Structural Engineering
2675 Pratum Avenue | Hoffman Estates, IL 60192
PH: (224) 293-6333 | www.wtengineering.com

SITE NO:	ML42100A
SITE NAME:	SCHRAGER
SITE ADDRESS:	2915 N SHERMAN BOULEVARD MILWAUKEE, WI 53210

W-T GROUP JOB NO: 1911530T

STRUCTURAL ANALYSIS

DATE: 07/09/2020

ROOFTOP CAPACITY LEVEL: **49.2% (PASS)**

The calculations included herein, as listed above, were prepared by me, or under my direct supervision, and to the best of my knowledge; comply with the requirements of all applicable codes and ordinances.

Jeff Gutowsky, P.E.
Wisconsin P.E. License No. 35009-006
Expires: 07-31-2020

INDEX OF CALCULATIONS

WT Group
Engineering • Design • Consulting

July 08, 2020

The W-T Group, LLC
Communications Division
2675 Pratum Avenue
Hoffman Estates, IL 60192

Attn: Sergio Contreras

Re: Subject: Structural Mount Analysis Letter
Site No: ML42100A
Site Name: Schrager
Address: 2915 N. Sherman Boulevard, Milwaukee, WI 53210
W-T Group Job No: 1911530T

Dear Sergio:

The Conclusions and recommendations made in this letter are based on the following assumptions:

- The structure(s) have been built in accordance with applicable building codes and have been properly maintained.
- The existing mount members and connection hardware are free of deficiencies and are capable of supporting the original equipment loads.
- The T-Mobile structure was constructed in accordance with industry standards and expected construction workmanship and that the construction followed the intent of the original design. Throughout the life of the project, no structural member was modified intentionally or not.
- Our scope is limited to verify the antenna mounts for the proposed new antennas and RRUs. This letter does not accept or imply any liability for the original design of the antenna support structure design and installation. The liability remains with the original Structural Engineer of record and the installation contractor.
- It is understood that the new equipment will be installed after the existing respective equipment is removed.

Applicable Codes and References:
Wisconsin Building Code (2015 International Building Code)
ASCE 7-10 Minimum Design Loads for Buildings and Other Structures
ANSI-TIA-222-G Standard
AISC Steel Construction Manual Fifteenth Edition

Structure Summary:
"The W-T Group, LLC (WTG)" has performed a structural analysis of the existing antenna mount frame for the proposed new and existing antennas. The existing and proposed antennas and RRUs are included in the loading table below. New T-Mobile antenna/RRU additions shall be mounted as specified in the construction documents issued by "W-T Communications Division"

dated 06/09/2020. The mount information was obtained from the previous construction drawings prepared by "Edge Consulting Engineers, Inc." dated 06/12/2012.

Proposed/Existing Loading:

Description	*Appointenance*	*Qty.*	*Weight (lbs)*	*Elevation (AGL)*
Proposed	**AAHF Massive MIMO w/ Integrated RRU(s) (25.63" x 19.72" x 10.32")**	**3**	**103.62**	**± 54'-0"**
	Commscope FFHH-65C-R3 (95.9" x 25.2" x 9.3")	**3**	**127.6**	**± 51'-0"**
	AHFIG (27.3" x 12.1" x 5.2")	**3**	**70.5**	
	AHLOA (22.05" x 12.13" x 7.44")	**3**	**83.77**	
Existing	COVP (20.38" x 16.08" x 5.83")	3	19.0	± 51'-0"

* Coax – (3) Hybrid Cable

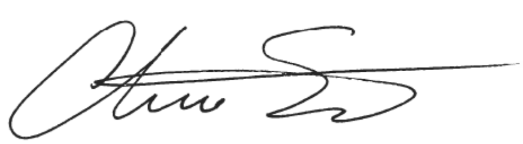
Overall Conclusion:

Based on our structural analysis performed by "The W-T Group, LLC", the existing antenna mounts are ***structurally adequate*** to support the proposed new and existing antenna and RRHs. General contractor to field verify the information called out on page 37 of this report prior to installation of the proposed antennas and equipment.

The engineering services are performed on the basis that the information used is current, complete and correct. The information may consist of, but not limited to information supplied by the client regarding the structure itself. It is the responsibility of the client to ensure that the information provided to “The W-T Group, LLC” is correct and complete. All services are performed, results obtained and recommendations made in accordance with the generally accepted engineering principles and practices.

We appreciate the opportunity to be of service on this project. Please do not hesitate to contact us with any questions or concerns.

Regards,
The W-T Group, LLC



CJ Starke, E.I.T.
Project Engineer, Structural Engineering

STRUCTURAL CALCULATIONS

OVERVIEW

Applicable Codes and References:

Wisconsin Building Code (2015 International Building Code)

ASCE 7-10 Minimum Design Loads for Buildings and Other Structures

AISC Steel Construction Manual Fifteenth Edition

ANSI/TIA-222-G Standard

Drawings provided by W-T Communications Division, LLC dated 06/09/2020

Load Combinations (ANSI/TIA-222-G)

- $1.2\ D + 1.0\ D_g + 1.6\ W_o$
- $0.9\ D + 1.0\ D_g + 1.6\ W_o$
- $1.2\ D + 1.0\ D_g + 1.0\ D_i + 1.0\ W_i + 1.0\ T_i$
- $1.2\ D + 1.0\ D_g + 1.0\ E$
- $0.9\ D + 1.0\ D_g + 1.0\ E$

Load Combinations (IBC 2015 LRFD):

- 1.4(D + F) (Eq. 16-1)
- $1.2(D + F) + 1.6(L + H) + 0.5(L_r$ or S or R) (Eq. 16-2)
- $1.2(D + F) + 1.6(L_r$ or S or R) + 1.6H + (f_1L or 0.5W) (Eq. 16-3)
- $1.2(D + F) + 1.0W + f_1L + 1.6H + 0.5(L_r$ or S or R) (Eq. 16-4)
- $1.2(D + F) + 1.0E + f_1L + 1.6H + f_2S$ (Eq. 16-5)
- 0.9D + 1.0W + 1.6H (Eq. 16-6)
- 0.9(D + F) + 1.0E + 1.6H (Eq. 16-7)

Load Combinations (IBC 2015 ASD):

- D + F (Eq. 16-8)
- D + H + F + L (Eq. 16-9)
- D + H + F + (L_r or S or R) (Eq. 16-10)
- D + H + F + 0.75(L) + 0.75(L_r or S or R) (Eq. 16-12)
- D + H + F + 0.75(0.6W) + 0.75L + 0.75(L_r or S or R) (Eq. 16-13)
- D + H + F + 0.75(0.7E) + 0.75L + 0.75S (Eq. 16-14)
- 0.6D + 0.6W + H (Eq. 16-15)
- 0.6(D + F) + 0.7E + H (Eq. 16-16)

Notations:

- D = Dead load of structure and appurtances, excluding guy assemblies
- D_g = Dead load of guy assemblies
- D_i = Weight of ice due to factored ice thickness
- E = Combined effect of horizontal and vertical earthquake induced forces.
- f_1 = 1 for floors in places of public assembly in excess of 100 pounds per square foot, and = 0.5 for other live loads.
- f_2 = 0.7 for roof configurations that do not shed snow off the structure, and = 0.2 for other roof configurations.
- F = Load due to fluids with well-defined pressures and maximum heights.
- H = Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.
- L = Floor live load.
- L_r = Roof live load.
- R = Rain load.
- S = Snow load.
- T = Self-straining load.
- T_i = Load effects due to temperature
- W = Load due to wind pressure.
- W_o = Wind load without ice

Material Specifications:

Bolts:

• Shear Bolts	ASTM A325	F_u = 120 ksi

Structural Steel:

• Angles	ASTM A36	F_y = 36 ksi
• Channels	ASTM A36	F_y = 36 ksi
• Plates	ASTM A36	F_y = 36 ksi
• Pipes	ASTM A53	F_y = 35 ksi
• Wide Flange	ASTM A992	F_y = 50 ksi
• HSS Tubes	ASTM A500	F_y = 46 ksi
• HSS Pipes	ASTM A500	F_y = 42 ksi

ANTENNA WIND LOADING (ASCE 7-10 & ANSI/TIA-222-G)

In accordance with ANSI / TIA-222-G Standard and ASCE 7-10

Antenna and mounting pipe data

Width of mounting pipe	W_{pipe} = **2.375** in
Height of mounting pipe	H_{pipe} = **8.0** ft
Width of AAHF	W_{ANT} = **19.72** in
Depth of AAHF	D_{ANT} = **10.32** in
Height of AAHF	H_{ANT} = **25.63** in
Height of Antenna above grade	z = **54.0** ft

General wind load requirements

Basic wind speed	V = **115** mph
Risk category / Structure class	II
Importance factor (Table 2-3)	I = **1.0**
Wind direction probability factor (Table 2-2)	K_d = **0.85**
Exposure category (cl.26.7.3)	C
Gust effect factor (Sect. 2.6.7)	G_h = **0.85**

Topography

Topography factor not signifcant (Sect. 2.6.6.4)	K_{zt} = **1.00**

Wind pressure

Nominal height of atmospheric boundary layer	z_g = **900** ft
3-second gust wind speed power law exponent	α = **9.5**
Terrain constant	K_e = **1.00**
Minimum value for K_z	K_{zmin} = max(2.01 × (z/z_g)^(2/α), 0.85) = **1.112**
Velocity pressure coefficient (Sect. 2.6.5.2)	K_z = min(K_{zmin}, 2.01) = **1.112**
Ratio of solid area to gross area	ε = **1.00**
Velocity pressure	q_h = 0.00256 × K_z × K_{zt} × K_d × V^2 × 1psf/mph^2 = **31.990** psf

Wind force coefficient of mounting pipe

Area of mounting pipe	$A_{f,pipe}$ = W_{pipe} × H_{pipe} = **1.583** ft^2
Aspect ratio of mounting pipe	AR_{pipe} = H_{pipe}/W_{pipe} = **40.421**
Velocity coefficient	C = (I × K_z × K_{zt})^(1/2) × V × W_{pipe} = **35.196**
Force coefficient for round members (Table 2-8)	$C_{a,pipe}$ = if(AR_{pipe} < 25, 0.8, 1.2) = **1.200**

Wind force coefficient of AAHF

Area of AAHF (x-axis)	$A_{f,ANTx}$ = W_{ANT} × H_{ANT} = **3.510** ft^2
Area of AAHF (z-axis)	$A_{f,ANTz}$ = D_{ANT} × H_{ANT} = **1.837** ft^2
Aspect ratio of AAHF (x-axis)	AR_{ANTx} = H_{ANT} / W_{ANT} = **1.300**
Aspect ratio of AAHF (z-axis)	AR_{ANTz} = H_{ANT} / D_{ANT} = **2.484**
Force coefficient for flat members (x-axis)	$C_{a,ANTx}$ = if(AR_{ANTx} < 25, 1.4, 2.0) = **1.400**
Force coefficient for flat members (z-axis)	$C_{a,ANTz}$ = if(AR_{ANTz} < 25, 1.4, 2.0) = **1.400**

Wind forces

Wind force on mounting pipe	$F_{A,pipe}$ = max(20 psf, q_h × G_h × $C_{a,pipe}$) × $A_{f,pipe}$ = **51.664** lbs
Distributed load on mounting pipe	w_{pipe} = $F_{A,pipe}$ / H_{pipe} = **6.458** plf

Wind force on AAHF (x-direction) $F_{A,ANT,x} = \max(20 \text{ psf}, q_h \times G_h \times C_{a,ANTx}) \times A_{f,ANTx} =$ **133.616** lbs

Wind force on AAHF (z-direction) $F_{A,ANT,z} = \max(20 \text{ psf}, q_h \times G_h \times C_{a,ANTz}) \times A_{f,ANTz} =$ **69.925** lbs

Dead load

Weight of AAHF $DL_{ANT} =$ **103.62** lbs

ANTENNA WIND LOADING (ASCE 7-10 & ANSI/TIA-222-G)

In accordance with ANSI / TIA-222-G Standard and ASCE 7-10

Antenna and mounting pipe data

Width of mounting pipe $W_{pipe} =$ **2.375** in

Height of mounting pipe $H_{pipe} =$ **8.0** ft

Width of AHFIG $W_{ANT1} =$ **12.1** in

Depth of AHFIG $D_{ANT1} =$ **5.2** in

Height of AHFIG $H_{ANT1} =$ **27.3** in

Width of FFHH $W_{ANT2} =$ **25.2** in

Depth of FFHH $D_{ANT2} =$ **9.3** in

Height of FFHH $H_{ANT2} =$ **95.9** in

Width of AHLOA $W_{ANT3} =$ **12.13** in

Depth of AHLOA $D_{ANT3} =$ **7.44** in

Height of AHLOA $H_{ANT3} =$ **22.05** in

Width of COVP $W_{ANT6} =$ **16.08** in

Depth of COVP $D_{ANT6} =$ **5.83** in

Height of COVP $H_{ANT6} =$ **20.38** in

Height of Antenna above grade $z =$ **51.0** ft

General wind load requirements

Basic wind speed $V =$ **115** mph

Risk category / Structure class II

Importance factor (Table 2-3) $I =$ **1.0**

Wind direction probability factor (Table 2-2) $K_d =$ **0.85**

Exposure category (cl.26.7.3) C

Gust effect factor (Sect. 2.6.7) $G_h =$ **0.85**

Topography

Topography factor not signifcant (Sect. 2.6.6.4) $K_{zt} =$ **1.00**

Wind pressure

Nominal height of atmospheric boundary layer $z_g =$ **900** ft

3-second gust wind speed power law exponent $\alpha =$ **9.5**

Terrain constant $K_e =$ **1.00**

Minimum value for K_z $K_{zmin} = \max(2.01 \times (z/z_g)^{\wedge}(2/\alpha), 0.85) =$ **1.098**

Velocity pressure coefficient (Sect. 2.6.5.2) $K_z = \min(K_{zmin}, 2.01) =$ **1.098**

Ratio of solid area to gross area $\varepsilon =$ **1.00**

Velocity pressure $q_h = 0.00256 \times K_z \times K_{zt} \times K_d \times V^2 \times 1\text{psf/mph}^2 =$ **31.608** psf

Wind force coefficient of mounting pipe

Area of mounting pipe $A_{f,pipe} = W_{pipe} \times H_{pipe} =$ **1.583** ft²

Aspect ratio of mounting pipe $AR_{pipe} = H_{pipe}/W_{pipe} =$ **40.421**

Velocity coefficient $C = (I \times K_z \times K_{zt})$^(1/2) $\times V \times W_{pipe} =$ **34.985**

Force coefficient for round members (Table 2-8) $C_{a,pipe} = \text{if}(AR_{pipe} < 25, 0.8, 1.2) =$ **1.200**

Wind force coefficient of AHFIG

Area of AHFIG (x-axis) $A_{f,ANT1x} = W_{ANT1} \times H_{ANT1} =$ **2.294** ft^2

Area of AHFIG (z-axis) $A_{f,ANT1z} = D_{ANT1} \times H_{ANT1} =$ **0.986** ft^2

Aspect ratio of AHFIG (x-axis) $AR_{ANT1x} = H_{ANT1} / W_{ANT1} =$ **2.256**

Aspect ratio of AHFIG (z-axis) $AR_{ANT1z} = H_{ANT1} / D_{ANT1} =$ **5.250**

Force coefficient for flat members (x-axis) $C_{a,ANT1x} = \text{if}(AR_{ANT1x} < 25, 1.4, 2.0) =$ **1.400**

Force coefficient for flat members (z-axis) $C_{a,ANT1z} = \text{if}(AR_{ANT1z} < 25, 1.4, 2.0) =$ **1.400**

Wind force coefficient of FFHH

Area of FFHH (x-axis) $A_{f,ANT2x} = W_{ANT2} \times H_{ANT2} =$ **16.782** ft^2

Area of FFHH (z-axis) $A_{f,ANT2z} = D_{ANT2} \times H_{ANT2} =$ **6.194** ft^2

Aspect ratio of FFHH (x-axis) $AR_{ANT2x} = H_{ANT2} / W_{ANT2} =$ **3.806**

Aspect ratio of FFHH (z-axis) $AR_{ANT2z} = H_{ANT2} / D_{ANT2} =$ **10.312**

Force coefficient for flat members (x-axis) $C_{a,ANT2x} = \text{if}(AR_{ANT2x} < 25, 1.4, 2.0) =$ **1.400**

Force coefficient for flat members (z-axis) $C_{a,ANT2z} = \text{if}(AR_{ANT2z} < 25, 1.4, 2.0) =$ **1.400**

Wind force coefficient of AHLOA

Area of AHLOA (x-axis) $A_{f,ANT3x} = W_{ANT3} \times H_{ANT3} =$ **1.857** ft^2

Area of AHLOA (z-axis) $A_{f,ANT3z} = D_{ANT3} \times H_{ANT3} =$ **1.139** ft^2

Aspect ratio of AHLOA (x-axis) $AR_{ANT3x} = H_{ANT3} / W_{ANT3} =$ **1.818**

Aspect ratio of AHLOA (z-axis) $AR_{ANT3z} = H_{ANT3} / D_{ANT3} =$ **2.964**

Force coefficient for flat members (x-axis) $C_{a,ANT3x} = \text{if}(AR_{ANT3x} < 25, 1.4, 2.0) =$ **1.400**

