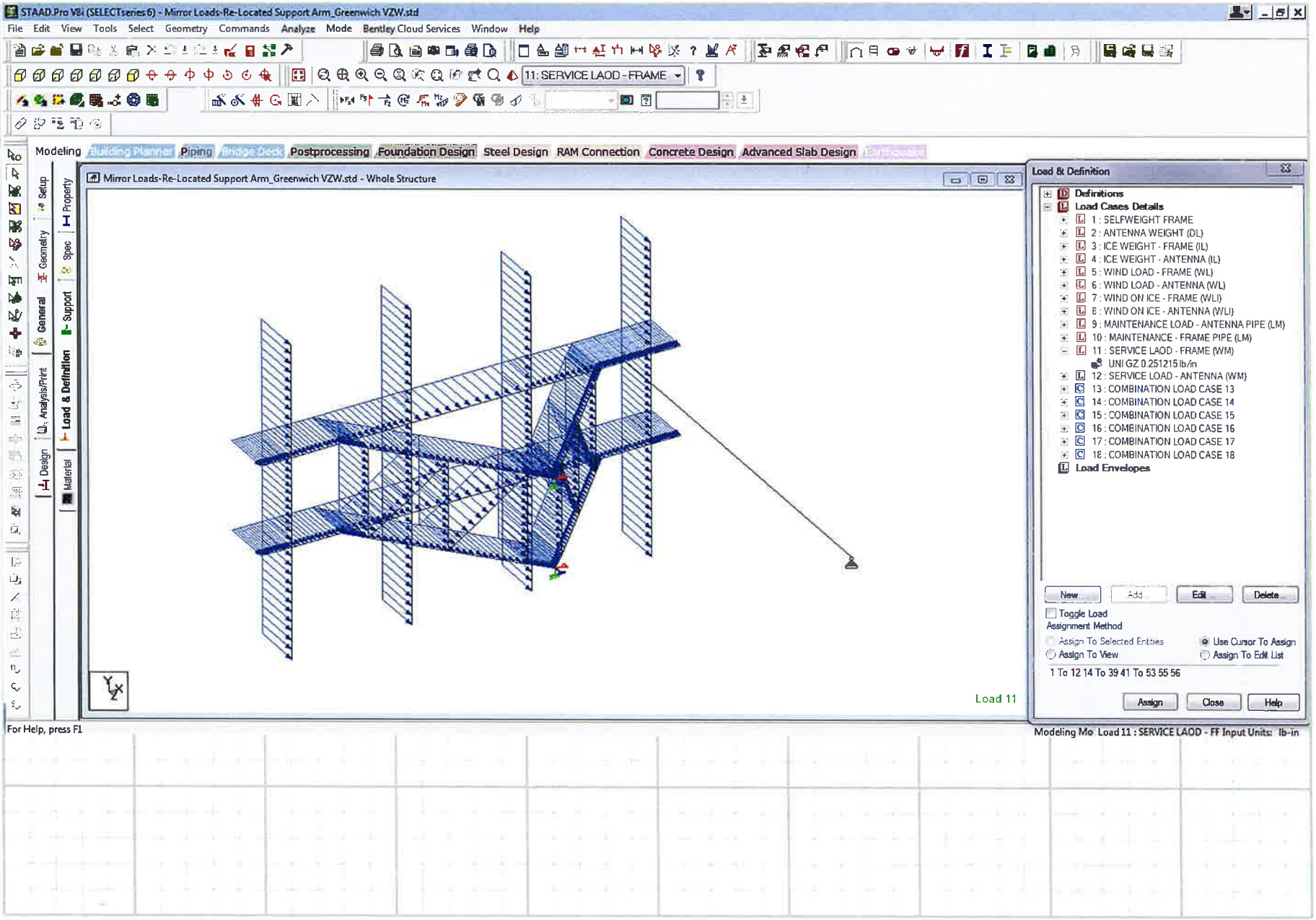

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
6: WIND LOAD - ANTENNA (
Modeling Building Planner Aging Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 6
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
UNI GZ 5.22396 lb/in
UNI GZ 0.695242 lb/in
UNI GZ 0.657699 lb/in
UNI GZ 0.657699 lb/in
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
50 To 52
Assign Close Help
For Help, press F1
Modeling Mo Load 6 : WIND LOAD - ANTE Input Units: lb-in

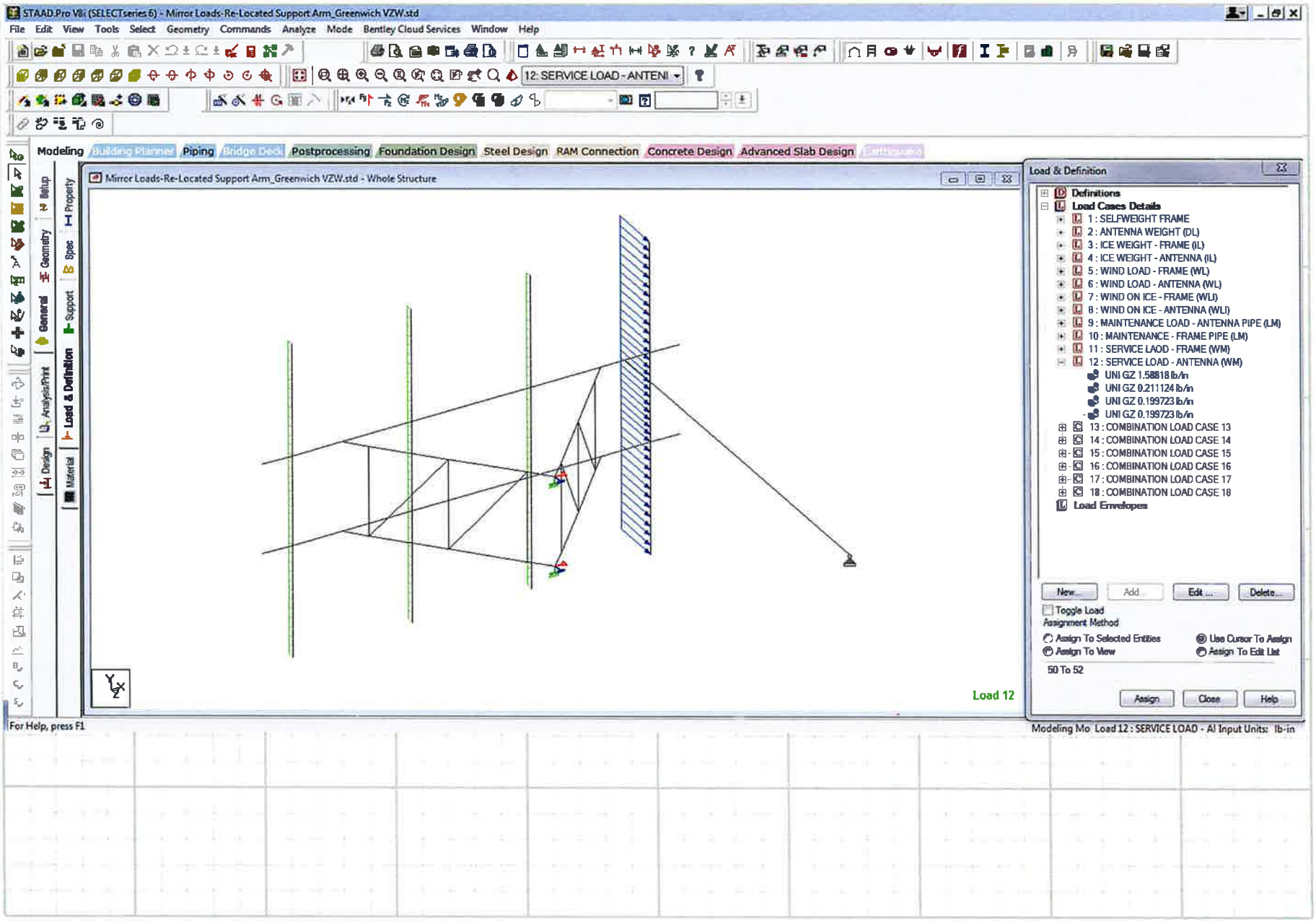

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
7: WIND ON ICE - FRAME (WI
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 7
For Help, press F1
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
UNI GZ 0.460344 lb/in
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load
Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
1 To 12 14 To 39 41 To 53 55 56
Assign Close Help
Modeling Mo Load 7 : WIND ON ICE - FRA Input Units: lb-in