Force coefficient for flat members (z-axis) $C_{a,ANT3z} = \text{if}(AR_{ANT3z} < 25, 1.4, 2.0) =$ **1.400**

Wind force coefficient of COVP

Area of COVP (x-axis) $A_{f,ANT6x} = W_{ANT6} \times H_{ANT6} =$ **2.276** ft^2

Area of COVP (z-axis) $A_{f,ANT6z} = D_{ANT6} \times H_{ANT6} =$ **0.825** ft^2

Aspect ratio of COVP (x-axis) $AR_{ANT6x} = H_{ANT6} / W_{ANT6} =$ **1.267**

Aspect ratio of COVP (z-axis) $AR_{ANT6z} = H_{ANT6} / D_{ANT6} =$ **3.496**

Force coefficient for flat members (x-axis) $C_{a,ANT6x} = \text{if}(AR_{ANT6x} < 25, 1.4, 2.0) =$ **1.400**

Force coefficient for flat members (z-axis) $C_{a,ANT6z} = \text{if}(AR_{ANT6z} < 25, 1.4, 2.0) =$ **1.400**

Wind forces

Wind force on mounting pipe $F_{A,pipe} = \max(20\text{ psf}, q_h \times G_h \times C_{a,pipe}) \times A_{f,pipe} =$ **51.046** lbs

Distributed load on mounting pipe $w_{pipe} = F_{A,pipe} / H_{pipe} =$ **6.381** plf

Wind force on AHFIG (x-direction) $F_{A,ANT1,x} = \max(20\text{ psf}, q_h \times G_h \times C_{a,ANT1x}) \times A_{f,ANT1x} =$ **86.283** lbs

Wind force on AHFIG (z-direction) $F_{A,ANT1,z} = \max(20\text{ psf}, q_h \times G_h \times C_{a,ANT1z}) \times A_{f,ANT1z} =$ **37.080** lbs

Wind force on FFHH (x-direction) $F_{A,ANT2,x} = \max(20\text{ psf}, q_h \times G_h \times C_{a,ANT2x}) \times A_{f,ANT2x} =$ **631.243** lbs

Wind force on FFHH (z-direction) $F_{A,ANT2,z} = \max(20\text{ psf}, q_h \times G_h \times C_{a,ANT2z}) \times A_{f,ANT2z} =$ **232.959** lbs

Wind force on AHLOA (x-direction) $F_{A,ANT3,x} = \max(20\text{ psf}, q_h \times G_h \times C_{a,ANT3x}) \times A_{f,ANT3x} =$ **69.863** lbs

Wind force on AHLOA (z-direction) $F_{A,ANT3,z} = \max(20\text{ psf}, q_h \times G_h \times C_{a,ANT3z}) \times A_{f,ANT3z} =$ **42.851** lbs

Wind force on COVP (x-direction) $F_{A,ANT6,x} = \max(20\text{ psf}, q_h \times G_h \times C_{a,ANT6x}) \times A_{f,ANT6x} =$ **85.599** lbs

Wind force on COVP (z-direction) $F_{A,ANT6,z} = \max(20\text{ psf}, q_h \times G_h \times C_{a,ANT6z}) \times A_{f,ANT6z} =$ **31.035** lbs

Dead load

Weight of AHFIG DL_{ANT1} = **70.5** lbs

Weight of FFHH DL_{ANT2} = **127.6** lbs

Weight of AHLOA DL_{ANT3} = **83.77** lbs

Weight of COVP DL_{ANT6} = **19.0** lbs

ANTENNA WIND LOADING (ASCE 7-10 & ANSI/TIA-222-G) – WITH ICE

In accordance with ANSI / TIA-222-G Standard and ASCE 7-10

Ice Thickness t_i = **0.75** in

Risk category / Structure class II

Importance factor (Table 2-3) I = **1.0**

Wind direction probability factor (Table 2-2) K_d = **0.85**

Exposure category (cl.26.7.3) C

Topography

Topography factor not signifcant (Sect. 2.6.6.4) K_{zt} = **1.0**

Wind speed with Ice V = **40.0** mph

Height of Antenna above grade z = **54.0** ft

Height escalation factor for ice thickness $K_{iz} = \min((z/33)^{0.10}, 1.4)$ = **1.050**

Thickness of radial glaze ice (Sect. 2.6.10) $t_{iz} = t_i \times I \times K_{iz} \times K_{zt}^{0.35} \times 2$ = **1.576** in

Appurtenance	Without Ice				With Ice			
	Weight (lb)	Height (in)	Width (in)	Depth (in)	Weight (lb)	Height (in)	Width (in)	Depth (in)
AAHF	103.62	25.63	19.72	10.32	107.29	28.78	22.87	13.47
FFHH	127.6	95.9	25.2	9.3	407.23	99.05	28.35	12.45
AHFIG	70.5	27.3	12.1	5.2	137.68	30.45	15.25	8.35
AHLOA	83.77	22.05	12.13	7.44	94.60	25.20	15.28	10.59
COVP	19.0	20.38	16.08	5.83	71.03	23.53	19.23	8.98

ANTENNA WIND LOADING (ASCE 7-10 & ANSI/TIA-222-G)

In accordance with ANSI / TIA-222-G Standard and ASCE 7-10

Antenna and mounting pipe data

Width of mounting pipe	W_{pipe} = **2.375** in
Height of mounting pipe	H_{pipe} = **8.0** ft
Width of AAHF	W_{ANT} = **22.87** in
Depth of AAHF	D_{ANT} = **13.47** in
Height of AAHF	H_{ANT} = **28.78** in
Height of Antenna above grade	z = **54.0** ft

General wind load requirements

Basic wind speed	V = **40.0** mph
Risk category / Structure class	II
Importance factor (Table 2-3)	I = **1.0**
Wind direction probability factor (Table 2-2)	K_d = **0.85**
Exposure category (cl.26.7.3)	C
Gust effect factor (Sect. 2.6.7)	G_h = **0.85**

Topography

Topography factor not signifcant (Sect. 2.6.6.4)	K_{zt} = **1.00**

Wind pressure

Nominal height of atmospheric boundary layer	z_g = **900** ft
3-second gust wind speed power law exponent	α = **9.5**
Terrain constant	K_e = **1.00**
Minimum value for K_z	$K_{zmin} = \max(2.01 \times (z/z_g)^\wedge(2/\alpha), 0.85)$ = **1.112**
Velocity pressure coefficient (Sect. 2.6.5.2)	$K_z = \min(K_{zmin}, 2.01)$ = **1.112**
Ratio of solid area to gross area	ε = **1.00**
Velocity pressure	$q_h = 0.00256 \times K_z \times K_{zt} \times K_d \times V^2 \times 1psf/mph^2$ = **3.870** psf

Wind force coefficient of mounting pipe

Area of mounting pipe	$A_{f,pipe} = W_{pipe} \times H_{pipe}$ = **1.583** ft^2
Aspect ratio of mounting pipe	$AR_{pipe} = H_{pipe}/W_{pipe}$ = **40.421**
Velocity coefficient	$C = (I \times K_z \times K_{zt})^\wedge(1/2) \times V \times W_{pipe}$ = **12.242**
Force coefficient for round members (Table 2-8)	$C_{a,pipe} = if(AR_{pipe} < 25, 0.8, 1.2)$ = **1.200**

Wind force coefficient of AAHF

Area of AAHF (x-axis)	$A_{f,ANTx} = W_{ANT} \times H_{ANT}$ = **4.571** ft^2
Area of AAHF (z-axis)	$A_{f,ANTz} = D_{ANT} \times H_{ANT}$ = **2.692** ft^2
Aspect ratio of AAHF (x-axis)	$AR_{ANTx} = H_{ANT} / W_{ANT}$ = **1.258**
Aspect ratio of AAHF (z-axis)	$AR_{ANTz} = H_{ANT} / D_{ANT}$ = **2.137**
Force coefficient for flat members (x-axis)	$C_{a,ANTx} = if(AR_{ANTx} < 25, 1.4, 2.0)$ = **1.400**
Force coefficient for flat members (z-axis)	$C_{a,ANTz} = if(AR_{ANTz} < 25, 1.4, 2.0)$ = **1.400**

Wind forces

Wind force on mounting pipe	$F_{A,pipe} = \max(20\text{ psf}, q_h \times G_h \times C_{a,pipe}) \times A_{f,pipe}$ = **31.667** lbs
Distributed load on mounting pipe	$w_{pipe} = F_{A,pipe} / H_{pipe}$ = **3.958** plf

Wind force on AAHF (x-direction) $F_{A,ANT,x}$ = max(20 psf, $q_h \times G_h \times C_{a,ANTx}$) $\times A_{f,ANTx}$ = **91.416** lbs

Wind force on AAHF (z-direction) $F_{A,ANT,z}$ = max(20 psf, $q_h \times G_h \times C_{a,ANTz}$) $\times A_{f,ANTz}$ = **53.843** lbs

Dead load

Weight of AAHF DL_{ANT} = **107.29** lbs

ANTENNA WIND LOADING (ASCE 7-10 & ANSI/TIA-222-G)

In accordance with ANSI / TIA-222-G Standard and ASCE 7-10

Antenna and mounting pipe data

Width of mounting pipe	W_{pipe} = **2.375** in
Height of mounting pipe	H_{pipe} = **8.0** ft
Width of AHFIG	W_{ANT1} = **15.25** in
Depth of AHFIG	D_{ANT1} = **8.35** in
Height of AHFIG	H_{ANT1} = **30.45** in
Width of FFHH	W_{ANT2} = **28.35** in
Depth of FFHH	D_{ANT2} = **12.45** in
Height of FFHH	H_{ANT2} = **99.05** in
Width of AHLOA	W_{ANT3} = **15.28** in
Depth of AHLOA	D_{ANT3} = **10.59** in
Height of AHLOA	H_{ANT3} = **25.20** in
Width of COVP	W_{ANT6} = **16.08** in
Depth of COVP	D_{ANT6}= **5.83** in
Height of COVP	H_{ANT6} = **20.38** in
Height of Antenna above grade	z = **51.0** ft

General wind load requirements

Basic wind speed	V = **40.0** mph
Risk category / Structure class	II
Importance factor (Table 2-3)	I = **1.0**
Wind direction probability factor (Table 2-2)	K_d = **0.85**
Exposure category (cl.26.7.3)	C
Gust effect factor (Sect. 2.6.7)	G_h = **0.85**

Topography

Topography factor not signifcant (Sect. 2.6.6.4) K_{zt} = **1.00**

Wind pressure

Nominal height of atmospheric boundary layer	z_g = **900** ft
3-second gust wind speed power law exponent	α = **9.5**
Terrain constant	K_e = **1.00**
Minimum value for K_z	K_{zmin} = max(2.01 × (z/z_g)^(2/α), 0.85) = **1.098**
Velocity pressure coefficient (Sect. 2.6.5.2)	K_z = min(K_{zmin}, 2.01) = **1.098**
Ratio of solid area to gross area	ε = **1.00**
Velocity pressure	$q_h = 0.00256 \times K_z \times K_{zt} \times K_d \times V^2 \times 1 psf/mph^2$ = **3.824** psf

Wind force coefficient of mounting pipe

Area of mounting pipe $A_{f,pipe} = W_{pipe} \times H_{pipe}$ = **1.583** ft^2

Aspect ratio of mounting pipe $AR_{pipe} = H_{pipe}/W_{pipe} = \mathbf{40.421}$

Velocity coefficient $C = (I \times K_z \times K_{zt})^{(1/2)} \times V \times W_{pipe} = \mathbf{12.169}$

Force coefficient for round members (Table 2-8) $C_{a,pipe} = if(AR_{pipe} < 25, 0.8, 1.2) = \mathbf{1.200}$

Wind force coefficient of AHFIG

Area of AHFIG (x-axis) $A_{f,ANT1x} = W_{ANT1} \times H_{ANT1} = \mathbf{3.225}\ ft^2$

Area of AHFIG (z-axis) $A_{f,ANT1z} = D_{ANT1} \times H_{ANT1} = \mathbf{1.766}\ ft^2$

Aspect ratio of AHFIG (x-axis) $AR_{ANT1x} = H_{ANT1} / W_{ANT1} = \mathbf{1.997}$

Aspect ratio of AHFIG (z-axis) $AR_{ANT1z} = H_{ANT1} / D_{ANT1} = \mathbf{3.647}$

Force coefficient for flat members (x-axis) $C_{a,ANT1x} = if(AR_{ANT1x} < 25, 1.4, 2.0) = \mathbf{1.400}$

Force coefficient for flat members (z-axis) $C_{a,ANT1z} = if(AR_{ANT1z} < 25, 1.4, 2.0) = \mathbf{1.400}$

Wind force coefficient of FFHH

Area of FFHH (x-axis) $A_{f,ANT2x} = W_{ANT2} \times H_{ANT2} = \mathbf{19.500}\ ft^2$

Area of FFHH (z-axis) $A_{f,ANT2z} = D_{ANT2} \times H_{ANT2} = \mathbf{8.564}\ ft^2$

Aspect ratio of FFHH (x-axis) $AR_{ANT2x} = H_{ANT2} / W_{ANT2} = \mathbf{3.494}$

Aspect ratio of FFHH (z-axis) $AR_{ANT2z} = H_{ANT2} / D_{ANT2} = \mathbf{7.956}$

Force coefficient for flat members (x-axis) $C_{a,ANT2x} = if(AR_{ANT2x} < 25, 1.4, 2.0) = \mathbf{1.400}$

Force coefficient for flat members (z-axis) $C_{a,ANT2z} = if(AR_{ANT2z} < 25, 1.4, 2.0) = \mathbf{1.400}$

Wind force coefficient of AHLOA

Area of AHLOA (x-axis) $A_{f,ANT3x} = W_{ANT3} \times H_{ANT3} = \mathbf{2.674}\ ft^2$

Area of AHLOA (z-axis) $A_{f,ANT3z} = D_{ANT3} \times H_{ANT3} = \mathbf{1.853}\ ft^2$

Aspect ratio of AHLOA (x-axis) $AR_{ANT3x} = H_{ANT3} / W_{ANT3} = \mathbf{1.649}$

Aspect ratio of AHLOA (z-axis) $AR_{ANT3z} = H_{ANT3} / D_{ANT3} = \mathbf{2.380}$

Force coefficient for flat members (x-axis) $C_{a,ANT3x} = if(AR_{ANT3x} < 25, 1.4, 2.0) = \mathbf{1.400}$

Force coefficient for flat members (z-axis) $C_{a,ANT3z} = if(AR_{ANT3z} < 25, 1.4, 2.0) = \mathbf{1.400}$

Wind force coefficient of COVP

Area of COVP (x-axis) $A_{f,ANT6x} = W_{ANT6} \times H_{ANT6} = \mathbf{2.276}\ ft^2$

Area of COVP (z-axis) $A_{f,ANT6z} = D_{ANT6} \times H_{ANT6} = \mathbf{0.825}\ ft^2$

Aspect ratio of COVP (x-axis) $AR_{ANT6x} = H_{ANT6} / W_{ANT6} = \mathbf{1.267}$

Aspect ratio of COVP (z-axis) $AR_{ANT6z} = H_{ANT6} / D_{ANT6} = \mathbf{3.496}$

Force coefficient for flat members (x-axis) $C_{a,ANT6x} = if(AR_{ANT6x} < 25, 1.4, 2.0) = \mathbf{1.400}$

Force coefficient for flat members (z-axis) $C_{a,ANT6z} = if(AR_{ANT6z} < 25, 1.4, 2.0) = \mathbf{1.400}$

Wind forces

Wind force on mounting pipe $F_{A,pipe} = max(20\ psf, q_h \times G_h \times C_{a,pipe}) \times A_{f,pipe} = \mathbf{31.667}\ lbs$

Distributed load on mounting pipe $w_{pipe} = F_{A,pipe} / H_{pipe} = \mathbf{3.958}\ plf$

Wind force on AHFIG (x-direction) $F_{A,ANT1,x} = max(20\ psf, q_h \times G_h \times C_{a,ANT1x}) \times A_{f,ANT1x} = \mathbf{64.495}\ lbs$

Wind force on AHFIG (z-direction) $F_{A,ANT1,z} = max(20\ psf, q_h \times G_h \times C_{a,ANT1z}) \times A_{f,ANT1z} = \mathbf{35.314}\ lbs$

Wind force on FFHH (x-direction) $F_{A,ANT2,x} = max(20\ psf, q_h \times G_h \times C_{a,ANT2x}) \times A_{f,ANT2x} = \mathbf{390.009}\ lbs$

Wind force on FFHH (z-direction) $F_{A,ANT2,z} = max(20\ psf, q_h \times G_h \times C_{a,ANT2z}) \times A_{f,ANT2z} = \mathbf{171.274}\ lbs$

Wind force on AHLOA (x-direction) $F_{A,ANT3,x} = max(20\ psf, q_h \times G_h \times C_{a,ANT3x}) \times A_{f,ANT3x} = \mathbf{53.480}\ lbs$

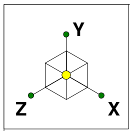
Wind force on AHLOA (z-direction) $F_{A,ANT3,z} = max(20\ psf, q_h \times G_h \times C_{a,ANT3z}) \times A_{f,ANT3z} = \mathbf{37.065}\ lbs$

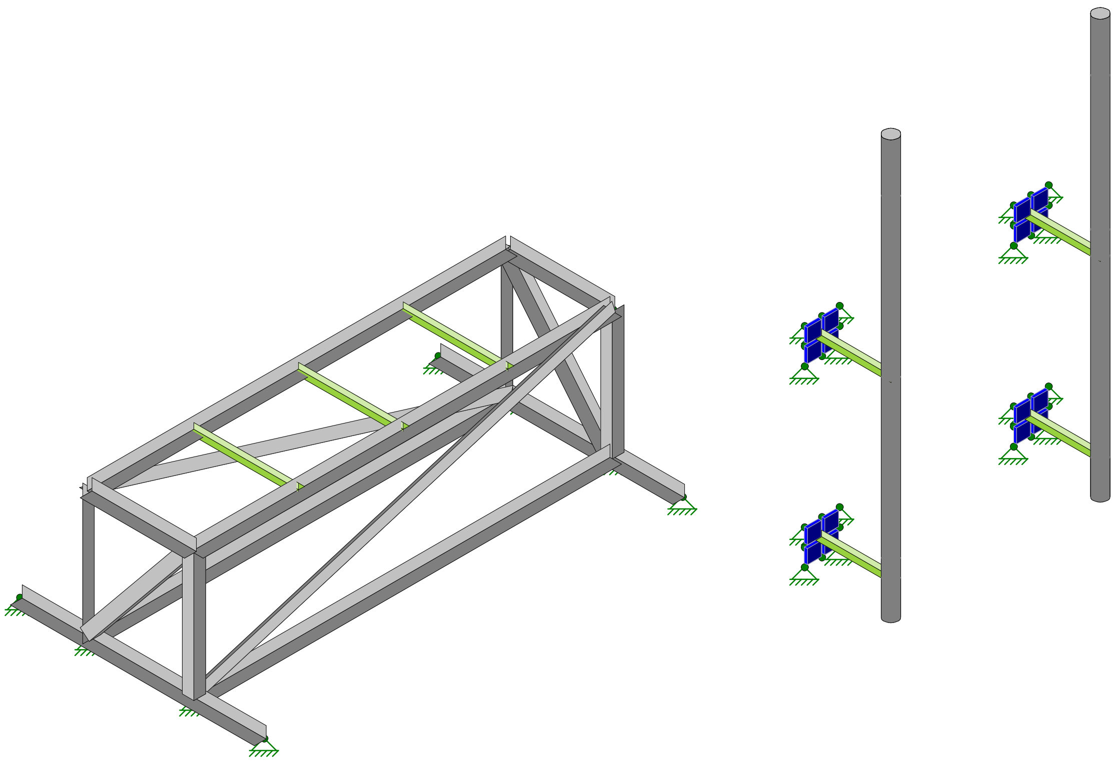
Wind force on COVP (x-direction) $F_{A,ANT6,x} = max(20\ psf, q_h \times G_h \times C_{a,ANT6x}) \times A_{f,ANT6x} = \mathbf{45.515}\ lbs$

Wind force on COVP (z-direction) $F_{A,ANT6,z} = max(20\ psf, q_h \times G_h \times C_{a,ANT6z}) \times A_{f,ANT6z} = \mathbf{16.502}\ lbs$

Dead load

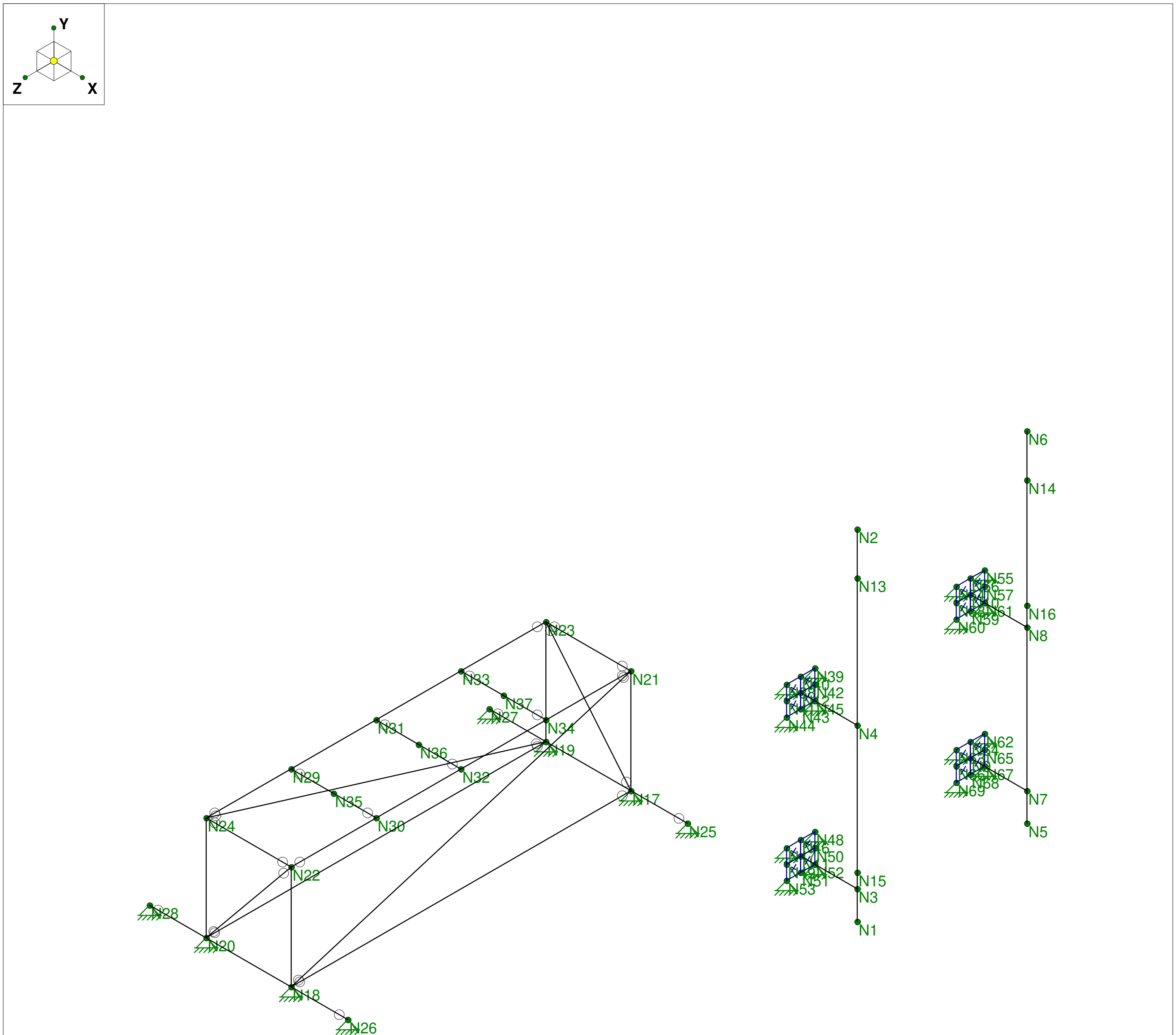
Weight of AHFIG	DL_{ANT1} = **137.68** lbs
Weight of FFHH	DL_{ANT2} = **407.23** lbs
Weight of AHLOA	DL_{ANT3} = **94.60** lbs
Weight of COVP	DL_{ANT6} = **71.03** lbs





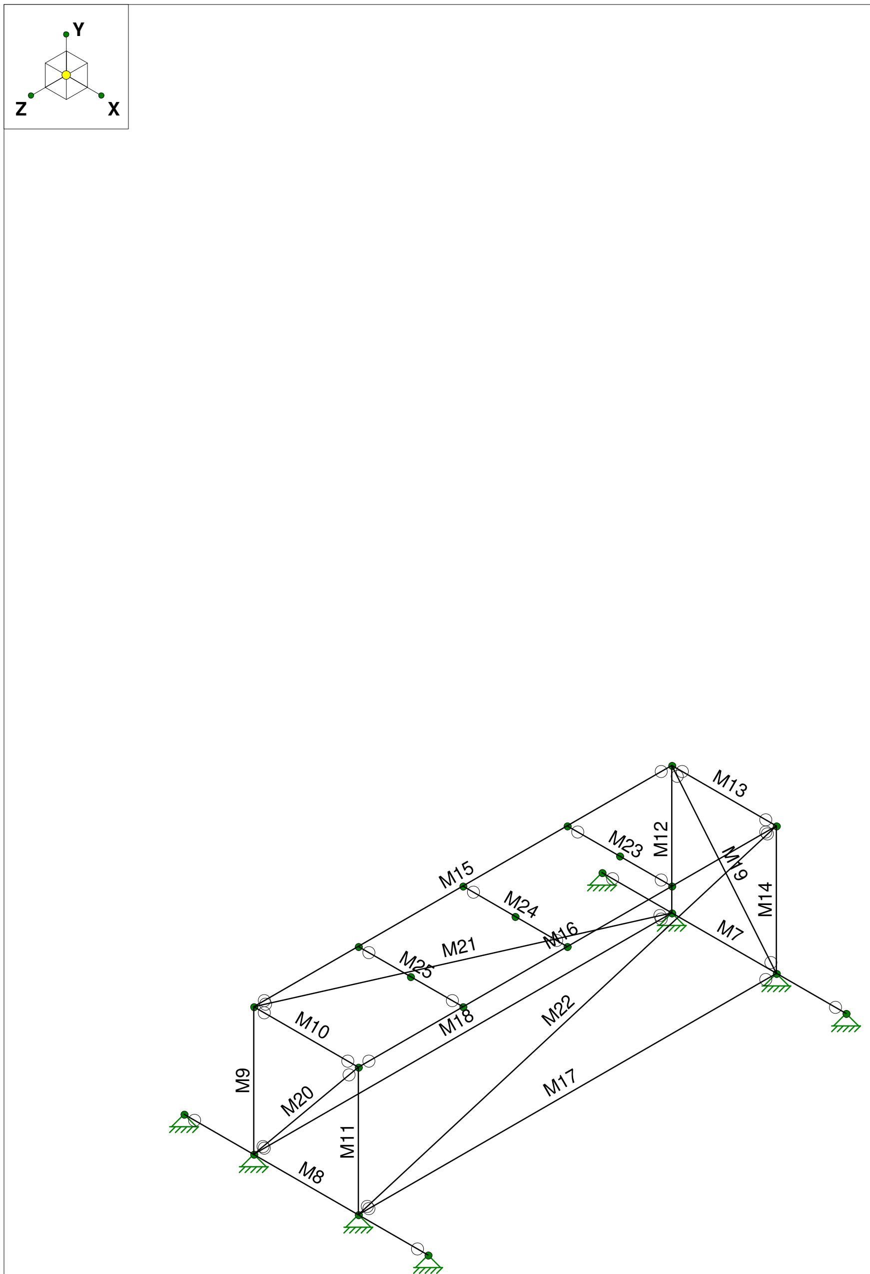
Envelope Only Solution

The W-T Group, LLC		Page - 17
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:08 AM
1911530T	3D MODEL	ML42100A_Antenna Mount.r3d



Envelope Only Solution

The W-T Group, LLC		Page - 18
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:09 AM
1911530T	NODE NUMBERS	ML42100A_Antenna Mount.r3d



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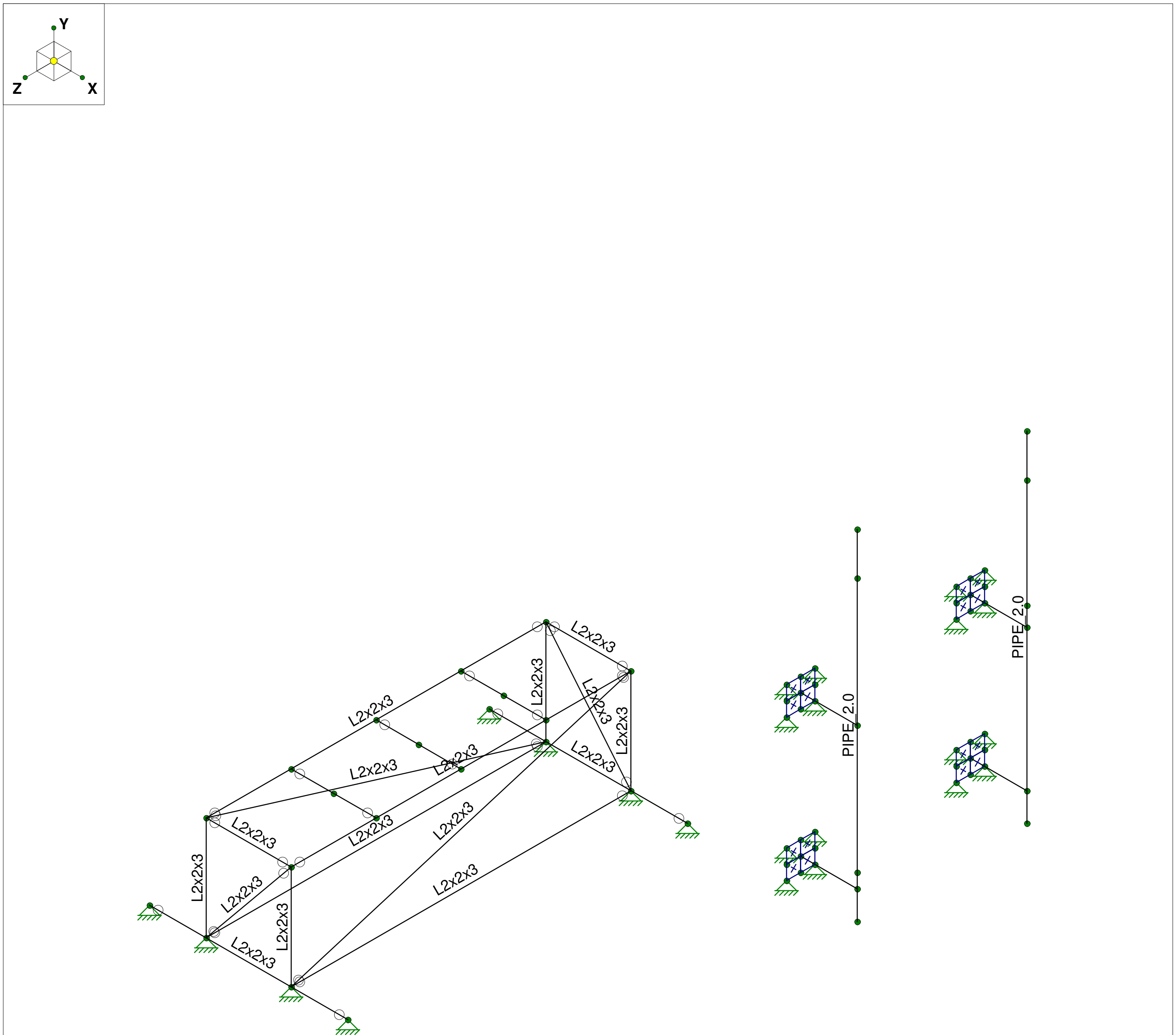
The W-T Group, LLC		Page - 19
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:10 AM
1911530T	MEMBER LABELS	ML42100A_Antenna Mount.r3d