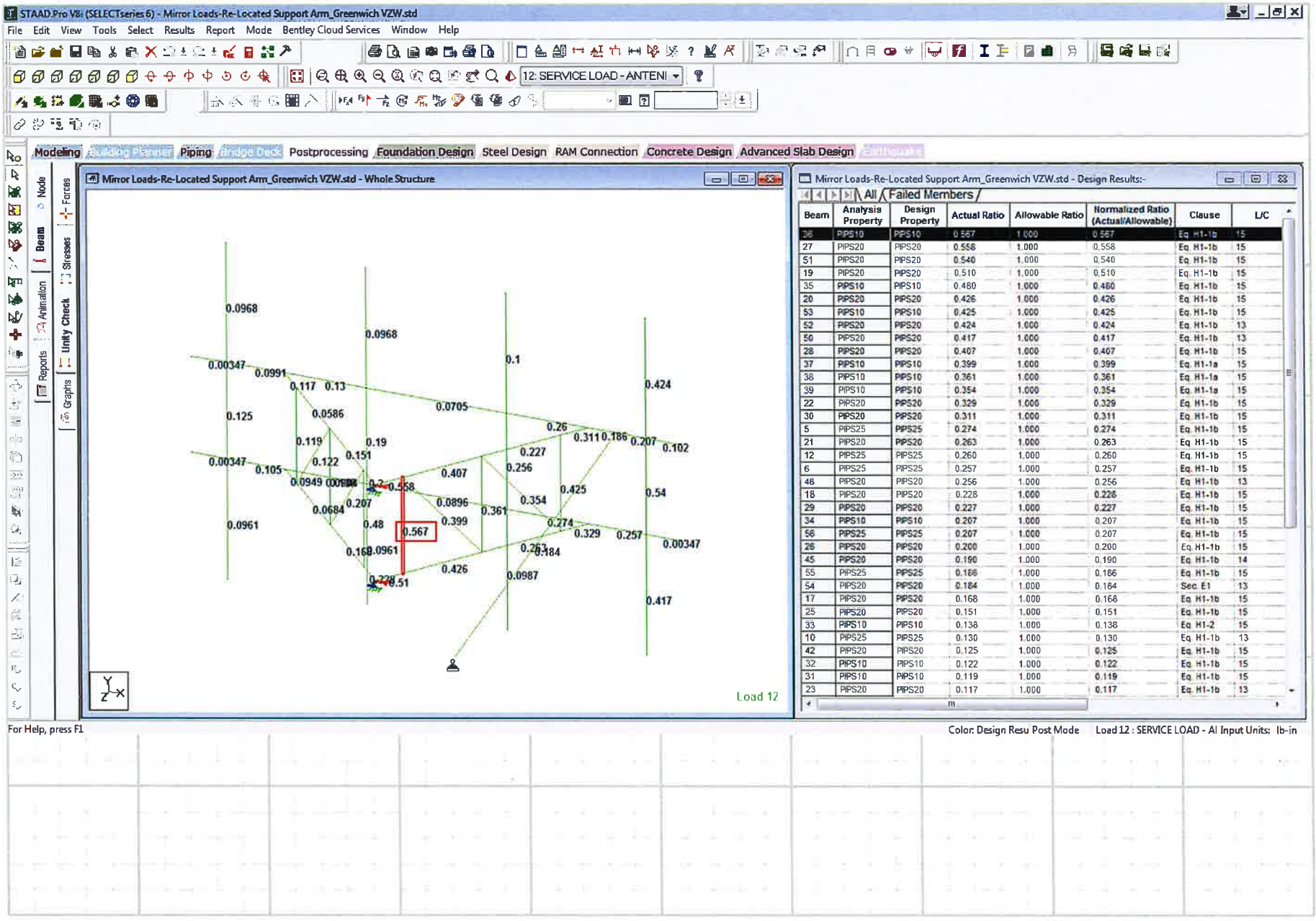

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
8 WIND ON ICE - ANTENNA
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 8
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
UNI GZ 2.00855 lb/in
UNI GZ 0.730028 lb/in
UNI GZ 0.319354 lb/in
UNI GZ 0.251874 lb/in
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
50 To 52
Assign Close Help
For Help, press F1
Modeling Mo Load 8 : WIND ON ICE - ANT Input Units: lb-in