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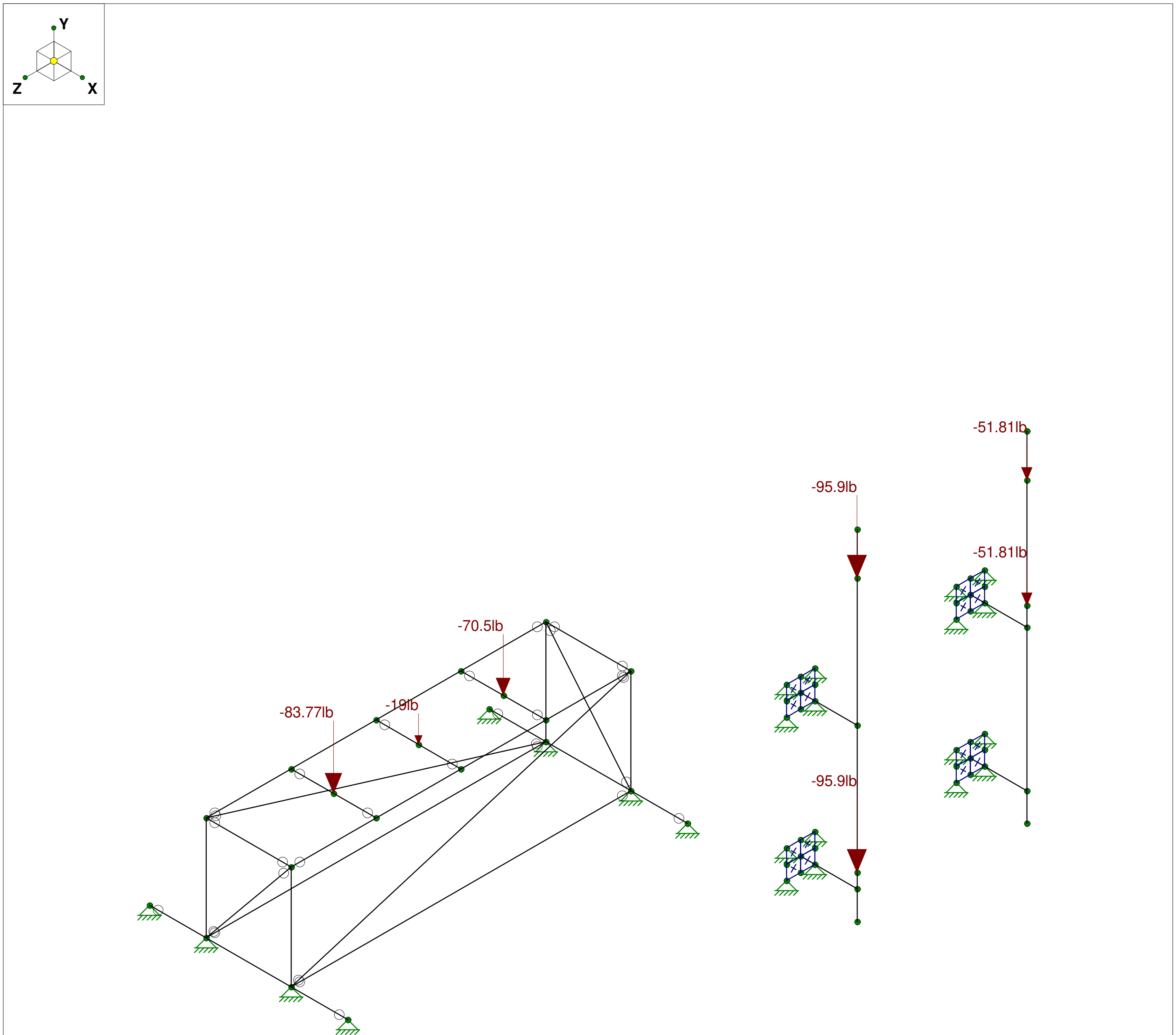
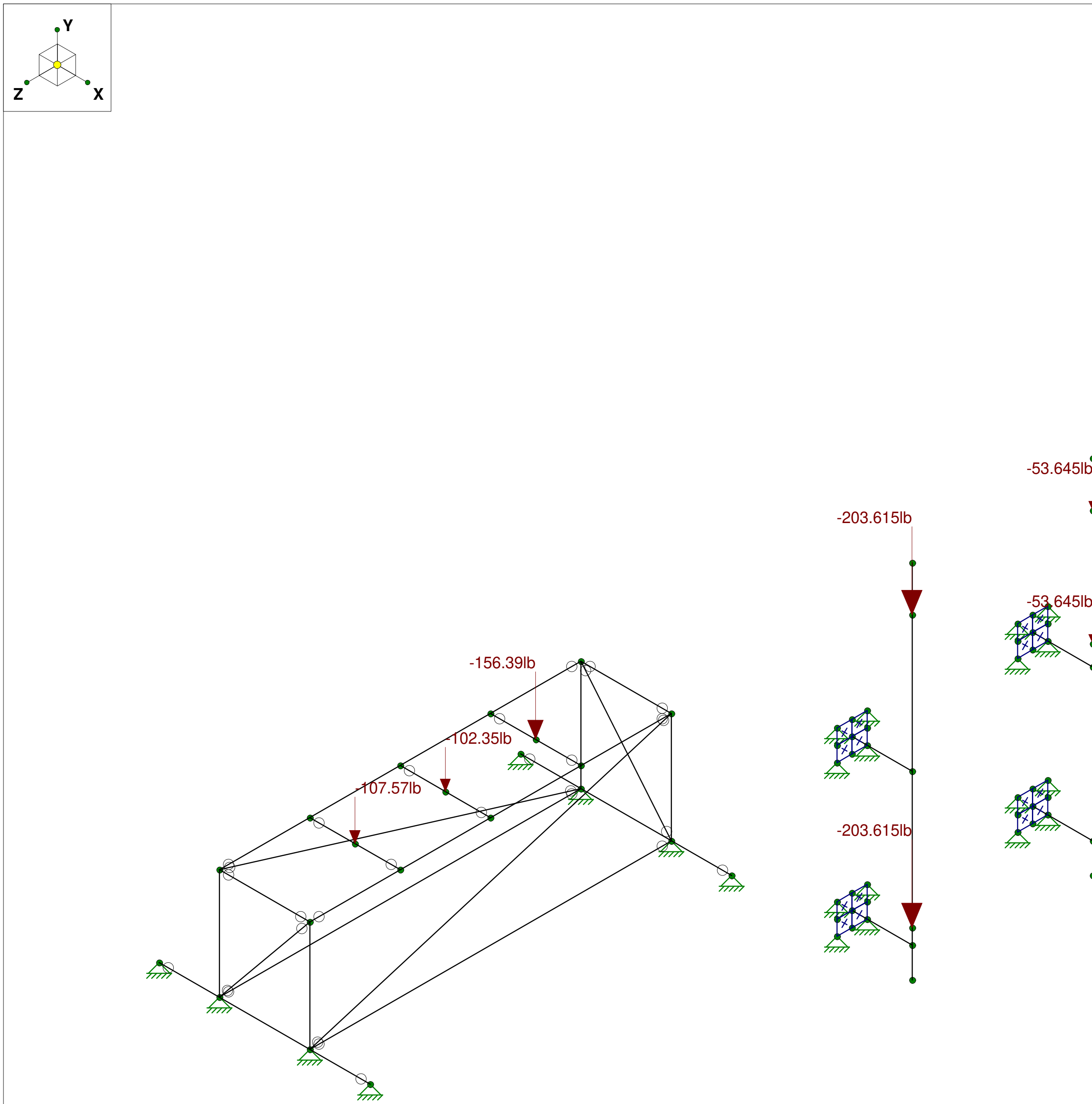
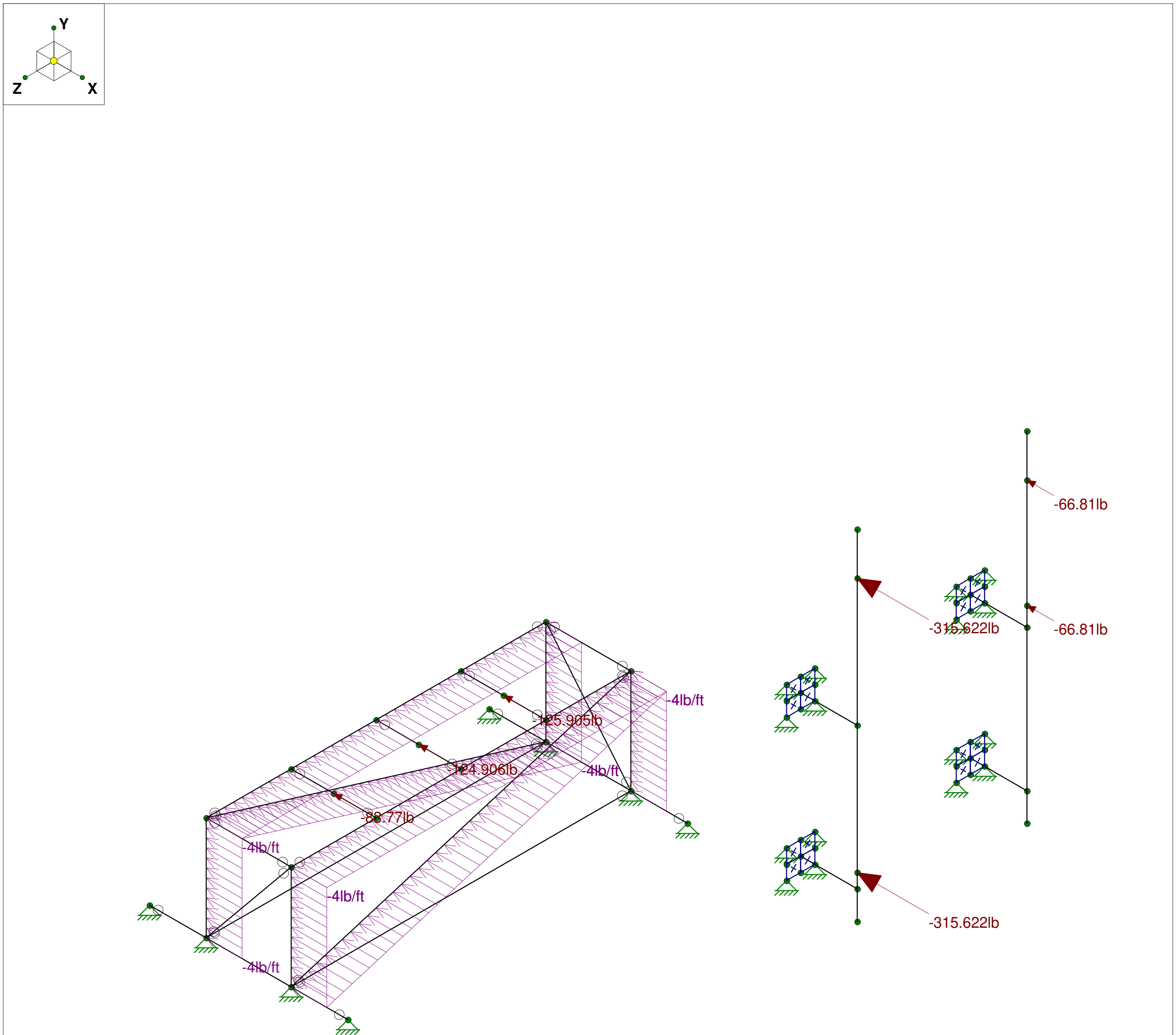
The W-T Group, LLC		Page - 20
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:10 AM
1911530T	MEMBER SHAPES	ML42100A_Antenna Mount.r3d



Loads: BLC 1, DL
Envelope Only Solution



Loads: BLC 4, DL ICE
Envelope Only Solution



Loads: BLC 2, WLX
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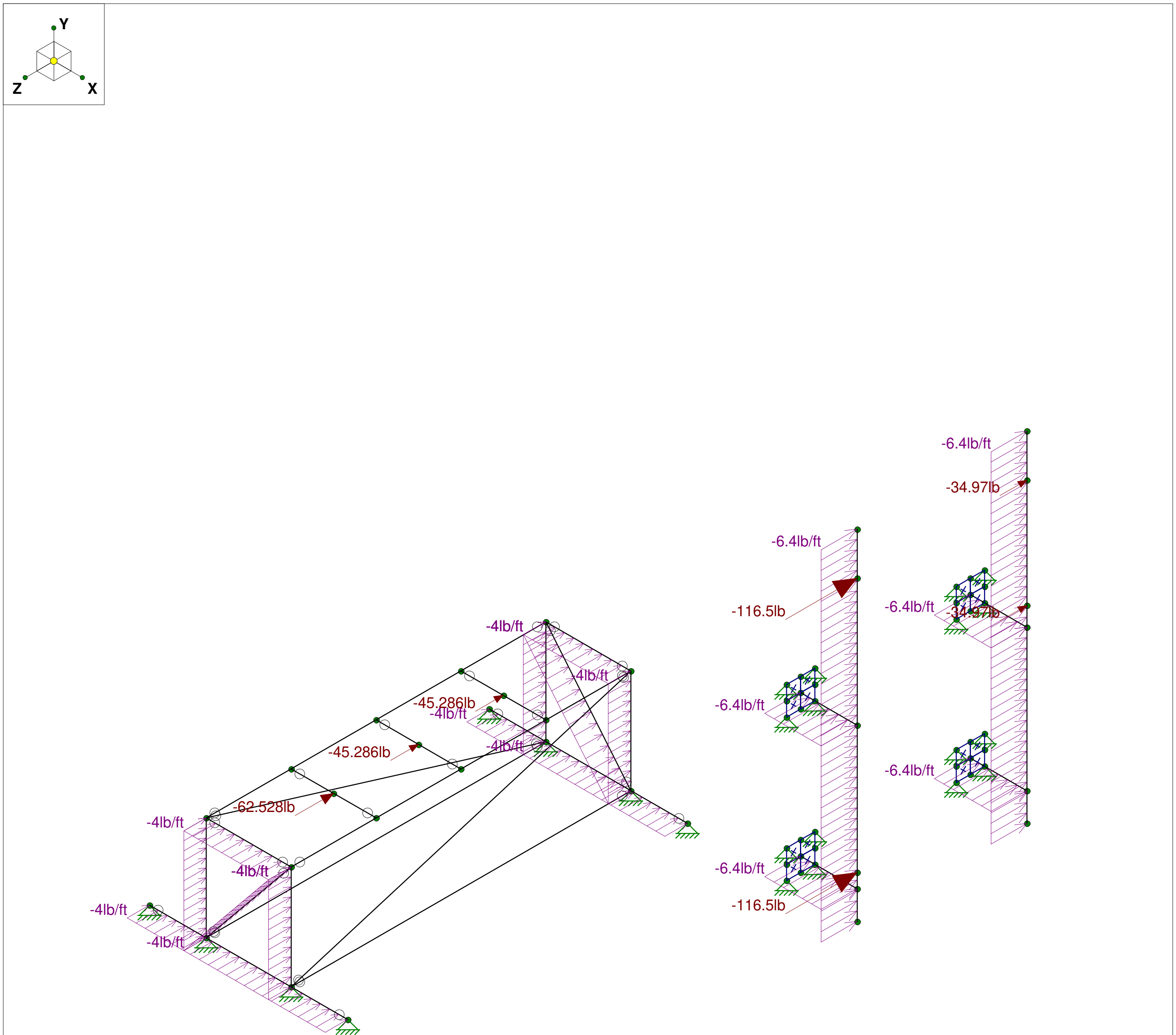
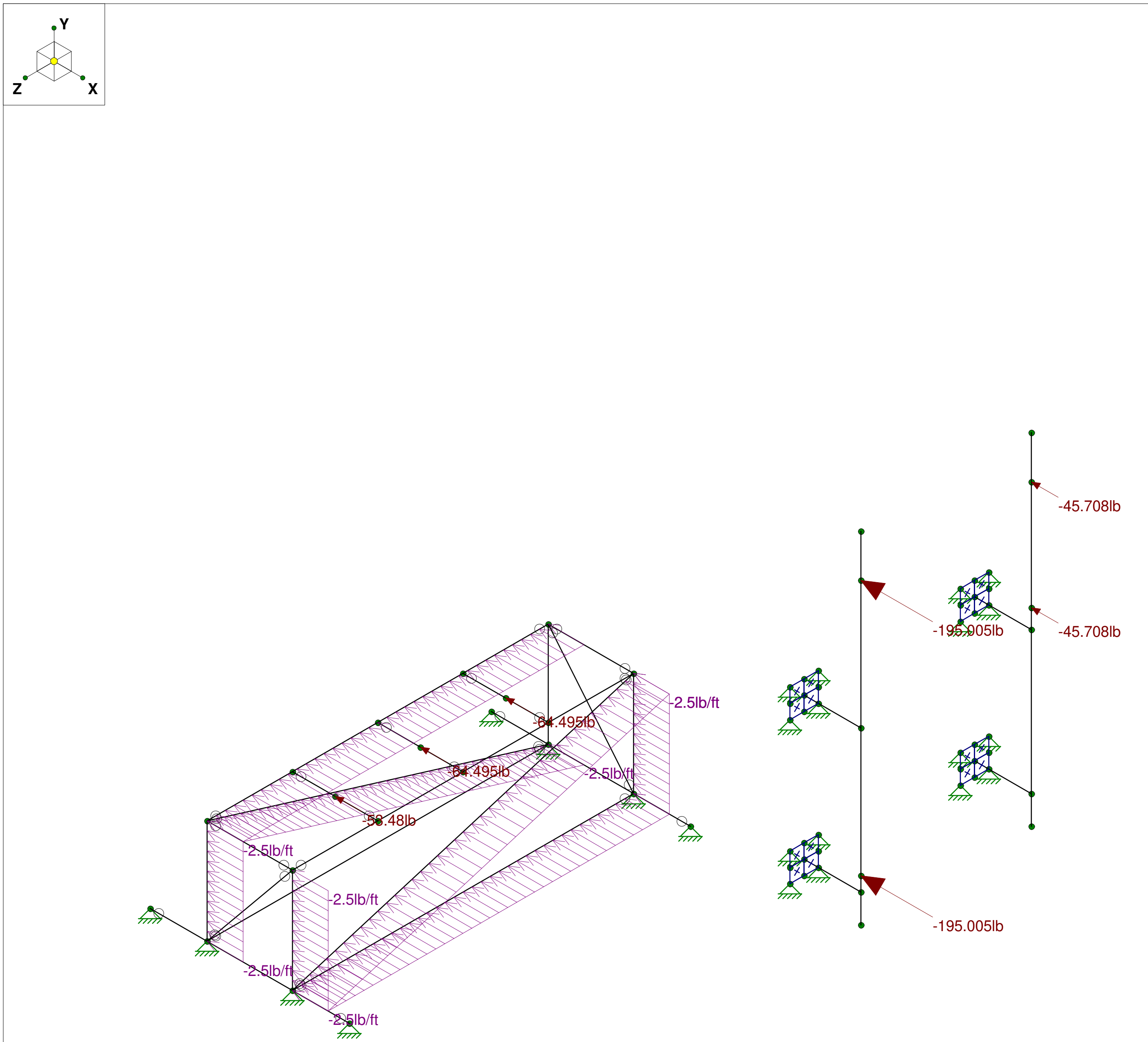
The W-T Group, LLC		Page - 23
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:12 AM
1911530T	WIND LOAD X-DIRECTION	ML42100A_Antenna Mount.r3d