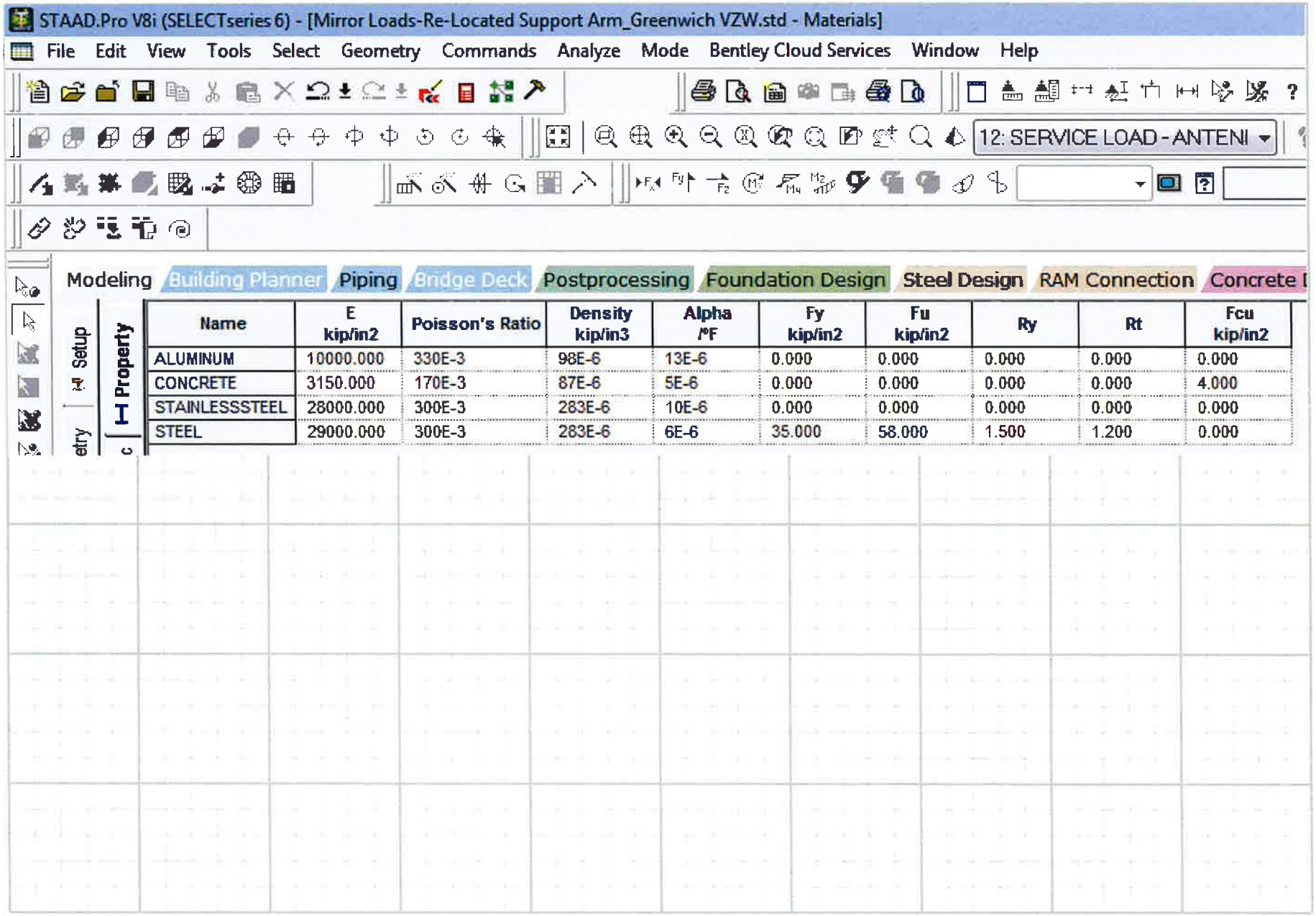

STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
9: MAINTENANCE LOAD - AN
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake
Setup Geometry General Property Spec Support Load & Definition Analysis/Print Design Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 9
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
FY -500 lb.in
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
38
Assign... Close... Help...
For Help, press F1
Modeling Mo Load 9 : MAINTENANCE LO. Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
10: MAINTENANCE - FRAME
Modeling Building Planner Bridge Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 10
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
FY -250 lb,in
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add... Edit... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
16
Assign Close Help
For Help, press F1
Modeling Mo Load 10 : MAINTENANCE - I Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
11: SERVICE LAOD - FRAME
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design Earthquake
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 11
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
UNI GZ 0.251215 lb/in
12 : SERVICE LOAD - ANTENNA (WM)
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add Edit Delete
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
1 To 12 14 To 39 41 To 53 55 56
Assign Close Help
For Help, press F1
Modeling Mo Load 11 : SERVICE LAOD - FF Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Geometry Commands Analyze Mode Bentley Cloud Services Window Help
12: SERVICE LOAD - ANTENI
Modeling Building Planner Piping Bridge Deck Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Setup Geometry General Analysis/Print Design
Property Spec Support Load & Definition Material
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 12
Load & Definition
Definitions
Load Cases Details
1 : SELFWEIGHT FRAME
2 : ANTENNA WEIGHT (DL)
3 : ICE WEIGHT - FRAME (IL)
4 : ICE WEIGHT - ANTENNA (IL)
5 : WIND LOAD - FRAME (WL)
6 : WIND LOAD - ANTENNA (WL)
7 : WIND ON ICE - FRAME (WLI)
8 : WIND ON ICE - ANTENNA (WLI)
9 : MAINTENANCE LOAD - ANTENNA PIPE (LM)
10 : MAINTENANCE - FRAME PIPE (LM)
11 : SERVICE LAOD - FRAME (WM)
12 : SERVICE LOAD - ANTENNA (WM)
UNI GZ 1.58818 lb/in
UNI GZ 0.211124 lb/in
UNI GZ 0.199723 lb/in
UNI GZ 0.199723 lb/in
13 : COMBINATION LOAD CASE 13
14 : COMBINATION LOAD CASE 14
15 : COMBINATION LOAD CASE 15
16 : COMBINATION LOAD CASE 16
17 : COMBINATION LOAD CASE 17
18 : COMBINATION LOAD CASE 18
Load Envelopes
New... Add Edit ... Delete...
Toggle Load Assignment Method
Assign To Selected Entities
Use Cursor To Assign
Assign To View
Assign To Edit List
50 To 52
Assign Close Help
For Help, press F1
Modeling Mo Load 12 : SERVICE LOAD - AI Input Units: lb-in


STAAD.Pro V8i (SELECTseries 6) - Mirror Loads-Re-Located Support Arm_Greenwich VZW.std
File Edit View Tools Select Results Report Mode Bentley Cloud Services Window Help
12: SERVICE LOAD - ANTENI
Modeling Piping Postprocessing Foundation Design Steel Design RAM Connection Concrete Design Advanced Slab Design
Node Beam Animation Unity Check Reports Graphs Forces Stresses
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Whole Structure
Load 12
Mirror Loads-Re-Located Support Arm_Greenwich VZW.std - Design Results:-
All Failed Members
Beam | Analysis Property | Design Property | Actual Ratio | Allowable Ratio | Normalized Ratio (Actual/Allowable) | Clause | L/C
26 | PIPS10 | PIPS10 | 0.567 | 1.000 | 0.567 | Eq. H1-1b | 15
27 | PIPS20 | PIPS20 | 0.558 | 1.000 | 0.558 | Eq. H1-1b | 15
51 | PIPS20 | PIPS20 | 0.540 | 1.000 | 0.540 | Eq. H1-1b | 15
19 | PIPS20 | PIPS20 | 0.510 | 1.000 | 0.510 | Eq. H1-1b | 15
35 | PIPS10 | PIPS10 | 0.480 | 1.000 | 0.480 | Eq. H1-1b | 15
20 | PIPS20 | PIPS20 | 0.426 | 1.000 | 0.426 | Eq. H1-1b | 15
53 | PIPS10 | PIPS10 | 0.425 | 1.000 | 0.425 | Eq. H1-1b | 15
52 | PIPS20 | PIPS20 | 0.424 | 1.000 | 0.424 | Eq. H1-1b | 13
50 | PIPS20 | PIPS20 | 0.417 | 1.000 | 0.417 | Eq. H1-1b | 13
28 | PIPS20 | PIPS20 | 0.407 | 1.000 | 0.407 | Eq. H1-1b | 15
37 | PIPS10 | PIPS10 | 0.399 | 1.000 | 0.399 | Eq. H1-1a | 15
38 | PIPS10 | PIPS10 | 0.361 | 1.000 | 0.361 | Eq. H1-1a | 15
39 | PIPS10 | PIPS10 | 0.354 | 1.000 | 0.354 | Eq. H1-1a | 15
22 | PIPS20 | PIPS20 | 0.329 | 1.000 | 0.329 | Eq. H1-1b | 15
30 | PIPS20 | PIPS20 | 0.311 | 1.000 | 0.311 | Eq. H1-1b | 15
5 | PIPS25 | PIPS25 | 0.274 | 1.000 | 0.274 | Eq. H1-1b | 15
21 | PIPS20 | PIPS20 | 0.263 | 1.000 | 0.263 | Eq. H1-1b | 15
12 | PIPS25 | PIPS25 | 0.260 | 1.000 | 0.260 | Eq. H1-1b | 15
6 | PIPS25 | PIPS25 | 0.257 | 1.000 | 0.257 | Eq. H1-1b | 15
48 | PIPS20 | PIPS20 | 0.256 | 1.000 | 0.256 | Eq. H1-1b | 13
18 | PIPS20 | PIPS20 | 0.228 | 1.000 | 0.228 | Eq. H1-1b | 15
29 | PIPS20 | PIPS20 | 0.227 | 1.000 | 0.227 | Eq. H1-1b | 15
34 | PIPS10 | PIPS10 | 0.207 | 1.000 | 0.207 | Eq. H1-1b | 15
56 | PIPS25 | PIPS25 | 0.207 | 1.000 | 0.207 | Eq. H1-1b | 15
26 | PIPS20 | PIPS20 | 0.200 | 1.000 | 0.200 | Eq. H1-1b | 15
45 | PIPS20 | PIPS20 | 0.190 | 1.000 | 0.190 | Eq. H1-1b | 14
55 | PIPS25 | PIPS25 | 0.186 | 1.000 | 0.186 | Eq. H1-1b | 15
54 | PIPS20 | PIPS20 | 0.184 | 1.000 | 0.184 | Sec. E1 | 13
17 | PIPS20 | PIPS20 | 0.168 | 1.000 | 0.168 | Eq. H1-1b | 15
25 | PIPS20 | PIPS20 | 0.151 | 1.000 | 0.151 | Eq. H1-1b | 15
33 | PIPS10 | PIPS10 | 0.138 | 1.000 | 0.138 | Eq. H1-2 | 15
10 | PIPS25 | PIPS25 | 0.130 | 1.000 | 0.130 | Eq. H1-1b | 13
42 | PIPS20 | PIPS20 | 0.125 | 1.000 | 0.125 | Eq. H1-1b | 15
32 | PIPS10 | PIPS10 | 0.122 | 1.000 | 0.122 | Eq. H1-1b | 15
31 | PIPS10 | PIPS10 | 0.119 | 1.000 | 0.119 | Eq. H1-1b | 15
23 | PIPS20 | PIPS20 | 0.117 | 1.000 | 0.117 | Eq. H1-1b | 13
For Help, press F1
Color: Design Resu Post Mode
Load 12 : SERVICE LOAD - Al Input Units: lb-in



Name	E kip/in2	Poisson's Ratio	Density kip/in3	Alpha /°F	Fy kip/in2	Fu kip/in2	Ry	Rt	Fcu kip/in2
ALUMINUM	10000.000	330E-3	98E-6	13E-6	0.000	0.000	0.000	0.000	0.000
CONCRETE	3150.000	170E-3	87E-6	5E-6	0.000	0.000	0.000	0.000	4.000
STAINLESSSTEEL	28000.000	300E-3	283E-6	10E-6	0.000	0.000	0.000	0.000	0.000
STEEL	29000.000	300E-3	283E-6	6E-6	35.000	58.000	1.500	1.200	0.000

JAHH-65B-R3B

8-port sector antenna, 2x 698–787, 2x 824–894 and 4x 1695–2360 MHz, 65° HPBW, 3x RET and low bands have diplexers. Internal SBT's on first LB (Port 1) and first HB(Port 5).