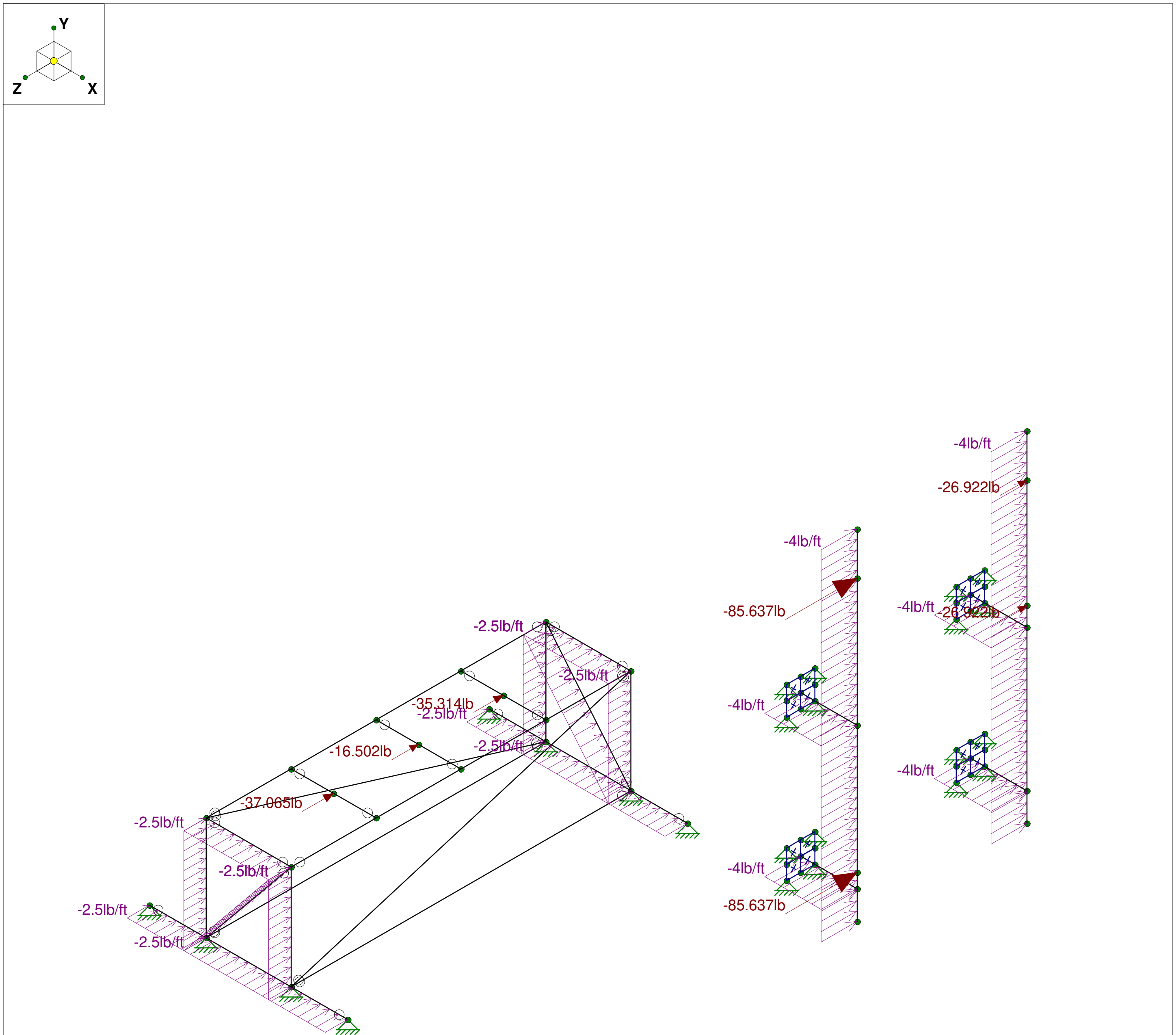
Loads: BLC 3, WLZ
Envelope Only Solution

The W-T Group, LLC		Page - 24
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:12 AM
1911530T	WIND LOAD Z-DIRECTION	ML42100A_Antenna Mount.r3d



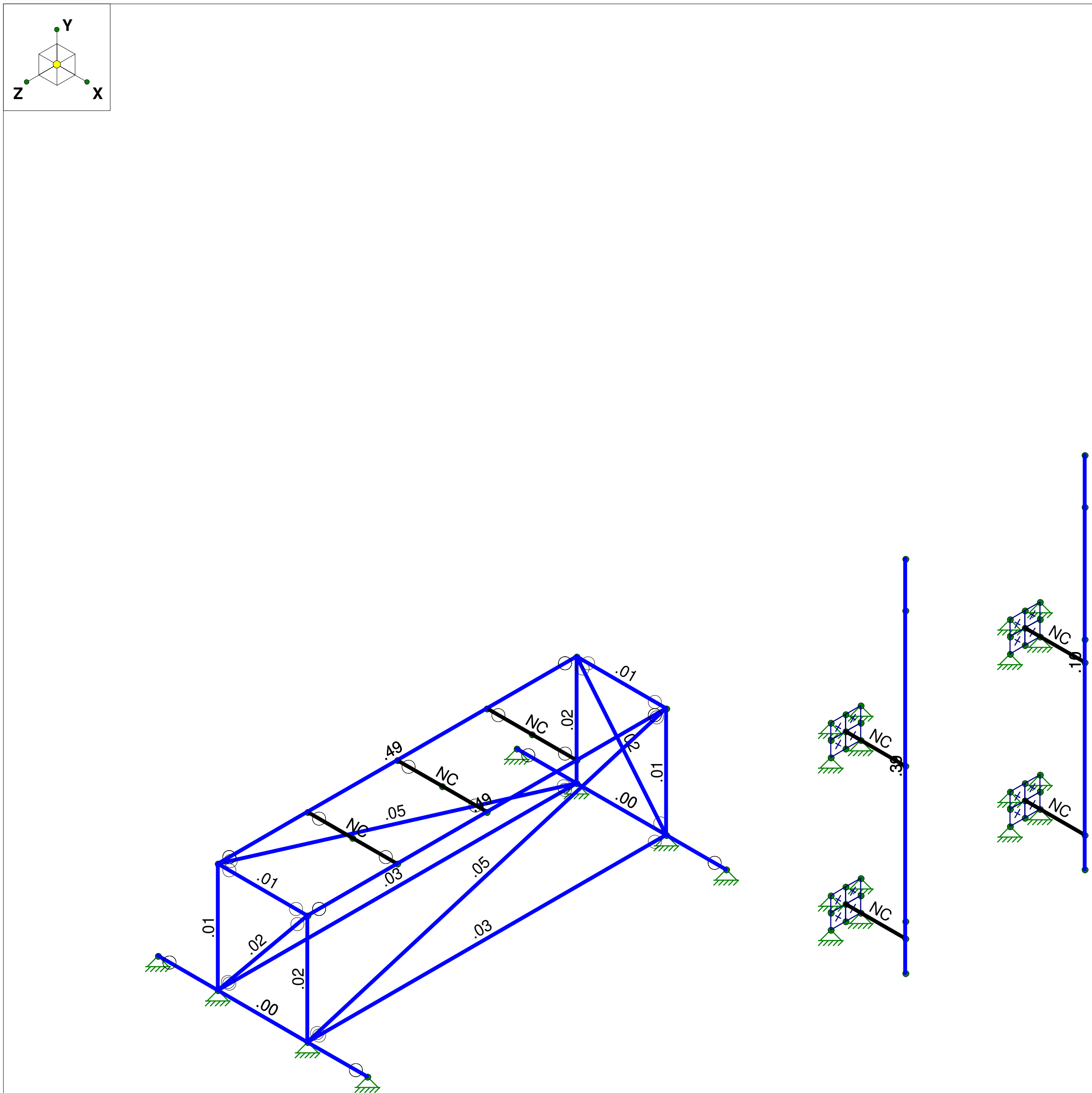
Loads: BLC 5, WLX ICE
Envelope Only Solution

The W-T Group, LLC		Page - 25
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:12 AM
1911530T	WIND LOAD X-DIRECTION (ICE)	ML42100A_Antenna Mount.r3d



Loads: BLC 6, WLZ ICE
Envelope Only Solution

The W-T Group, LLC		Page - 26
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:13 AM
1911530T	WIND LOAD Z-DIRECTION (ICE)	ML42100A_Antenna Mount.r3d



Code Check (Env)
No Calc
> 1.0
.90-1.0
.75-.90
.50-.75
0.-.50

Member Code Checks Displayed (Enveloped)
Envelope Only Solution

The W-T Group, LLC		Page - 27
CJS	ML42100A: SCHRAGER	July 8, 2020 at 9:14 AM
1911530T	MEMBER STRESS RATIOS	ML42100A_Antenna Mount.r3d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (in/sec^2)	386.4
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-15: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-14
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (in)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

Joint Coordinates and Temperatures

	Label	X [in]	Y [in]	Z [in]	Temp [F]	Detach From Diap...
1	N1	0	0	0	0	
2	N2	0	72	0	0	
3	N3	0	6	0	0	
4	N4	0	36	0	0	
5	N5	0	0	-36	0	
6	N6	0	72	-36	0	
7	N7	0	6	-36	0	
8	N8	0	36	-36	0	
9	N9	-12	6	-36	0	
10	N10	-12	36	-36	0	
11	N11	-12	6	0	0	
12	N12	-12	36	0	0	
13	N13	0	63	0	0	
14	N14	0	63	-36	0	
15	N15	0	9	0	0	
16	N16	0	40	-36	0	
17	N17	-48	0	0	0	
18	N18	-48	0	72	0	
19	N19	-66	0	0	0	
20	N20	-66	0	72	0	
21	N21	-48	22	0	0	
22	N22	-48	22	72	0	
23	N23	-66	22	0	0	
24	N24	-66	22	72	0	
25	N25	-36	0	0	0	
26	N26	-36	0	72	0	
27	N27	-78	0	0	0	
28	N28	-78	0	72	0	
29	N29	-66	22	54	0	
30	N30	-48	22	54	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [in]	Y [in]	Z [in]	Temp [F]	Detach From Diap...
31	N31	-66	22	36	0	
32	N32	-48	22	36	0	
33	N33	-66	22	18	0	
34	N34	-48	22	18	0	
35	N35	-57	22	54	0	
36	N36	-57	22	36	0	
37	N37	-57	22	18	0	
38	N38	-12	39	3	0	
39	N39	-12	39	-3	0	
40	N40	-12	39	0	0	
41	N41	-12	36	3	0	
42	N42	-12	36	-3	0	
43	N43	-12	33	0	0	
44	N44	-12	33	3	0	
45	N45	-12	33	-3	0	
46	N46	-12	9	0	0	
47	N47	-12	9	3	0	
48	N48	-12	9	-3	0	
49	N49	-12	6	3	0	
50	N50	-12	6	-3	0	
51	N51	-12	3	0	0	
52	N52	-12	3	-3	0	
53	N53	-12	3	3	0	
54	N54	-12	39	-33	0	
55	N55	-12	39	-39	0	
56	N56	-12	39	-36	0	
57	N57	-12	36	-39	0	
58	N58	-12	36	-33	0	
59	N59	-12	33	-36	0	
60	N60	-12	33	-33	0	
61	N61	-12	33	-39	0	
62	N62	-12	9	-39	0	
63	N63	-12	9	-33	0	
64	N64	-12	9	-36	0	
65	N65	-12	6	-39	0	
66	N66	-12	6	-33	0	
67	N67	-12	3	-39	0	
68	N68	-12	3	-36	0	
69	N69	-12	3	-33	0	

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1...	Density[k/...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2
7	A1085	29000	11154	.3	.65	.49	50	1.4	65	1.3

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N11						
2	N12						
3	N9						
4	N10						
5	N18	Reaction	Reaction	Reaction			
6	N26	Reaction	Reaction	Reaction			
7	N20	Reaction	Reaction	Reaction			
8	N28	Reaction	Reaction	Reaction			
9	N19	Reaction	Reaction	Reaction			
10	N27	Reaction	Reaction	Reaction			
11	N17	Reaction	Reaction	Reaction			
12	N25	Reaction	Reaction	Reaction			
13	N54	Reaction	Reaction	Reaction			
14	N55	Reaction	Reaction	Reaction			
15	N56						
16	N57						
17	N58						
18	N59						
19	N60	Reaction	Reaction	Reaction			
20	N61	Reaction	Reaction	Reaction			
21	N62	Reaction	Reaction	Reaction			
22	N63	Reaction	Reaction	Reaction			
23	N64						
24	N65						
25	N66						
26	N67	Reaction	Reaction	Reaction			
27	N68						
28	N69	Reaction	Reaction	Reaction			
29	N38	Reaction	Reaction	Reaction			
30	N39	Reaction	Reaction	Reaction			
31	N40						
32	N41						
33	N42						
34	N43						
35	N44	Reaction	Reaction	Reaction			
36	N45	Reaction	Reaction	Reaction			
37	N46						
38	N47	Reaction	Reaction	Reaction			
39	N48	Reaction	Reaction	Reaction			
40	N49						
41	N50						
42	N51						
43	N52	Reaction	Reaction	Reaction			
44	N53	Reaction	Reaction	Reaction			

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotat...	Section/Shape	Type	Design List	Material	Desig...
1	M1	N10	N8			RIGID	None	None	RIGID	Typical
2	M2	N12	N4			RIGID	None	None	RIGID	Typical
3	M3	N11	N3			RIGID	None	None	RIGID	Typical
4	M4	N9	N7			RIGID	None	None	RIGID	Typical
5	M5	N6	N5			PIPE_2.0	Col...	Pipe	A53 Gr.B	Typical
6	M6	N2	N1			PIPE_2.0	Col...	Pipe	A53 Gr.B	Typical
7	M7	N27	N25			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
8	M8	N28	N26			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotat...	Section/Shape	Type	Design List	Material	Desig...
9	M9	N20	N24			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
10	M10	N24	N22			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
11	M11	N22	N18			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
12	M12	N19	N23			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
13	M13	N23	N21			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
14	M14	N21	N17			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
15	M15	N24	N23			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
16	M16	N22	N21			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
17	M17	N18	N17			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
18	M18	N20	N19			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
19	M19	N23	N17			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
20	M20	N22	N20			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
21	M21	N19	N24			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
22	M22	N21	N18			L2x2x3	Bea...	Single Angle	A36 Gr.36	Typical
23	M23	N33	N34			RIGID	None	None	RIGID	Typical
24	M24	N31	N32			RIGID	None	None	RIGID	Typical
25	M25	N29	N30			RIGID	None	None	RIGID	Typical

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
1	DL	DL		-1		7				
2	WLX	WLX				7		8		
3	WLZ	WLZ				7		16		
4	DL ICE	OL1				7				
5	WLX ICE	OL2				7		7		
6	WLZ ICE	OL3				7		16		

Joint Loads and Enforced Displacements (BLC 1 : DL)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N14	L	Y	-51.81
2	N16	L	Y	-51.81
3	N13	L	Y	-95.9
4	N15	L	Y	-95.9
5	N35	L	Y	-83.77
6	N36	L	Y	-19
7	N37	L	Y	-70.5

Joint Loads and Enforced Displacements (BLC 2 : WLX)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N14	L	X	-66.81
2	N16	L	X	-66.81
3	N13	L	X	-315.622
4	N15	L	X	-315.622
5	N35	L	X	-83.77
6	N36	L	X	-124.906
7	N37	L	X	-125.905

Joint Loads and Enforced Displacements (BLC 3 : WLZ)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N13	L	Z	-116.5
2	N15	L	Z	-116.5
3	N14	L	Z	-34.97
4	N16	L	Z	-34.97

Joint Loads and Enforced Displacements (BLC 3 : WLZ) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
5	N35	L	Z	-62.528
6	N36	L	Z	-45.286
7	N37	L	Z	-45.286

Joint Loads and Enforced Displacements (BLC 4 : DL ICE)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N13	L	Y	-203.615
2	N15	L	Y	-203.615
3	N14	L	Y	-53.645
4	N16	L	Y	-53.645
5	N35	L	Y	-107.57
6	N36	L	Y	-102.35
7	N37	L	Y	-156.39

Joint Loads and Enforced Displacements (BLC 5 : WLX ICE)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N14	L	X	-45.708
2	N13	L	X	-195.005
3	N15	L	X	-195.005
4	N16	L	X	-45.708
5	N35	L	X	-53.48
6	N36	L	X	-64.495
7	N37	L	X	-64.495

Joint Loads and Enforced Displacements (BLC 6 : WLZ ICE)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N14	L	Z	-26.922
2	N16	L	Z	-26.922
3	N13	L	Z	-85.637
4	N15	L	Z	-85.637
5	N36	L	Z	-16.502
6	N37	L	Z	-35.314
7	N35	L	Z	-37.065

Member Distributed Loads (BLC 2 : WLX)

	Member Label	Direction	Start Magnitude[lb/ft,...	End Magnitude[lb/ft,F...	Start Location[in,%]	End Location[in,%]
1	M16	X	-4	-4	0	0
2	M15	X	-4	-4	0	0
3	M21	X	-4	-4	0	0
4	M22	X	-4	-4	0	0
5	M12	X	-4	-4	0	0
6	M14	X	-4	-4	0	0
7	M9	X	-4	-4	0	0
8	M11	X	-4	-4	0	0

Member Distributed Loads (BLC 3 : WLZ)