- Internal SBT on low and high band allow remote RET control from the radio over the RF jumper cable
- One RET for 700MHz, one RET for 850MHz, and one RET for both high bands to ensure same tilt level for 4x Rx or 4x MIMO
- Internal filter on low band and interleaved dipole technology providing for attractive, low wind load mechanical package
- Separate RS-485 RET input/output for low and high band

Electrical Specifications

Frequency Band, MHz	**698–787**	**824–894**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain, dBi	14.5	15.8	18.0	18.4	18.5	18.8
Beamwidth, Horizontal, degrees	67	65	63	63	65	68
Beamwidth, Vertical, degrees	12.4	10.5	5.7	5.2	4.9	4.4
Beam Tilt, degrees	2–14	2–14	0–10	0–10	0–10	0–10
USLS (First Lobe), dB	18	18	20	20	21	23
Front-to-Back Ratio at 180°, dB	32	34	31	35	36	38
Isolation, Cross Polarization, dB	25	25	25	25	25	25
Isolation, Inter-band, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port at 50°C, maximum, watts	200	200	300	300	300	250
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

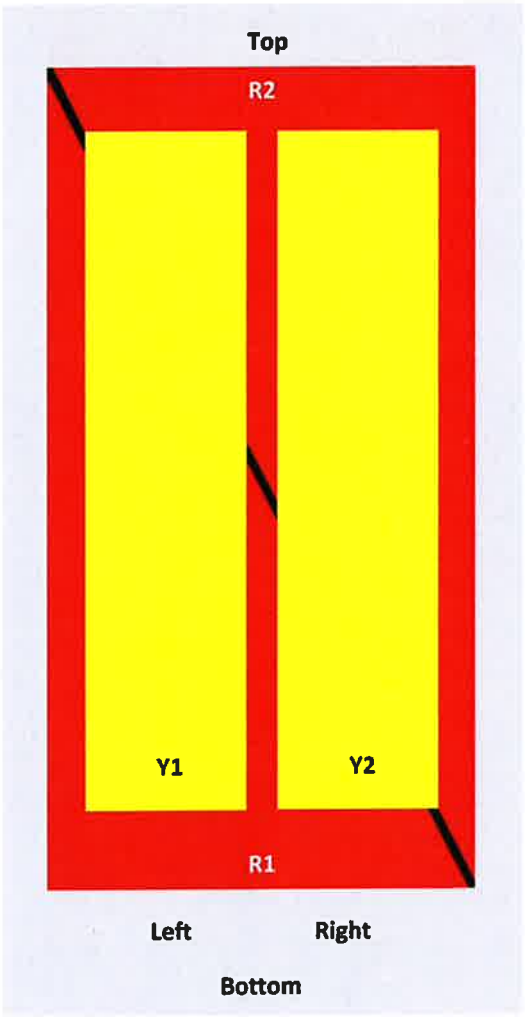
Electrical Specifications, BASTA*

Frequency Band, MHz	**698–787**	**824–894**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain by all Beam Tilts, average, dBi	14.3	14.9	17.6	18.1	18.2	18.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.5	±0.6	±0.4	±0.5	±0.6
Gain by Beam Tilt, average, dBi	2 ° | 14.3 8 ° | 14.3 14 ° | 14.3	2 ° | 15.0 8 ° | 14.9 14 ° | 15.4	0 ° | 17.2 5 ° | 17.6 10 ° | 17.6	0 ° | 17.6 5 ° | 18.2 10 ° | 18.2	0 ° | 17.7 5 ° | 18.3 10 ° | 18.3	0 ° | 17.9 5 ° | 18.7 10 ° | 18.7
Beamwidth, Horizontal Tolerance, degrees	±1.2	±1.4	±4	±2.4	±2.9	±2.7
Beamwidth, Vertical Tolerance, degrees	±0.9	±0.5	±0.3	±0.2	±0.3	±0.1
USLS, beampeak to 20° above beampeak, dB	18	17	17	18	19	18
Front-to-Back Total Power at 180° ± 30°, dB	25	24	26	29	27	29
CPR at Boresight, dB	22	23	20	21	21	24
CPR at Sector, dB	11	12	11	11	11	8

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

Array Layout

JAHH-65A-R3B JAHH-65B-R3B JAHH-65C-R3B



Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-798	1-2	1	ANxxxxxxxxxxxxxxxx1
R2	824-894	3-4	2	ANxxxxxxxxxxxxxxxx2
Y1	1695-2360	5-6	3	ANxxxxxxxxxxxxxxxx3
Y2	1695-2360	7-8		

View from the front of the antenna

(Sizes of colored boxes are not true depictions of array sizes)

General Specifications

Operating Frequency Band	1695 – 2360 MHz | 698 – 787 MHz | 824 – 894 MHz

JAHH-65B-R3B

Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage

Mechanical Specifications

RF Connector Quantity, total	8
RF Connector Quantity, low band	4
RF Connector Quantity, high band	4
RF Connector Interface	4.3-10 Female
Color	Light gray
Grounding Type	RF connector body grounded to reflector and mounting bracket
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	301.0 N @ 150 km/h 67.7 lbf @ 150 km/h
Wind Loading, lateral	254.0 N @ 150 km/h 57.1 lbf @ 150 km/h
Wind Loading, maximum	638.0 N @ 150 km/h 143.4 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Length	1828.0 mm | 72.0 in
Width	350.0 mm | 13.8 in
Depth	208.0 mm | 8.2 in
Net Weight, without mounting kit	28.7 kg | 63.3 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 5
Internal RET	High band (1) | Low band (2)
Power Consumption, idle state, maximum	2 W
Power Consumption, normal conditions, maximum	13 W
Protocol	3GPP/AISG 2.0 (Single RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male

JAHH-65B-R3B

Packed Dimensions

Length	1975.0 mm | 77.8 in
Width	456.0 mm | 18.0 in
Depth	357.0 mm | 14.1 in
Shipping Weight	42.0 kg | 92.6 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
China RoHS SJ/T 11364-2014	Above Maximum Concentration Value (MCV)

Included Products

BSAMNT-3 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

BSAMNT-SBS-2-2

Side-By-Side Mounting Kit to mount two antennas on a pipe with 2.375 - 4.5 inch (60 – 115 mm) diameter

- 4x4 MIMO capability at both UMTS and LTE band for faster data throughput
- Ensures consistent distance between the antennas for each site (2 inches / 50mm)
- Forces both antennas to point to the same boresight direction

General Specifications

Application	Outdoor
Includes	Brackets | Hardware
Package Quantity	1

Mechanical Specifications

Color	Silver
Material Type	Galvanized steel

Dimensions

Compatible Diameter, maximum	115.0 mm | 4.5 in
Compatible Diameter, minimum	60.0 mm | 2.4 in
Net Weight	30.6 kg | 67.4 lb

Regulatory Compliance/Certifications

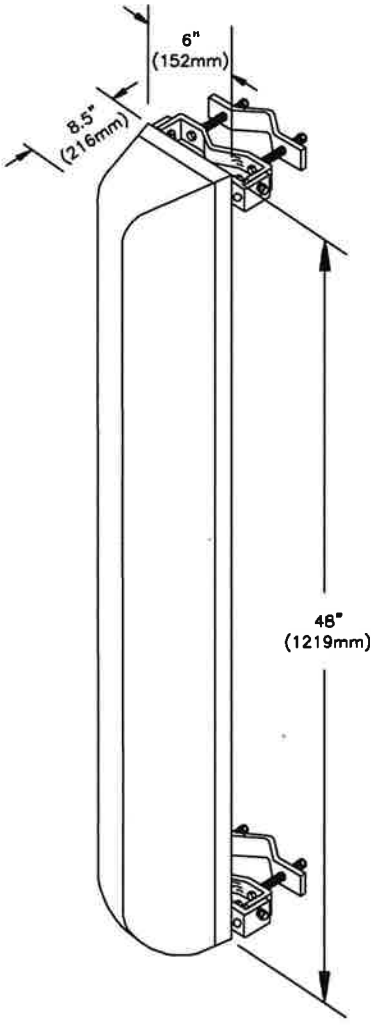
Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
China RoHS SJ/T 11364-2014	Above Maximum Concentration Value (MCV)

DB844H80(E)-XY

dB Director®

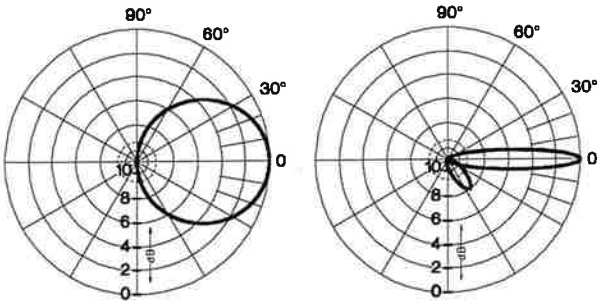
12.7 dBd, 80°, Directional Log Periodic Antenna

Model Number	DB844H80-XY	DB844H80E-XY
Termination	Type N-Female	7/16 DIN
Frequency Range	806-960 MHz	
Gain	12.7 dBd (14.8 dBi)	
VSWR	< 1.5:1	
Beamwidth (3dB from max)	Horizontal: 80° ± 5° Vertical: 15° ± 1°	
Front to Back Ratio	> 40 dB	
Polarization	Vertical	
Max. Input Power	500 Watts	
Application	Cellular, ESMR	
Weight	10 lbs (4.5 kg)	
Wind Area	2 ft² (0.19 m²)	
Wind Load	80 lbf (356N) 35.9 kp (at 100 mph)	
Max. Wind Speed	125 mph (200 km/h)	
Material	Radiators: Brass Back Panel: Pass. Aluminum Radome: ABS Mounting Hdw: Galvanized Steel	
Color	Normal: Gray	
Mounting	DB380 pipe mount kit (max. 3.5" OD), included.	
Downtilt Brackets (Optional)	DB5083	
Weather Protection	Fully protected by metal and ABS.	
Lightning Protection	All metal parts grounded.	
Packing Size	59" x 10" x 15" (150 x 25 x 38 cm)	
Shipping Weight	29 lbs (13 kg)	



12.7 dBd (14.8 dBi) Gain Directional Log Periodic Antenna with 80° horizontal 3 dB beamwidth for 806-960 MHz.

Antenna Patterns



Horizontal

Vertical

Electrical Downtilt (T) Option

Model Number	Downtilt	Gain
DB844H80T6XY/844H80T6E-XY	6°	12.0 dBd
DB844H80T8XY/844H80T8E-XY	8°	11.7 dBd
844H80T11(- or E)XY	11°	11.7 dBd
844H80T13(- or E)XY	13°	11.5 dBd

Specifications are for reference only. 099089-000-M 04/00

DECIBEL PRODUCTS

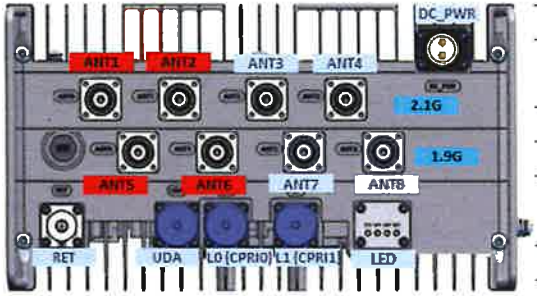
A Division of Allen Telecom Inc.

8635 Stemmons Freeway • P. O. Box 569610 • Dallas, Texas 75356-9610

214 / 631-0310 • Fax: 214 / 631-4706

80°

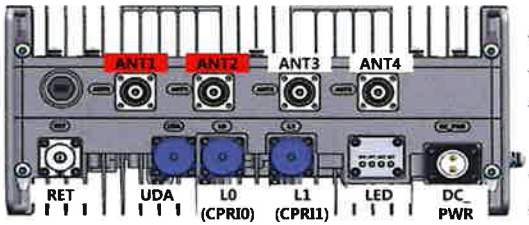
PCS+AWS Dual Band RRH(Model : RFV01U-D1A)



8 port Dual Band

Item	Specification	
Band	Band2 (1.9GHz)	Band66 (2.1GHz)
Frequency	DL : 1930~1990MHz	DL : 2110~2180MHz
	UL : 1850~1910MHz	UL : 1710~1780MHz
IBW	60MHz	70MHz
OBW	20MHz	30MHz
Carrier Bandwidth	5MHz, 10MHz, 15MHz, 20MHz	
# of carriers	2 carriers	3 carriers
Total # of carriers	4 carriers	
RF Chain	4T4R, 2T4R, 2T2R (SW configurable)	
RF Output Power	Total : 320W (for OBW 40MHz)	
	4 x 40W or 2 x 60W	4 x 60W or 2 x 90W
Spectrum Analyzer	TX/RX Support	
Noise Figure	Less than 3.0 dB	
RX Sensitivity	Typical : -105dBm @1Rx (25RBs 5MHz)	
Modulation	256QAM support	
Input Power	-48VDC (-38VDC to -57VDC)	
Power Consumption	About 1,270 Watt @ 100% RF load, typical conditions (w/ BAS OOBE)+TMA/RET	
Size (WHD)	380 x 380 x 255 mm (15.0" x 15.0" x 10.0") (w/ BAS OOBE)	
Volume	36.8 L	
Weight	38.3 kg(84.4 lb) w/o solar shield(finger guard) & mount bracket 44.2 kg (97.5 lb) with solar shield(finger guard) & mount bracket	
Operating Temperature	-40℃ (-40°F) ~ 55℃ (131°F) (Without solar load)	
Cooling	Natural convection	
Unwanted Emission	3GPP 36.104 Category A	3GPP 36.104 Category A,
	[B2] : FCC 47 CFR 24.238	[B66] : FCC 47 CFR 27.53 h)
CPRI Cascade	Not supported	
Optic Interface	20km, 2 ports (9.8Gbps x 2), SFP, single mode, Duplex	
RET & TMA Interface	AISG 2.2	
Bias-T	4 ports (2 ports per band) (Max. 49W)	
Mounting Options	Pole, wall, tower, side by side, back to back	
NB-IoT	Support	
PIM Cancellation	Support	
# of antenna port	4	4
External Alarm	4	

700+850MHz Dual Band RRH(Model : RFV01U-D2A)



Item	Specification	
Band	Band13 (700MHz)	Band5 (850MHz)
Frequency	DL : 746~756MHz	DL : 869~894MHz
	UL : 777~787MHz	UL : 824~849MHz
IBW	10MHz	25MHz
OBW	10MHz	25MHz
Carrier Bandwidth	10MHz	5MHz, 10MHz
# of carriers	1 carrier	3C
Total # of carriers	4C	
RF Chain	4T4R, 2T4R, 2T2R (SW configurable)	
RF Output Power	Total : 320W	
	4 x 40W or 2 x 60W	4 x 40W or 2 x 60W
Spectrum Analyzer	TX/RX Support	
Noise Figure	Less than 3.0 dB	
RX Sensitivity	Typical : -105dBm @1Rx (25RBs 5MHz)	
Modulation	256QAM support	
Input Power	-48VDC (-38VDC to -57VDC)	
Power Consumption	About 1,106Watt @ 100% RF load, typical conditions + TMA/RET	
Size (WHD)	380 x 380 x 207 mm (15.0" x 15.0" x 8.1")	
Volume	29.9 L	
Weight	31.9 kg(70.3 lb) w/o solar shield(finger guard) & mount bracket 37.2 kg(82.0 lb) with solar shield(finger guard) & mount bracket	
Operating Temperature	-40℃ (-40℉) ~ 55℃ (131℉) (Without solar load)	
Cooling	Natural convection	
Unwanted Emission	3GPP 36.104 Category A,	3GPP 36.104 Category A
	FCC 47 CFR 27.53 c), f)	FCC 47 CFR 22.917
CPRI Cascade	Not supported	
Optic Interface	20km, 2 ports (9.8Gbps x 2), SFP, single mode, Duplex	
RET & TMA Interface	AISG 2.2	
Bias-T	2 ports (Max. 49W)	
Mounting Options	Pole, wall, tower, side by side, back to back	
NB-IoT	Support	
PIM Cancellation	Support	
# of antenna port	4	
External Alarm	4	

Product Data Sheet DB-C1-12C-24AB-0Z

Tower Top and Base Power Protection/Fiber Connection System for HYBRIFLEX® Cable

Product Description

RFS' flexible Tower, Base Stations and Rooftop protection and Distribution products provide protection for up to 12 Remote Radio Heads/Integrated Antennas. The solutions mitigate the risk of damage due to lightning and provide high levels of availability and reliability to radio equipment.