	Member Label	Direction	Start Magnitude[lb/ft,...	End Magnitude[lb/ft,F...	Start Location[in,%]	End Location[in,%]
1	M2	Z	-6.4	-6.4	0	0
2	M6	Z	-6.4	-6.4	0	0
3	M3	Z	-6.4	-6.4	0	0
4	M4	Z	-6.4	-6.4	0	0
5	M5	Z	-6.4	-6.4	0	0
6	M1	Z	-6.4	-6.4	0	0

Member Distributed Loads (BLC 3 : WLZ) (Continued)

	Member Label	Direction	Start Magnitude[lb/ft,...	End Magnitude[lb/ft,F...	Start Location[in,%]	End Location[in,%]
7	M19	Z	-4	-4	0	0
8	M13	Z	-4	-4	0	0
9	M12	Z	-4	-4	0	0
10	M14	Z	-4	-4	0	0
11	M9	Z	-4	-4	0	0
12	M8	Z	-4	-4	0	0
13	M7	Z	-4	-4	0	0
14	M11	Z	-4	-4	0	0
15	M20	Z	-4	-4	0	0
16	M10	Z	-4	-4	0	0

Member Distributed Loads (BLC 5 : WLX ICE)

	Member Label	Direction	Start Magnitude[lb/ft,...	End Magnitude[lb/ft,F...	Start Location[in,%]	End Location[in,%]
1	M15	X	-2.5	-2.5	0	0
2	M21	X	-2.5	-2.5	0	0
3	M9	X	-2.5	-2.5	0	0
4	M11	X	-2.5	-2.5	0	0
5	M22	X	-2.5	-2.5	0	0
6	M17	X	-2.5	-2.5	0	0
7	M14	X	-2.5	-2.5	0	0

Member Distributed Loads (BLC 6 : WLZ ICE)

	Member Label	Direction	Start Magnitude[lb/ft,...	End Magnitude[lb/ft,F...	Start Location[in,%]	End Location[in,%]
1	M2	Z	-4	-4	0	0
2	M6	Z	-4	-4	0	0
3	M3	Z	-4	-4	0	0
4	M4	Z	-4	-4	0	0
5	M5	Z	-4	-4	0	0
6	M1	Z	-4	-4	0	0
7	M13	Z	-2.5	-2.5	0	0
8	M19	Z	-2.5	-2.5	0	0
9	M12	Z	-2.5	-2.5	0	0
10	M14	Z	-2.5	-2.5	0	0
11	M7	Z	-2.5	-2.5	0	0
12	M10	Z	-2.5	-2.5	0	0
13	M9	Z	-2.5	-2.5	0	0
14	M20	Z	-2.5	-2.5	0	0
15	M11	Z	-2.5	-2.5	0	0
16	M8	Z	-2.5	-2.5	0	0

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	TIA 1 (a)	Yes	Y		DL	1.2	W...	1																
2	TIA 1 (b)	Yes	Y		DL	1.2	WLZ	1																
3	TIA 2 (a)	Yes	Y		DL	.9	W...	1																
4	TIA 2 (b)	Yes	Y		DL	.9	WLZ	1																
5	TIA 3	Yes	Y		DL	1.4																		
6	TIA 4	Yes	Y		DL	1.2	LLS	1.5																
7	TIA 5	Yes	Y		DL	1.2	IL	1.5																
8	Deflection 1	Yes	Y		DL	1																		
9	Deflection 2	Yes	Y		LL	1																		
10	Deflection 3	Yes	Y		DL	1	LL	1																
11	IBC 16-1	Yes	Y		DL	1.4																		
12	IBC 16-2 (a)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6														

Load Combinations (Continued)

	Description	Sol...	PD...	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
13	IBC 16-3 (...	Yes	Y		DL	1.2	W...	.5																
14	IBC 16-3 (...	Yes	Y		DL	1.2	WLZ	.5																
15	IBC 16-3 (...	Yes	Y		DL	1.2	W...	-.5																
16	IBC 16-3 (...	Yes	Y		DL	1.2	WLZ	-.5																
17	IBC 16-4 (...	Yes	Y		DL	1.2	W...	1	LL	.5	LLS	1												
18	IBC 16-4 (...	Yes	Y		DL	1.2	WLZ	1	LL	.5	LLS	1												
19	IBC 16-4 (...	Yes	Y		DL	1.2	W...	-1	LL	.5	LLS	1												
20	IBC 16-4 (...	Yes	Y		DL	1.2	WLZ	-1	LL	.5	LLS	1												
21	IBC 16-6 (a)	Yes	Y		DL	.9	W...	1																
22	IBC 16-6 (b)	Yes	Y		DL	.9	WLZ	1																
23	IBC 16-6 (c)	Yes	Y		DL	.9	W...	-1																
24	IBC 16-6 (d)	Yes	Y		DL	.9	WLZ	-1																
25	TIA 1 (a)	Yes	Y		OL1	1.2	OL2	1																
26	TIA 1 (b)	Yes	Y		OL1	1.2	OL3	1																
27	TIA 2 (a)	Yes	Y		OL1	.9	OL2	1																
28	TIA 2 (b)	Yes	Y		OL1	.9	OL3	1																
29	TIA 3	Yes	Y		OL1	1.4																		
30	TIA 4	Yes	Y		OL1	1.2	LLS	1.5																
31	TIA 5	Yes	Y		OL1	1.2	IL	1.5																
32	Deflection 1	Yes	Y		OL1	1																		
33	Deflection 2	Yes	Y		LL	1																		
34	Deflection 3	Yes	Y		OL1	1	LL	1																
35	IBC 16-1	Yes	Y		OL1	1.4																		
36	IBC 16-2 (a)	Yes	Y		OL1	1.2	LL	1.6	LLS	1.6														
37	IBC 16-3 (...	Yes	Y		OL1	1.2	OL2	.5																
38	IBC 16-3 (...	Yes	Y		OL1	1.2	OL3	.5																
39	IBC 16-3 (...	Yes	Y		OL1	1.2	OL2	-.5																
40	IBC 16-3 (...	Yes	Y		OL1	1.2	OL3	-.5																
41	IBC 16-4 (...	Yes	Y		OL1	1.2	OL2	1	LL	.5	LLS	1												
42	IBC 16-4 (...	Yes	Y		OL1	1.2	OL3	1	LL	.5	LLS	1												
43	IBC 16-4 (...	Yes	Y		OL1	1.2	OL2	-1	LL	.5	LLS	1												
44	IBC 16-4 (...	Yes	Y		OL1	1.2	OL3	-1	LL	.5	LLS	1												
45	IBC 16-6 (a)	Yes	Y		OL1	.9	OL2	1																
46	IBC 16-6 (b)	Yes	Y		OL1	.9	OL3	1																
47	IBC 16-6 (c)	Yes	Y		OL1	.9	OL2	-1																
48	IBC 16-6 (d)	Yes	Y		OL1	.9	OL3	-1																

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N45	max	235.884	18	112.777	17	90.592	18	0	48	0	48	0	48
2		min	-198.856	24	-54.03	23	-53.368	24	0	1	0	1	0	1
3	N44	max	235.884	20	112.777	17	53.368	22	0	48	0	48	0	48
4		min	-198.856	4	-54.03	23	-90.592	20	0	1	0	1	0	1
5	N17	max	223.319	21	359.447	19	14.076	22	0	48	0	48	0	48
6		min	-223.511	19	-197.813	3	-14.078	24	0	1	0	1	0	1
7	N39	max	210.734	21	112.777	17	53.368	22	0	48	0	48	0	48
8		min	-309.658	19	-54.03	23	-90.592	20	0	1	0	1	0	1
9	N38	max	210.734	21	112.777	17	90.592	18	0	48	0	48	0	48
10		min	-309.658	19	-54.03	23	-53.368	24	0	1	0	1	0	1
11	N20	max	202.572	17	338.029	17	14.074	22	0	48	0	48	0	48
12		min	-202.365	23	-169.411	23	-14.078	20	0	1	0	1	0	1
13	N52	max	165.087	43	112.56	19	72.666	19	0	48	0	48	0	48
14		min	-49.407	3	-54.232	3	-35.624	3	0	1	0	1	0	1
15	N53	max	165.087	43	112.56	19	35.624	21	0	48	0	48	0	48
16		min	-49.407	3	-54.232	3	-72.666	19	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
17	N47	max	122.366	21	112.56	19	72.666	19	0	48	0	48	0	48
18		min	-158.964	19	-54.232	3	-35.624	3	0	1	0	1	0	1
19	N48	max	122.366	21	112.56	19	35.624	21	0	48	0	48	0	48
20		min	-158.964	19	-54.232	3	-72.666	19	0	1	0	1	0	1
21	N61	max	120.525	18	44.816	18	50.367	18	0	48	0	48	0	48
22		min	-98.347	24	-9.19	24	-28.074	24	0	1	0	1	0	1
23	N60	max	120.525	20	44.816	20	28.074	22	0	48	0	48	0	48
24		min	-98.347	4	-9.19	4	-50.367	20	0	1	0	1	0	1
25	N55	max	82.755	22	44.816	20	28.074	22	0	48	0	48	0	48
26		min	-141.316	20	-9.19	4	-50.367	20	0	1	0	1	0	1
27	N54	max	82.755	24	44.816	18	50.367	18	0	48	0	48	0	48
28		min	-141.316	2	-9.19	24	-28.074	24	0	1	0	1	0	1
29	N69	max	71.234	19	41.406	19	4.496	21	0	48	0	48	0	48
30		min	-13.916	3	-6.343	3	-26.416	19	0	1	0	1	0	1
31	N67	max	71.234	19	41.406	19	26.416	19	0	48	0	48	0	48
32		min	-13.916	3	-6.343	3	-4.496	3	0	1	0	1	0	1
33	N18	max	18.585	45	337.766	19	103.971	18	0	48	0	48	0	48
34		min	-18.842	43	-169.812	3	-103.967	20	0	1	0	1	0	1
35	N19	max	18.296	17	359.215	17	103.974	18	0	48	0	48	0	48
36		min	-18.108	23	-198.212	23	-103.967	24	0	1	0	1	0	1
37	N63	max	5.799	21	41.406	19	26.416	19	0	48	0	48	0	48
38		min	-26.735	19	-6.343	3	-4.496	3	0	1	0	1	0	1
39	N62	max	5.799	21	41.406	19	4.496	21	0	48	0	48	0	48
40		min	-26.735	19	-6.343	3	-26.416	19	0	1	0	1	0	1
41	N25	max	0	48	2.619	19	1.323	18	0	48	0	48	0	48
42		min	0	1	-1.133	25	-1.323	24	0	1	0	1	0	1
43	N28	max	0	48	2.509	17	1.324	18	0	48	0	48	0	48
44		min	0	1	-1.023	43	-1.323	24	0	1	0	1	0	1
45	N27	max	0	48	2.648	17	1.322	22	0	48	0	48	0	48
46		min	0	1	-.736	23	-1.324	20	0	1	0	1	0	1
47	N26	max	0	48	2.56	19	1.323	22	0	48	0	48	0	48
48		min	0	1	-.75	27	-1.325	20	0	1	0	1	0	1
49	Totals:	max	1226.966	21	1233.162	35	646.724	22						
50		min	-1226.967	19	0	9	-646.724	24						

Envelope AISC 15th(360-16): LRFD Steel Code Checks

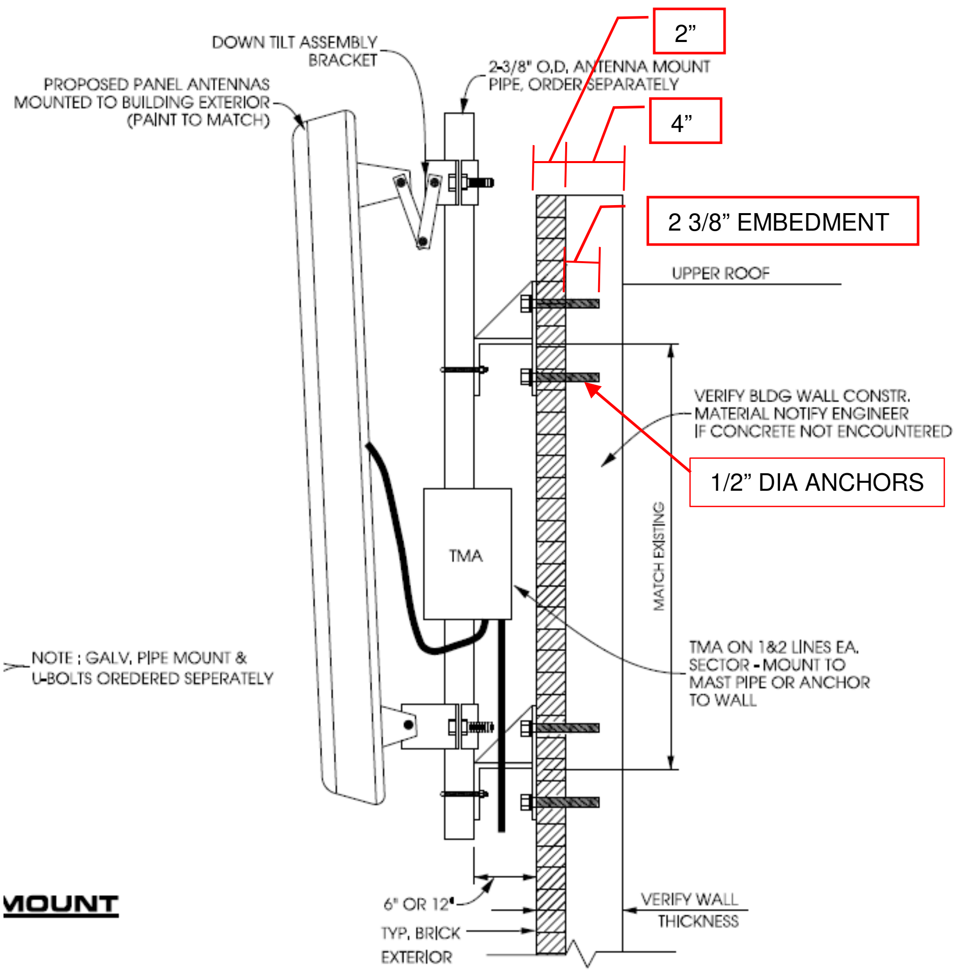
	Member	Shape	Code ...	Loc[in]	LC	Shear ...	Loc[in]	Dir	LC	phi*Pnc [...	phi*Pnt [lb]	phi*Mn y...	phi*Mn z...	Cb	Eqn
1	M5	PIPE_2.0	.096	36	19	.033	36		20	20866.733	32130	1871.625	1871.625	1....	H1-1b
2	M6	PIPE_2.0	.388	36	19	.051	36		20	20866.733	32130	1871.625	1871.625	1....	H1-1b
3	M7	L2x2x3	.005	12.25	17	.001	12.25	y	17	12663.633	23392.8	557.717	1223.415	1....	H2-1
4	M8	L2x2x3	.005	29.75	19	.001	29.75	y	19	12663.633	23392.8	557.717	1223.903	1....	H2-1
5	M9	L2x2x3	.011	0	19	.001	0	y	19	19767.618	23392.8	557.717	1239.29	2....	H2-1
6	M10	L2x2x3	.007	9	19	.000	18	z	18	20899.16	23392.8	557.717	1239.29	1....	H2-1
7	M11	L2x2x3	.023	22	19	.001	22	y	19	19767.618	23392.8	557.717	1239.29	2....	H2-1
8	M12	L2x2x3	.024	0	17	.001	0	y	17	19767.618	23392.8	557.717	1239.29	2....	H2-1
9	M13	L2x2x3	.007	9	17	.000	0	z	20	20899.16	23392.8	557.717	1239.29	1....	H2-1
10	M14	L2x2x3	.011	22	17	.001	22	y	17	19767.618	23392.8	557.717	1239.29	2....	H2-1
11	M15	L2x2x3	.492	36	35	.019	54	y	35	4761.143	23392.8	557.717	965.708	1....	H2-1
12	M16	L2x2x3	.492	36	35	.019	54	y	35	4761.143	23392.8	557.717	965.709	1....	H2-1
13	M17	L2x2x3	.031	36	11	.001	0	y	11	4761.143	23392.8	557.717	970.99	1....	H2-1
14	M18	L2x2x3	.031	36	11	.001	0	y	11	4761.143	23392.8	557.717	970.99	1....	H2-1
15	M19	L2x2x3	.022	14.805	19	.001	28.425	z	18	17660.418	23392.8	557.717	1199.68	1....	H2-1
16	M20	L2x2x3	.020	14.805	17	.001	28.425	z	20	17660.418	23392.8	557.717	1199.68	1....	H2-1
17	M21	L2x2x3	.051	36.859	18	.002	0	z	19	4354.581	23392.8	557.717	957.105	1....	H2-1
18	M22	L2x2x3	.051	38.427	20	.002	0	z	17	4354.581	23392.8	557.717	957.105	1....	H2-1

WT Group THE W-T GROUP, LLC 2675 PRATUM AVENUE HOFFMAN ESTATES, IL 60192 PHONE: (224) 293-6444	Project ML42100A: SCHRAGER			Job Ref. 1911530T	
	Section CHECK FOR WALL MOUNT ANCHOR BOLTS			Sheet no./rev. 37	
	Calc. by CJS	Date 07/08/2020	Chk'd by	Date	App'd by	Date

CHECK FOR ANCHOR BOLT

From original construction drawings by “Edge Consulting Engineers, Inc.”, dated 12/11/2012.