Mounting Bracket Included

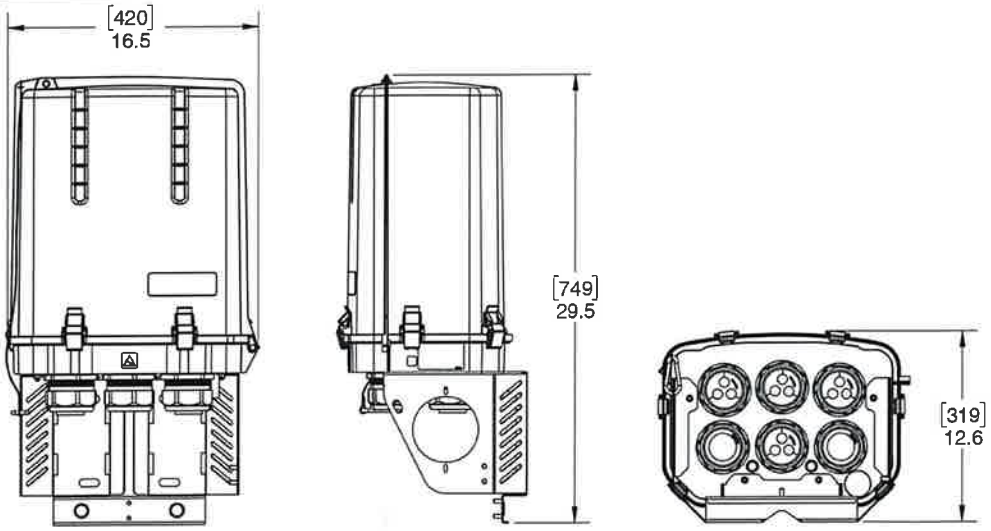
Features

- Designed for distribution to 12 RRH circuits, DC power and fiber optics.
- Alarms for moisture detection and intrusion
- Digital Voltmeter with twelve (12) position switch to monitor each DC circuit
- Power alarms for wiring anomalies and power disruptions
- Employs the Strikesorb® 30-V1-2CHV Surge Protective Device (SPD) specifically designed for the Remote Radio Head (RRH) installation environment and certified for use in DC applications and at low DC operating voltages (48V)
- The Strikesorb 30-V1-2CHV is a Class I SPD certified by VDE per the IEC 61643-11standard as suitable for installation in areas where direct lightning exposure is expected. Strikesorb 30-V1-2CHV is able to withstand direct lightning currents of up to 5kA (10/350) and induced surge currents of up to 60kA (8/20)
- Provides very low let through / clamping voltage – unique for a Class I product – as it does not employ spark gaps or other switching elements. Strikesorb offers unique protection levels to the RRH equipment as well as the Base Band Units
- RS485 communication link uses two (2) twisted pair (+ground) wires per hybrid cable, and communicates all voltage, boost system and alarm data
- Patent pending design

Benefits

- Distributes DC up to 12 Remote Radio Heads and connects up to 24 LC fiber pairs
- Utilizes an IP 67 rated enclosure, also rated to NEBS and UL, allowing for indoor or outdoor installation on a roof or tower top
- Six total cable ports for cable access with custom configurable UL rated glands that accommodate varying diameters of hybrid (combined power and fiber optic) or standard cables with diameters up to 2" (will fit most standard 15/8" coax class cables), depending upon port configuration
- Lightweight aerodynamic design provides maximum flexibility for tower top installation

Product Diagram



* This data is provisional and subject to change.

Product Data Sheet DB-C1-12C-24AB-0Z

Tower Top and Base Power Protection/Fiber Connection System for HYBRIFLEX® Cable

Technical Specifications

Electrical Specifications

Nominal Operating Voltage	48 VDC
Nominal Discharge Current [I_n]	20 kA 8/20 µs
Maximum Surge Current [I_{max}]	60 kA 8/20 µs
Maximum Impulse (Lightning) Current per IEC 61643-11	5 kA 10/350 µs
Maximum Continuous Operating Voltage [Uc]	75 VDC
Voltage Protection Rating (VPR) per UL 1449 4th Edition	400V
Protection Class as per IEC 61643-11	Class I
Power Alarm	Cross polarity, short circuit, or power outage
Intrusion Sensor	Microswitch
Moisture Sensor	infrared moisture detector
Strikesorb Module Type	30-V1-2CHV Strikesorb modules installed to protect 12 Remote Radio Heads
Power Boost Ready	RS485 twisted pair connection available

Mechanical Specifications

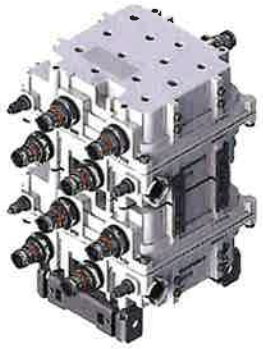
Suppression Connection Method	Compression lug, #14 - #2 AWG (2 mm2 - 33 mm2)
Fiber Connection Method	LC-LC Single mode
Pressure Equalizing Vent	Gore™ Vent
Environmental Rating	IP 67
Operating Temperature	-40° C to +80° C
UV Resistant	Yes
Dimensions (L x W x H)	12.6" x 16.5" x 29.5" [319mm x 420mm 749mm]
Weight System:	32 lbs (14.51 kg)
Combined Wind Loading	150mph (sustained): 185 lbs (823 N)

Standards Compliance

Strikesorb modules are compliant to the following Surge Protective Device (SPD) Standards:	UL 1449 4th Edition, IEC 61643-11:2011, EN 61643-11:2012, IEEE C62.11, IEEE C62.41.2, IEEE C62.45 NEBS certified to: GR-63-CORE Issue 4, GR-1089-CORE Issue 6, GR-3108-CORE Issue 3, GR-487-CORE Issue 4, GR-950-CORE Issue 1

* This data is provisional and subject to change.

CBC78T-DS-43-2X | E14F05P50



4 Pack Diplexer 700MHz/850MHz, DC sense, 4.3-10 Connectors

- BTS-to-feeder and feeder-to-antenna application
- New 4.3-10 connectors for improved PIM performance and size reduction
- Convertible mounting brackets

General Specifications

Product Family	CBC78
Modularity	4-Quad
Includes	Mounting hardware

Electrical Specifications

Sub-module	1 | 2 | 3 | 4	1 | 2 | 3 | 4	1 | 2 | 3 | 4
Branch	1	1	2
Port Designation		698-803	824-894
License Band	USA 700 USA 750	USA 700 USA 750	CEL 850

Electrical Specifications, Band Pass

Frequency Range	698–798 MHz	698–803 MHz	824–894 MHz
Insertion Loss, typical	0.20 dB	0.30 dB	0.20 dB
Total Group Delay, maximum		45 ns	35 ns
Return Loss, minimum		22 dB	22 dB
Return Loss, typical		24 dB	24 dB
Isolation, minimum	50 dB	35 dB	50 dB
Input Power, RMS, maximum		200 W	200 W
Input Power, PEP, maximum		2000 W	2000 W
3rd Order PIM, minimum		-161 dBc	-161 dBc
3rd Order PIM Test Method		2 x 20 W CW tones	2 x 20 W CW tones

Product Classification

Product Type	Diplexer

dc Power/Alarm Electrical Specifications

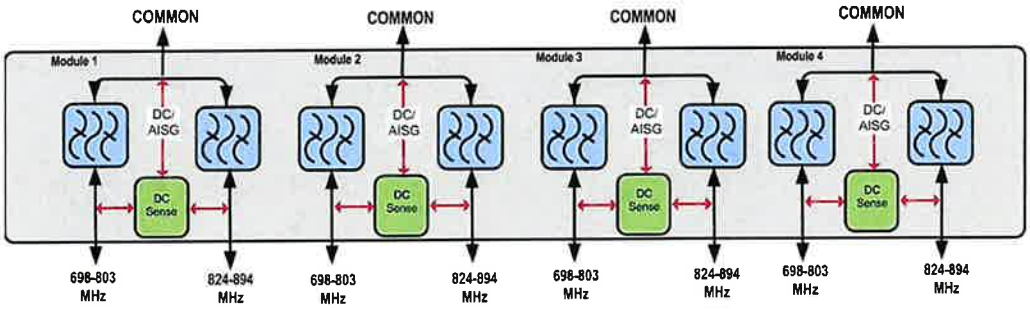
dc/AISG Pass-through Method	Auto sensing
dc/AISG Pass-through Path	See logic table
Lightning Surge Current	10 kA

Lightning Surge Current Waveform 8/20 waveform

Electrical Specifications

Impedance 50 ohm

Block Diagram



Logic Table

Combining Mode Operation (Ground Based)			
RF Ports Input Voltage			
700 MHz	**800 MHz**	**COMMON**	**DC/AISG Path Selection**
7 ≤ V ≤ 30	V<7	V<7	**700 MHz to COMMON "ON"** 800 MHz Port "OFF"
V<7	**7 ≤ V ≤ 30**	V<7	**800 MHz to COMMON "ON"** 700 MHz "OFF"
7 ≤ V ≤ 30	**7 ≤ V ≤ 30**	V<7	**700 MHz to COMMON "ON"** 800 MHz "OFF"
V<7	V<7	V<7	ALL ports OFF

Splitting Mode Operation (Tower Top)			
RF Ports Input Voltage			
700 MHz	**800 MHz**	**COMMON**	**DC/AISG Path Selection**
V<7	V<7	7 ≤ V ≤ 30	**700 MHz to COMMON "ON"** 800 MHz "OFF"

Mechanical Specifications

RF Connector Interface 4.3-10 Female

RF Connector Interface Body Style Long neck

Ground Screw Diameter 6.00 mm

CBC78T-DS-43-2X | E14F05P50

Color	Gray
Mount Type	Pole | Wall
Mounting Pipe Hardware	Band clamps (2)