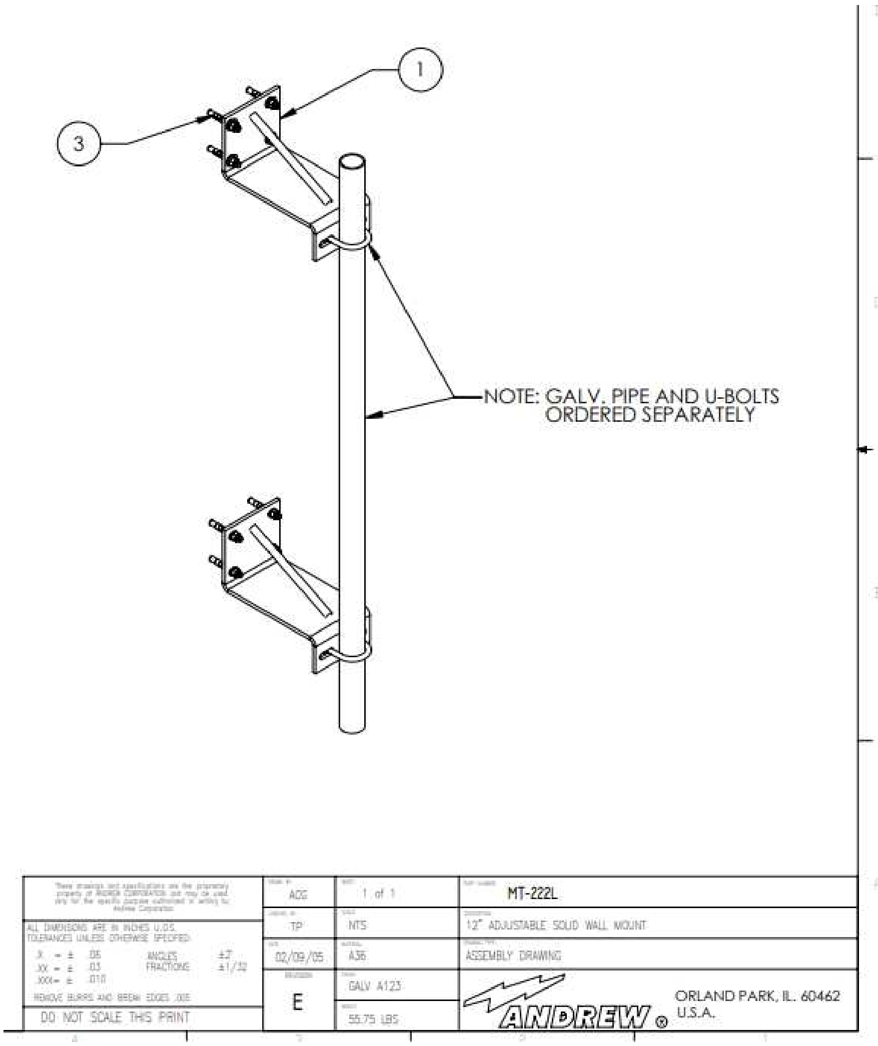
Contractor to verify the below information prior to installation of proposed antennas.



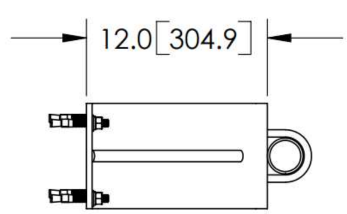
TYP. INSTALL

The W-T Group, LLC	Project				Job Ref.	
THE W-T GROUP, LLC 2675 PRATUM AVENUE HOFFMAN ESTATES, IL 60192 PHONE: (224) 293-6444	ML42100A: SCHRAGER				1911530T	
	Section				Sheet no./rev.	
	CHECK FOR WALL MOUNT ANCHOR BOLTS				38	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	CJS	07/08/2020				

From Commscope/Andrew Assembly Drawings, dated 02/09/2005



ITEM	PART NO.	DESCRIPTION	QTY.	WEIGHT
1	MT221L.04	12" WALL MOUNT BRACKET	2	16.62 LBS
2	MT222H	HARDWARE KIT (ITEM 3)	2	
3	MT-271	1/2" X 3-3/4" WEDGE ANCHOR KIT	8	0.18 LBS



Envelope Joint Reactions

	Joint		X [lb]	L...	Y [lb]	L...	Z [lb]	L...	MX [lb-ft]	L...	MY [lb-ft]	L...	MZ [lb-ft]	L...
1	N45	max	235.884	18	112.777	17	90.592	18	0	48	0	48	0	48
2		min	-198.856	24	-54.03	23	-53.368	24	0	1	0	1	0	1
3	N44	max	235.884	20	112.777	17	53.368	22	0	48	0	48	0	48
4		min	-198.856	4	-54.03	23	-90.592	20	0	1	0	1	0	1
5	N17	max	223.319	21	359.447	19	14.076	22	0	48	0	48	0	48
6		min	-223.511	19	-197.813	3	-14.078	24	0	1	0	1	0	1

From Risa 3D Analysis

Tension	235.884 lbs
Shear, Vy	112.777 lbs
Shear, Vz	90.592 lbs
Resultant Shear	114.66 lbs

Based on similar expansion anchors by Hilti:

Bolt Dia	1/2"
No. of Bolts	4
Effective Embedment Depth	2"

Table 16 - Hilti KWIK Bolt TZ stainless steel design strength with concrete / pullout failure in cracked concrete[1,2,3,4,5]

Nominal anchor diameter in.	Effective embed. in. (mm)	Nominal embed. in. (mm)	Tension - ϕN_n				Shear - ϕV_n			
			f'_c = 2,500 psi lb (kN)	f'_c = 3,000 psi lb (kN)	f'_c = 4,000 psi lb (kN)	f'_c = 6,000 psi lb (kN)	f'_c = 2,500 psi lb (kN)	f'_c = 3,000 psi lb (kN)	f'_c = 4,000 psi lb (kN)	f'_c = 6,000 psi lb (kN)
3/8	2 (51)	2-5/16 (59)	1,520 (6.8)	1,665 (7.4)	1,925 (8.6)	2,355 (10.5)	1,685 (7.5)	1,845 (8.2)	2,130 (9.5)	2,605 (11.6)
1/2	2 (51)	2-3/8 (60)	1,750 (7.8)	1,915 (8.5)	2,210 (9.8)	2,710 (12.1)	2,375 (10.6)	2,605 (11.6)	3,005 (13.4)	3,680 (16.4)
	3-1/4 (83)	3-5/8 (91)	3,235 (14.4)	3,545 (15.8)	4,095 (18.2)	5,015 (22.3)	6,970 (31.0)	7,640 (34.0)	8,820 (39.2)	10,800 (48.0)

Allowable Tension	1,750 lbs
Allowable Shear	2,375 lbs

Tension at Each Bolts	235.884 lbs
Shear at Each Bolts	114.66 lbs

Combined Tension and Shear 0.183 < 1.0 O.K.

Existing Parapet wall is adequate by inspection

EXHIBITS

Structural Analysis Worksheet

Site Information

Project Manager: Sergio Contreras

T# T1900570

File names to be used for tower info (tower steel/bolt/fdn. info): .pdf/.xls

*Existing carrier loading should reflect all leased loading.

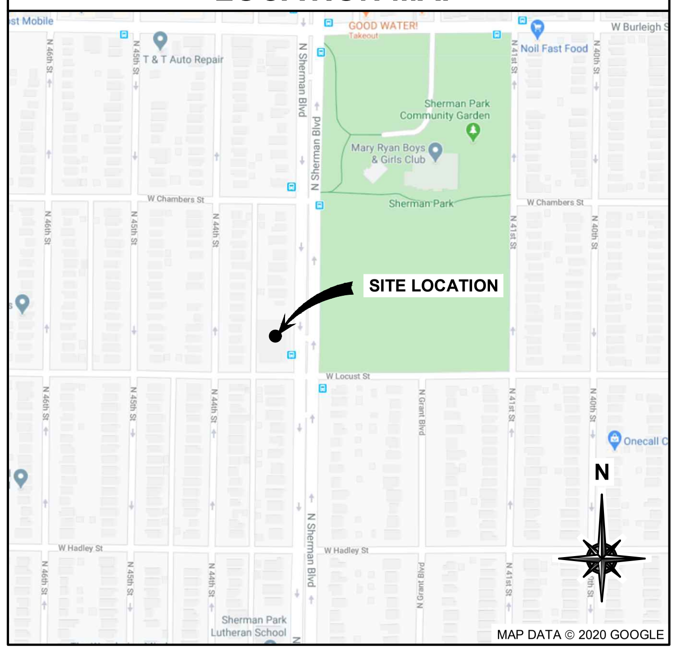
Loading information

Item	Carrier	Elevation (Ft)	Status (Proposed, Existing, Future)	Qty	Antenna/TMA/RRU Model	Height	Width	Depth	Weight	Mount Type	Qty Coax	Coax Size	Coax Location* (inside, outside, face, stacked?)
1	T-Mobile	51'-0"	Existing	3 (1 per sector)	COVP	20.38	16.08	5.83	19	Radio Frame	3	HYBRID	
2	T-Mobile	51'-0"	**Proposed**	**3 (1 per sector)**	**AHFIG**	**27.3**	**12.1**	**5.2**	**70.5**	Radio Frame			
3	T-Mobile	51'-0"	**Proposed**	**3 (1 per sector)**	**AHLOA**	**22.05**	**12.13**	**7.44**	**83.77**	Radio Frame			
4	T-Mobile	**+/-54'-0"**	**Proposed**	**3 (1 per sector)**	**AAHF ANTENNA**	**25.6**	**19.7**	**10.3**	**103.6**	Wall Mount			
5	T-Mobile	51'-0"	**Proposed**	**3 (1 per sector)**	**COMMSCOPE FFHH-65C-R3**	**95.9**	**25.2**	**9.3**	**127.6**	Wall Mount			

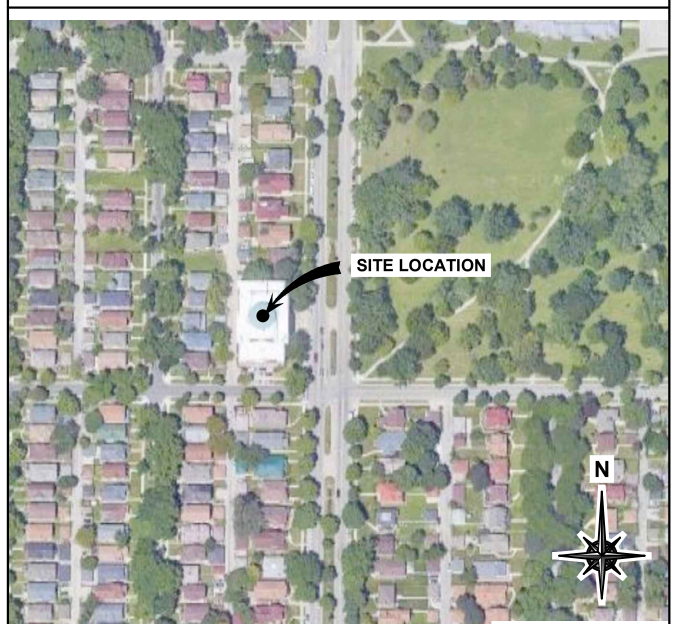
SITE NUMBER: ML42100A
SITE NAME: SCHRAGER
SITE TYPE: ROOFTOP

JURISDICTION: CITY OF MILWAUKEE
CITY: CITY OF MILWAUKEE
COUNTY: MILWAUKEE COUNTY

LOCATION MAP



AERIAL MAP



PROJECT DESCRIPTION

NO NEW WATER OR SEWER IS REQUIRED AS FACILITY IS UNMANNED.

EXISTING BUILD OUT:

9 ANTENNAS, 9 RRU MODULES, 4 COVP'S, 3 HCS, 1 SITE SUPPORT CABINET, 1 EQUIPMENT CABINET, 3 SYSTEM MODULES ON SSC, U2100 MODULES ON POST

FINAL BUILD OUT:

6 ANTENNAS, 6 RRU MODULES, 4 COVP'S, 1 OVP, 3 HCS, 3 HCS 2.0 LONG JUMPERS, 1 SITE SUPPORT CABINET, 1 BATTERY CABINET, 6 FIBER SPLITTERS IN SSC, 1 SYSTEM MODULE IN SSC, 2 AMIA'S IN SSC

SCOPE OF WORK:

- (1) GSM ESMB TO BE REMOVED AND RETURNED TO WAREHOUSE
- (1) LTE FSMF & (2) FBBC'S TO BE REMOVED AND RETURNED TO WAREHOUSE
- (1) FBBA TO BE REMOVED AND RETURNED TO WAREHOUSE
- RELOCATE (1) EXISTING FSMF TO SSC. RE-PURPOSE FOR GSM-UMTS PCS
- (3) EXISTING FRIG'S TO BE REMOVED AND RETURNED TO WAREHOUSE
- (3) EXISTING FXFB'S TO BE REMOVED AND RETURNED TO WAREHOUSE
- (3) EXISTING FHFB'S TO BE REMOVED AND RETURNED TO WAREHOUSE
- U2100 MODULES & POST TO BE REMOVE AND RETURNED TO WAREHOUSE
- INSTALL (3) NEW AHLOA'S (1 PER SECTOR)
- INSTALL (3) NEW AHFIG'S (1 PER SECTOR)
- REPLACE (9) EXISTING ANTENNAS WITH (6) NEW ANTENNAS
- INSTALL NEW RF JUMPERS FOR NEW RRU'S
- UTILIZE (3) EXISTING HCS CABLES
- INSTALL (3) NEW HCS 2.0 LONG JUMPERS
- UTILIZE (1) EXISTING EQUIPMENT COVP & (3) EXISTING ANTENNA COVP'S
- INSTALL (1) NEW OVP AT EQUIPMENT
- EXISTING SSC & EXISTING EQUIPMENT CABINET TO BE REMOVED
- INSTALL (1) NEW SSC AT EQUIPMENT
- INSTALL (1) NEW BBU AT EQUIPMENT
- INSTALL (1) NEW AMIA W/ (1) ASIK CORE MODULE, (1) ASIB CORE MODULE, (3) ABIL CAPACITY MODULES AND (3) ABIC CAPACITY MODULES IN NEW SSC
- INSTALL (1) NEW AMIA W/ (1) ASIA CORE MODULE, (1) ASIK CORE MODULE, (2) ABIA CAPACITY MODULES AND (1) ABIL CAPACITY MODULE IN NEW SSC
- INSTALL (6) NEW FIBER SPLITTERS IN NEW SSC (2 PER SECTOR)
- INSTALL NEW CSR IXRE

APPLICABLE CODES

DOWNERS GROVE ADOPTED CODES:

2015 INTERNATIONAL BUILDING CODE WITH D.G. AMENDMENTS
2014 NATIONAL ELECTRICAL CODE WITH D.G. AMENDMENTS

CURRENT D.G. ZONING ORDINANCE

PROJECT TYPE

ANCHOR

PROJECT LOCATION

COORDINATES (NAD83):

LAT: 43.07192100°
LONG: -87.96804700°

SITE ADDRESS:

2915 N. SHERMAN BOULEVARD
MILWAUKEE, WI 53210
MILWAUKEE COUNTY

DATA OBTAINED FROM T-MOBILE RFDS

CONTACTS

APPLICANT:

T-MOBILE
1400 OPUS PLACE
DOWNERS GROVE, IL 60515
TEL: T.B.D.
CONTACT: T.B.D.

PROPERTY OWNER:

SCHRAGER AUCTION GALLERIES LTD
TEL: T.B.D.
CONTACT: T.B.D.

PROJECT TEAM

A&E:

WT GROUP, LLC
2675 PRATUM AVENUE
HOFFMAN ESTATES, IL 60192
CONTACT: SERGIO CONTRERAS
TEL: (224) 293-6411
FAX: (224) 293-6444

STRUCTURAL ENGINEER:

T.B.D.

REFERENCED MATERIALS

A SITE WALK WAS NOT PERFORMED FOR THIS SITE PER SCOPE OF WORK. COMPOUND, ELEVATION, SHELTER/EQUIPMENT LAYOUT AND ANTENNA PLANS SHOWN WITHIN THIS SET WERE TAKEN FROM AVAILABLE DOCUMENTS/DRAWINGS PROVIDED BY OTHERS.

SHEET INDEX

SHEET NUMBER:	DESCRIPTION:
T-1	TITLE SHEET
T-2	GENERAL NOTES & SPECIFICATIONS
T-3	GENERAL NOTES & SPECIFICATIONS
C-1	OVERALL SITE PLAN
C-2	EXISTING & NEW SITE PLANS
A-1	ELEVATION
A-2	ANTENNA PLANS & SCHEDULE
A-3	EQUIPMENT SPECIFICATIONS
A-4	EQUIPMENT SPECIFICATIONS
A-5	EQUIPMENT SPECIFICATIONS
A-6	EQUIPMENT SPECIFICATIONS
A-7	RF PLUMBING DIAGRAM
E-1	UTILITY PLAN
GR-1	GROUNDING DETAILS
GR-2	GROUNDING DETAILS

APPROVALS

PENDING APPROVAL OF THE JURISDICTION, THE FOLLOWING PARTIES HAVE REVIEWED THE DESIGN WITHIN THEIR FUNCTIONAL RESPONSIBILITIES AND HAVE APPROVED THIS PROJECT FOR CONSTRUCTION. CONTRACTORS MAY NOT START CONSTRUCTION WITHOUT A NOTICE TO PROCEED (NTP).