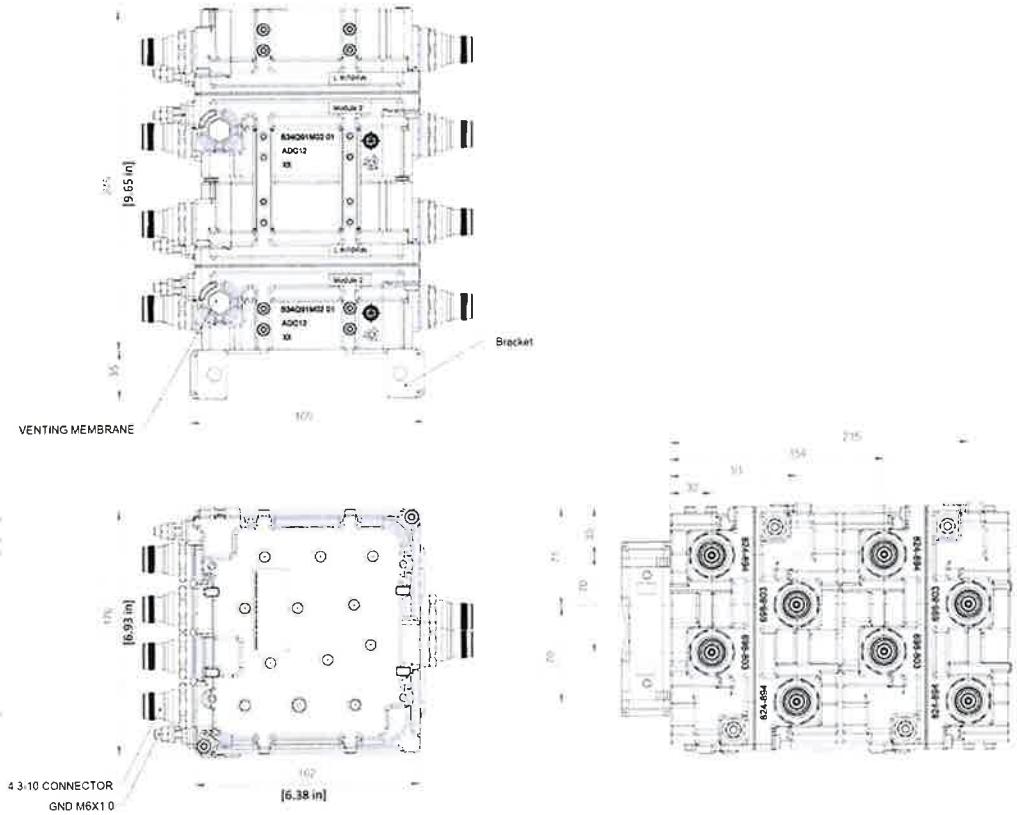
Dimensions

Height	162.0 mm | 6.4 in
Width	176.0 mm | 6.9 in
Depth	245.0 mm | 9.6 in
Weight, without mounting hardware	9.4 kg | 20.7 lb
Mounting Hardware Weight	0.5 kg | 1.1 lb

Environmental Specifications

Operating Temperature	-40 °C to +65 °C (-40 °F to +149 °F)
Relative Humidity	5%–100%
Ingress Protection Test Method	IEC 60529:2001, IP67
Corrosion Test Method	IEC 60068-2-11, 30 days

Outline Drawing



Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

On Air Engineering, LLC
88 Foundry Pond Road
Cold Spring, NY 10516
onair@optonline.net

October 30, 2019

Mr. Andrew Leone
Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

Re: Butternut CT - Structural Mount Opinion Letter – AWS-PCS-850-LTE Modification
CT State Police Tower; Butternut Hollow Rd., Greenwich, CT 06830

Dear Andrew:

This Structural Mount Opinion Letter serves as a follow-up to the "Antenna Mount Analysis" prepared by AECOM dated 6-27-19 for the above referenced Verizon Wireless antenna/equipment modification. Our office has also prepared construction drawings (CD's) dated 10-30-19 for this modification.

The AECOM Mount Analysis determined that Verizon's antenna frames would be stressed to 56.7% for their proposed antenna/equipment loading, provided the mounting frame stabilizer arms be adjusted and re-located (a minor modification). The AECOM analysis also includes a typical frame plan (attached) of the support masts, existing/proposed antennas and proposed RRH's. Further language on that page provides for the RF Engineer to "verify locations" prior to assembly.

To clarify the antenna/RRH locations on each frame, please see attached plan extracted from our CD's which shows the preferred RF Engineer frame layout, whereas the existing antennas (2 per frame) will remain at the end of each frame. The proposed antennas/RRH's can be located inward from these positions and the existing mast locations can remain. Our opinion is that the arrangement of the antennas/RRH's will have no effect on the AECOM structural frame analysis results.

Should you have any questions, please do not hesitate to contact our office.

Very truly yours,

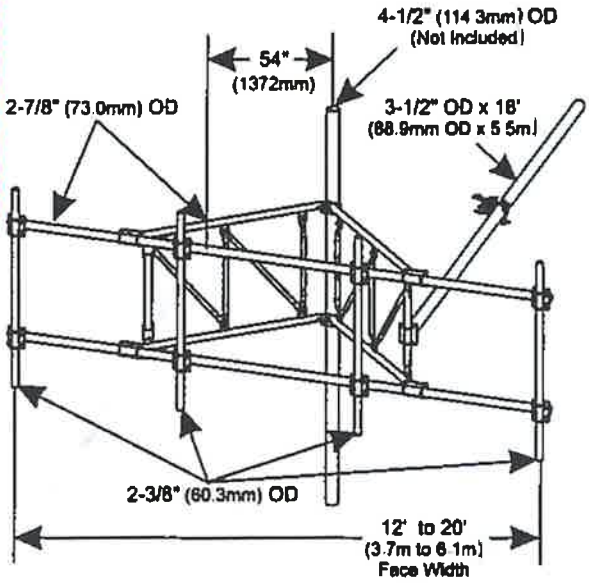
STATE OF CONNECTICUT DAVID A. WEINPAHL NO. 22144 PROFESSIONAL ENGINEER

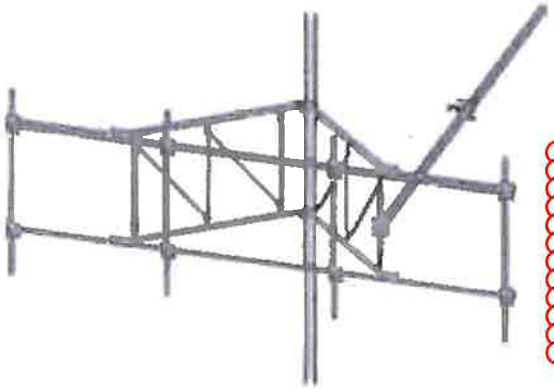
David A. Weinpahl, P.E.
CT License No. 22144
Managing Partner
On Air Engineering, LLC

DW:dw
enclosures

EXCEPT FROM AECOM MOUNT ANALYSIS

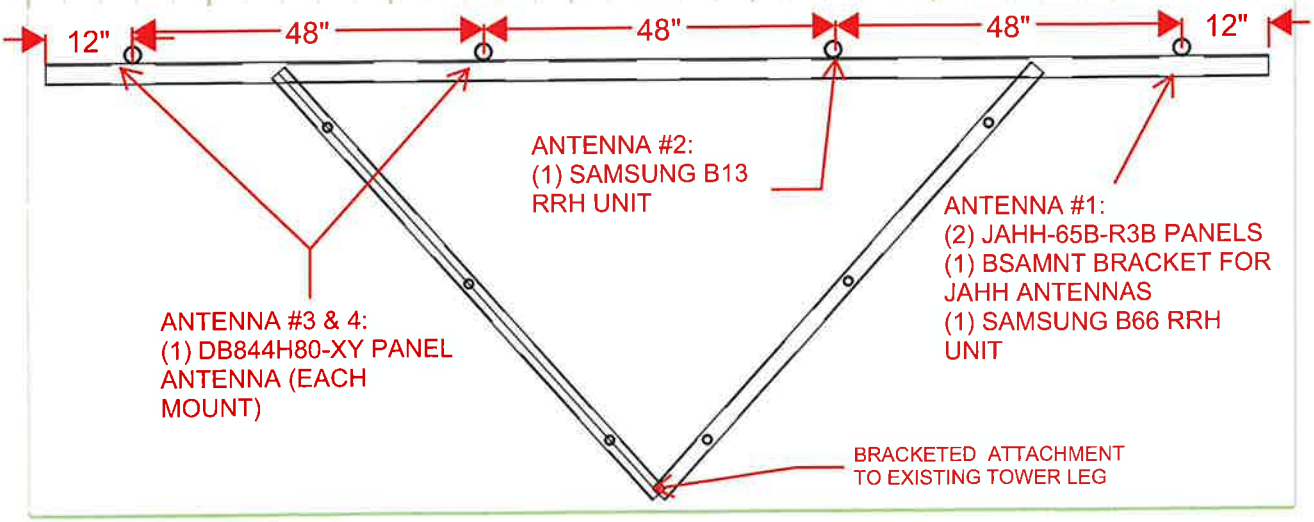
NOTE: ALL DIMENSIONS ARE FOR REFERECE AND SHALL BE VERIFIED BY THE RF ENGINEER PRIOR TO ANTENNA/EQUIPMENT INSTALLATION (IMAGE NOT TO SCALE)

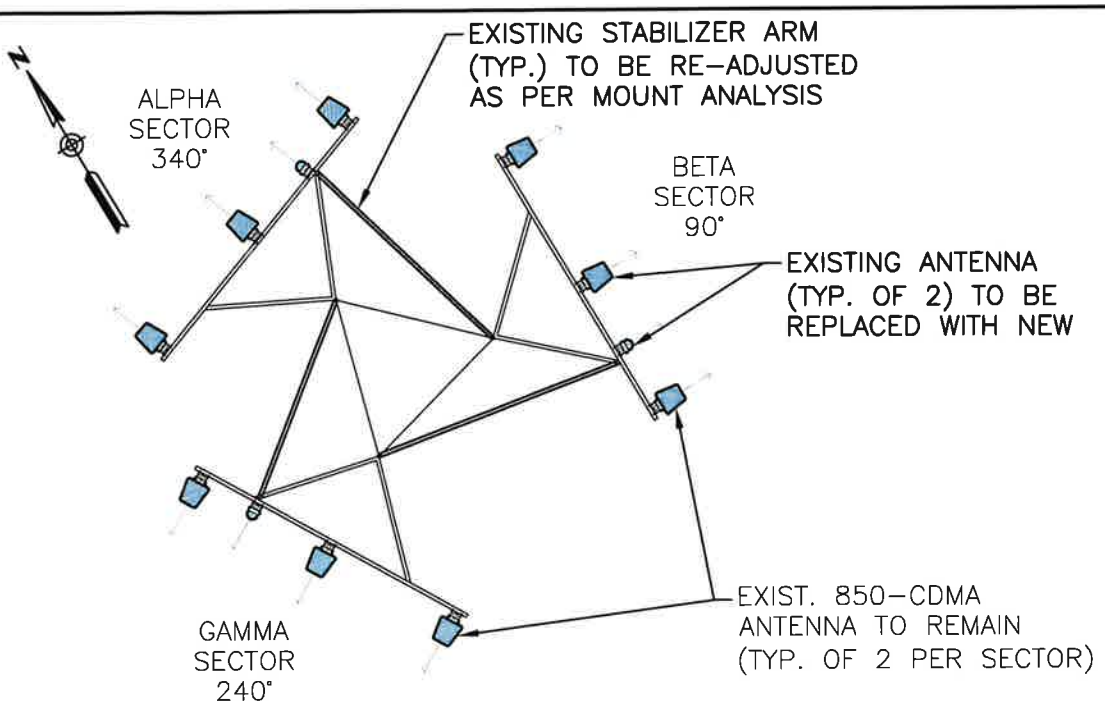




MTS WIRELESS COMPONENTS ANTENNA FRAME. DIMENSIONS SHOWN ARE ASSUMED AND ARE REQUIRED TO BE FIELD VERIFIED PRIOR TO ANTENNA MODIFICATIONS. ANALYSIS MODELED FROM PART # SF-SP16-4-126 (MTS WIRELESS COMPONENTS PRODUCT CATALOG 2003 (PAGE 2). ANTENNA INVENTORY ASSUMED FOR FINAL CONDITIONS. RF ENGINEER SHALL VERIFY LOCATIONS PRIOR TO ASSEMBLY.

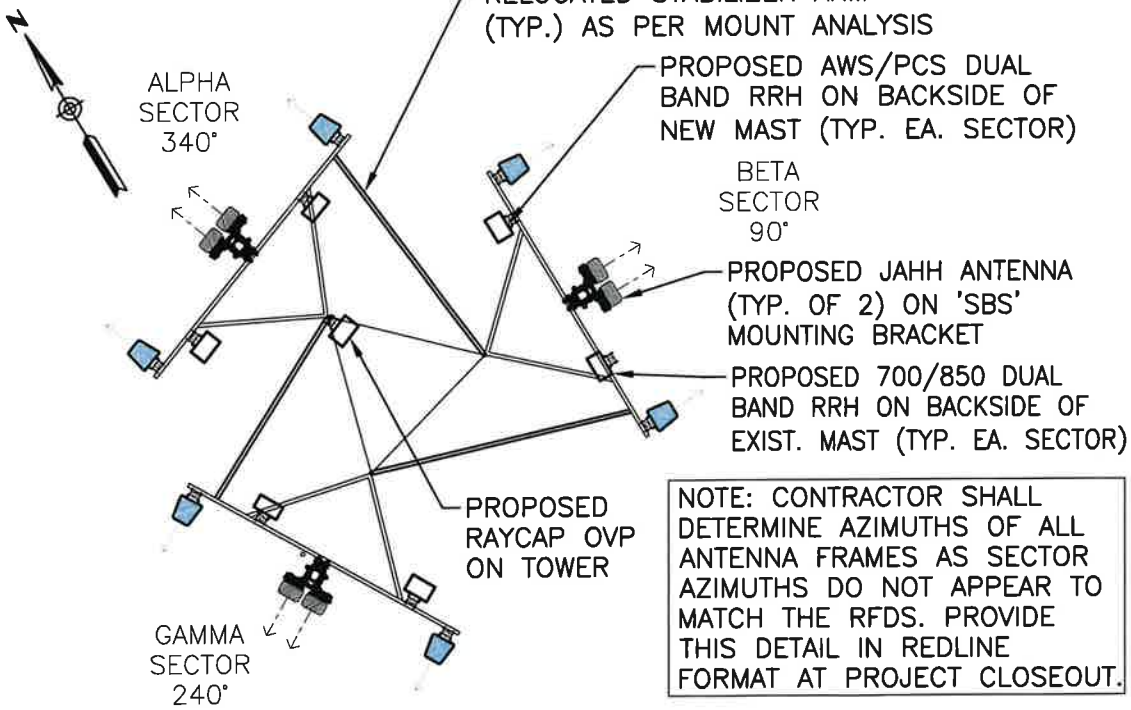
App.:	Lattice towers	**Mounts to:**	4-1/2" (114.3mm) OD
Size:	12' (3.7m) - 20' (6.1m) face	**Material:**	Hot dip galv. steel
		Incl.:	Frame, u-bolts, 1 stiff arm
Design:	Triangular w/ 54" (1372mm) standoff	**Order Sep.:**	Avail. with or without pipe mounts
Feature:	Robust standoff frame		





2 ANTENNA PLAN @ 130 FT. - EXISTING

SCALE: 1/8" = 1'-0"



NOTE: CONTRACTOR SHALL DETERMINE AZIMUTHS OF ALL ANTENNA FRAMES AS SECTOR AZIMUTHS DO NOT APPEAR TO MATCH THE RFDS. PROVIDE THIS DETAIL IN REDLINE FORMAT AT PROJECT CLOSEOUT.

3 ANTENNA PLAN @ 130 FT. - PROPOSED

SCALE: 1/8" = 1'-0"

verizon

WIRELESS COMMUNICATIONS FACILITY

20 ALEXANDER DRIVE
WALLINGFORD, CT 06492

On Air Engineering, LLC
88 Foundry Pond Road
Cold Spring, NY 10516
201-456-4624
onair@optonline.net

LICENSURE

STATE OF CONNECTICUT
DAVID A. WEINPAHL
NO. 22144
LICENSED PROFESSIONAL ENGINEER

DAVID WEINPAHL, P.E.
CT LIC NO. 22144

SUBMITTALS

NO	DATE	DESCRIPTION
0	10.30.19	REVIEW

DRAWN BY:	MF
CHECKED BY:	DW

PROJECT NAME:

ANTMO
AWS-PCS-850-LTE
DESIGN EXHIBITS

SITE NAME:

BUTTERNUT CT

SITE ADDRESS:

CT STATE POLICE TOWER
BUTTERNUT HOLLOW RD.
GREENWICH, CT 06830

SHEET TITLE:

ELEVATION &
ANTENNA PLANS

SHEET NUMBER:

A-2