	PRINT NAME	SIGNATURE	DATE
LANDLORD			
PRECON. MGR			
DEVELOP. MGR			
CONST. INSP.			
A&E MGR.			
RF ENGINEER			
OPERATIONS			
ZONING REP			
UTILITIES			

T-Mobile

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2675 Pratum Avenue | Hoffman Estates, IL 60192
T: 224.293.6333 | F: 224.293.6444
wtengineering.com

WT Group
Engineering • Design • Consulting

Insite inc.
Wireless Consulting Services

ML42100A
SCHRAGER
2915 N. SHERMAN BOULEVARD
MILWAUKEE, WI 53210

EXPIRES: 07/31/20 SIGNED:

REVISIONS

REV.	ISSUED FOR	DATE	BY
A	FOR CLIENT REVIEW	06/09/20	SC

AQUATIC \ DESIGN & PROGRAM MANAGEMENT
CIVIL \ TELECOMMUNICATION \ MECHANICAL
PLUMBING \ ELECTRICAL \ LAND SURVEYING
ACCESSIBILITY CONSULTING \ STRUCTURAL

CHECK: JKR
DRAWN: PS
JOB: T1900570

T-1
TITLE SHEET

GENERAL REQUIREMENTS:

1.1 INTENT

1. THESE SPECIFICATIONS AND CONSTRUCTION DRAWINGS ACCOMPANYING THEM DESCRIBE THE WORK TO BE DONE AND THE MATERIALS TO BE FURNISHED FOR CONSTRUCTION.

2. THE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO BE FULLY EXPLANATORY AND SUPPLEMENTARY. HOWEVER, SHOULD ANYTHING BE SHOWN, INDICATED OR SPECIFIED ON ONE AND NOT THE OTHER, IT SHALL BE DONE THE SAME AS IF SHOWN, INDICATED OR SPECIFIED IN BOTH.

3. THE INTENTION OF THE DOCUMENTS IS TO INCLUDE ALL LABOR AND MATERIALS REASONABLY NECESSARY FOR THE PROPER EXECUTION AND COMPLETION OF THE WORK AS STIPULATED IN THE CONTRACT.

4. THE PURPOSE OF THE SPECIFICATIONS IS TO INTERPRET THE INTENT OF THE DRAWINGS AND TO DESIGNATE THE METHOD OF THE PROCEDURE, TYPE AND QUALITY OF MATERIALS REQUIRED TO COMPLETE THE WORK.

5. MINOR DEVIATIONS FROM THE DESIGN LAYOUT ARE ANTICIPATED AND SHALL BE CONSIDERED AS PART OF THE WORK. NO CHANGES THAT ALTER THE CHARACTER OF THE WORK WILL BE MADE OR PERMITTED BY THE OWNER WITHOUT ISSUING A CHANGE ORDER.

1.2 CONFLICTS

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL MEASUREMENTS AT THE SITE BEFORE ORDERING ANY MATERIALS OR DOING ANY WORK. NO EXTRA CHARGE OR COMPENSATION SHALL BE ALLOWED DUE TO DIFFERENCE BETWEEN ACTUAL DIMENSIONS AND DIMENSIONS INDICATED ON THE CONSTRUCTION DRAWINGS. ANY SUCH DISCREPANCY IN DIMENSION WHICH MAY BE FOUND SHALL BE SUBMITTED TO THE OWNER FOR CONSIDERATION BEFORE THE CONTRACTOR PROCEEDS WITH THE WORK IN THE AFFECTED AREAS.

2. THE BIDDER, IF AWARDED THE CONTRACT, WILL NOT BE ALLOWED ANY EXTRA COMPENSATION BY REASON OF ANY MATTER OR THING CONCERNING WHICH SUCH BIDDER MIGHT HAVE FULLY INFORMED THEMSELVES PRIOR TO THE BIDDING.

3. NO PLEA OF IGNORANCE OF CONDITIONS THAT EXIST, OR OF DIFFICULTIES OR CONDITIONS THAT MAY BE ENCOUNTERED OR OF ANY OTHER RELEVANT MATTER CONCERNING THE WORK TO BE PERFORMED IN THE EXECUTION OF THE WORK WILL BE ACCEPTED AS AN EXCUSE FOR ANY FAILURE OR OMISSION ON THE PART OF THE CONTRACTOR TO FULFILL EVERY DETAIL OF ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS GOVERNING THE WORK.

1.3 CONTRACTS AND WARRANTIES

1. CONTRACTOR IS RESPONSIBLE FOR APPLICATION AND PAYMENT OF CONTRACTOR LICENSES AND BONDS.

1.4 STORAGE

1. ALL MATERIALS MUST BE STORED IN A LEVEL AND DRY FASHION AND IN A MANNER THAT DOES NOT NECESSARILY OBSTRUCT THE FLOW OF OTHER WORK. ANY STORAGE METHOD MUST MEET ALL RECOMMENDATIONS OF THE ASSOCIATED MANUFACTURER.

2. THE BTS MUST BE STORED INSIDE UNTIL THERE IS POWER ON SITE.

1.5 CLEAN UP

1. THE CONTRACTORS SHALL AT ALL TIMES KEEP THE SITE FREE FROM ACCUMULATION OF WASTE MATERIALS OR RUBBISH CAUSED BY THEIR EMPLOYEES AT WORK AND AT THE COMPLETION OF THE WORK, THEY SHALL REMOVE ALL RUBBISH FROM AND ABOUT THE BUILDING AREA, INCLUDING ALL THEIR TOOLS, SCAFFOLDING AND SURPLUS MATERIALS AND SHALL LEAVE THEIR WORK CLEAN AND READY FOR USE.

2. EXTERIOR: VISUALLY INSPECT EXTERIOR SURFACES AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER.
   A. REMOVE ALL TRACES OF SPLASHED MATERIALS FROM ADJACENT SURFACES.
   B. IF NECESSARY TO ACHIEVE A UNIFORM DEGREE OF CLEANLINESS, HOSE DOWN THE EXTERIOR OF THE STRUCTURE.

3. INTERIOR: VISUALLY INSPECT INTERIOR SURFACE AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER FROM WALLS/FLOOR/CEILING.
   A. REMOVE ALL TRACES OF SPLASHED MATERIAL FROM ADJACENT SURFACES.
   B. REMOVE PAINT DROPPINGS, SPOTS, STAINS AND DIRT FROM FINISHED SURFACES.

1.6 CHANGE ORDER PROCEDURE

1. CHANGE ORDERS MAY BE INITIATED BY THE OWNER AND/OR THE CONTRACTOR INVOLVED. THE CONTRACTOR, UPON VERBAL REQUEST FROM THE OWNER SHALL PREPARE A WRITTEN PROPOSAL DESCRIBING THE CHANGE IN WORK OR MATERIALS AND ANY CHANGES IN THE CONTRACT AMOUNT AND PRESENT TO THE OWNER WITHIN 72 HRS FOR APPROVAL. SUBMIT REQUESTS FOR SUBSTITUTIONS IN THE FORM AND IN ACCORDANCE WITH PROCEDURES REQUIRED FOR CHANGE ORDER PROPOSALS. ANY CHANGES IN SCOPE OF WORK OR MATERIALS WHICH ARE PERFORMED BY THE CONTRACTOR WITHOUT A WRITTEN CHANGE ORDER AS DESCRIBED AND APPROVED BY THE OWNER SHALL PLACE FULL RESPONSIBILITY OF THESE ACTIONS ON THE CONTRACTOR.

1.7 RELATED DOCUMENTS AND COORDINATION

1. GENERAL CARPENTRY, ELECTRICAL AND ANTENNA DRAWINGS ARE INTERRELATED. IN PERFORMANCE OF THE WORK, THE CONTRACTOR MUST REFER TO ALL DRAWINGS. ALL COORDINATION TO BE THE RESPONSIBILITY OF THE CONTRACTOR.

1.8 SHOP DRAWINGS

1. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AS REQUIRED AND LISTED IN THESE SPECIFICATIONS TO THE OWNER FOR APPROVAL.

2. ALL SHOP DRAWINGS SHALL BE REVIEWED, CHECKED AND CORRECTED BY CONTRACTOR PRIOR TO SUBMITTAL TO THE OWNER.

1.9 PRODUCTS AND SUBSTITUTIONS

1. SUBMIT 3 COPIES OF EACH REQUEST FOR SUBSTITUTION. IN EACH REQUEST IDENTIFY THE PRODUCT OR FABRICATION OR INSTALLATION METHOD TO BE REPLACED BY THE SUBSTITUTION. INCLUDE RELATED SPECIFICATION SECTION AND DRAWING NUMBERS AND COMPLETE DOCUMENTATION SHOWING COMPLIANCE WITH THE REQUIREMENTS FOR SUBSTITUTIONS.

2. SUBMIT ALL NECESSARY PRODUCT DATA AND CUT SHEETS WHICH PROPERLY INDICATE AND DESCRIBE THE ITEMS, PRODUCTS AND MATERIALS BEING INSTALLED. THE CONTRACTOR SHALL, IF DEEMED NECESSARY BY THE OWNER SUBMIT ACTUAL SAMPLES TO THE OWNER FOR APPROVAL IN LIEU OF CUT SHEETS.

1.10 QUALITY ASSURANCE

1. ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

1.11 ADMINISTRATION

1. BEFORE THE COMMENCEMENT OF ANY WORK, THE CONTRACTOR WILL ASSIGN A PROJECT MANAGER WHO WILL ACT AS A SINGLE POINT OF CONTACT FOR ALL PERSONNEL INVOLVED IN THIS PROJECT. THIS PROJECT MANAGER WILL DEVELOP A MASTER SCHEDULE FOR THE PROJECT WHICH WILL BE SUBMITTED TO THE OWNER PRIOR TO THE COMMENCEMENT OF ANY WORK.

2. SUBMIT A BAR TYPE PROGRESS CHART NOT MORE THAN 3 DAYS AFTER THE DATE ESTABLISHED FOR COMMENCEMENT OF THE WORK ON THE SCHEDULE, INDICATING A TIME BAR FOR EACH MAJOR CATEGORY OR UNIT OF WORK TO BE PERFORMED AT SITE, PROPERLY SEQUENCED AND COORDINATED WITH OTHER ELEMENTS OF WORK AND SHOWING COMPLETION OF THE WORK SUFFICIENTLY IN ADVANCE OF THE DATE ESTABLISHED FOR SUBSTANTIAL COMPLETION OF THE WORK.

3. PRIOR TO COMMENCING CONSTRUCTION, THE OWNER SHALL SCHEDULE AN ON-SITE MEETING WITH ALL MAJOR PARTIES. THIS WOULD INCLUDE (THOUGH NOT LIMITED TO) THE OWNER, PROJECT MANAGER, CONTRACTOR, LAND OWNER REPRESENTATIVE, LOCAL TELEPHONE COMPANY, TOWER ERECTION FOREMAN (IF SUBCONTRACTED).

4. CONTRACTOR SHALL BE EQUIPPED WITH SOME MEANS OF CONSTANT COMMUNICATIONS, SUCH AS A MOBILE PHONE OR A BEEPER. THIS EQUIPMENT WILL NOT BE SUPPLIED BY THE OWNER, NOR WILL WIRELESS SERVICE BE ARRANGED.

5. DURING CONSTRUCTION, CONTRACTOR MUST ENSURE THAT EMPLOYEES AND SUBCONTRACTORS WEAR HARD HATS AT ALL TIMES. CONTRACTOR WILL COMPLY WITH ALL SAFETY REQUIREMENTS IN THEIR AGREEMENT.

6. PROVIDE WRITTEN DAILY UPDATES ON SITE PROGRESS TO THE OWNER.

7. COMPLETE INVENTORY OF CONSTRUCTION MATERIALS AND EQUIPMENT IS REQUIRED PRIOR TO START OF CONSTRUCTION.

8. NOTIFY THE OWNER / PROJECT MANAGER IN WRITING NO LESS THAN 48 HOURS IN ADVANCE OF CONCRETE POURS, TOWER ERECTIONS, AND EQUIPMENT CABINET PLACEMENTS.

1.12 INSURANCE AND BONDS

1. CONTRACTOR SHALL AT THEIR OWN EXPENSE CARRY AND MAINTAIN FOR THE DURATION OF THE PROJECT ALL INSURANCE AS REQUIRED AND LISTED AND SHALL NOT COMMENCE WITH THEIR WORK UNTIL THEY HAVE PRESENTED AN ORIGINAL CERTIFICATE OF INSURANCE STATING ALL COVERAGES TO THE OWNER. REFER TO THE MASTER AGREEMENT FOR REQUIRED INSURANCE LIMITS.

2. THE OWNER SHALL BE NAMED AS AN ADDITIONAL INSURED ON ALL POLICIES.

3. CONTRACTOR MUST PROVIDE PROOF OF INSURANCE.

ANTENNA INSTALLATION:

1.1 REQUIREMENTS OF REGULATOR AGENCIES

1. FURNISH U.L. LISTED EQUIPMENT WHERE SUCH LABEL IS AVAILABLE, INSTALL IN CONFORMANCE WITH U.L. STANDARDS WHERE APPLICABLE.

2. INSTALL ANTENNA, ANTENNA CABLES, GROUNDING SYSTEM IN ACCORDANCE WITH DRAWINGS AND SPECIFICATION IN EFFECT AT PROJECT LOCATION AND RECOMMENDATIONS OF STATE AND LOCAL BUILDING CODES, SPECIAL CODES HAVING JURISDICTION OVER SPECIFIC PORTIONS OF WORK. THIS INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   A. TIA - TELECOMMUNICATIONS INDUSTRY ASSOCIATION TIA-222-G. STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES.
   B. FAA - FEDERAL AVIATION ADMINISTRATION ADVISORY CIRCULAR AC 70/7460-IH, OBSTRUCTION MARKING AND LIGHTING.
   C. FCC - FEDERAL COMMUNICATIONS COMMISSION RULES AND REGULATIONS FORM 715, OBSTRUCTION MARKING AND LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES AND FORM 715A, HIGH INTENSITY OBSTRUCTION LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES.
   D. AISC - AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS.
   E. NEC - NATIONAL ELECTRICAL CODE - ON TOWER LIGHTING KITS.
   F. UL - UNDERWRITER'S LABORATORIES APPROVED ELECTRICAL PRODUCTS.
   G. IN ALL CASES, PART 77 OR THE FAA RULES AND PARTS 17 AND 22 OF THE FCC RULES ARE APPLICABLE AND IN THE EVENT OF CONFLICT, SUPERSEDE ANY OTHER STANDARDS OR SPECIFICATIONS.
   H. LIFE SAFETY CODE NFPA -101.

T-Mobile

Insite inc.
Wireless Consulting Services

ML42100A
SCHRAGER
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WT Group
Engineering • Design • Consulting

EXPIRES: 07/31/20 SIGNED:

REVISIONS

REV.	ISSUED FOR	DATE	BY
A	FOR CLIENT REVIEW	06/09/20	SC

AQUATIC \ DESIGN & PROGRAM MANAGEMENT
CIVIL \ TELECOMMUNICATION \ MECHANICAL
PLUMBING \ ELECTRICAL \ LAND SURVEYING
ACCESSIBILITY CONSULTING \ STRUCTURAL

CHECK: JKR
DRAWN: PS
JOB: T1900570

T-2
GENERAL NOTES & SPECIFICATIONS

GENERAL ELECTRIC PROVISION:

1. SUBMITTAL OF BID INDICATES CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.
2. CONTRACTOR SHALL PERFORM ALL VERIFICATION OBSERVATIONS TEST, AND EXAMINATION WORK PRIOR TO THE ORDERING OF THE ELECTRICAL EQUIPMENT AND THE ACTUAL CONSTRUCTION. CONTRACTOR SHALL ISSUE A WRITTEN NOTICE OF ALL FINDINGS TO THE ARCHITECT LISTING ALL MALFUNCTIONS, FAULTY EQUIPMENT AND DISCREPANCIES.
3. EACH CONDUCTOR OF EVERY SYSTEM SHALL BE PERMANENTLY TAGGED IN EACH PANEL BOARD, PULL BOX, J-BOX, SWITCH BOX, ETC., IN COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ACT (O.S.H.A.).
4. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR A COMPLETE AND PROPERLY OPERATIVE SYSTEM ENERGIZED THROUGHOUT AND AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.
5. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED AND SHALL BE OF THE BEST GRADE AND OF THE SAME MANUFACTURER THROUGHOUT FOR EACH CLASS OR GROUP OF EQUIPMENT. MATERIALS SHALL BE LISTED "J" WHERE SUBJECT TO SUCH APPROVAL. MATERIALS SHALL MEET WITH APPROVAL OF THE DIVISION OF INDUSTRIAL SAFETY AND ALL GOVERNING BODIES HAVING JURISDICTION. MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH APPLICABLE STANDARDS ESTABLISHED BY ANSI, NEMA AND NBFU.
6. ALL CONDUIT INSTALLED SHALL BE SURFACE MOUNTED OR DIRECT BURIAL UNLESS OTHERWISE NOTED.
7. CONTRACTOR SHALL CARRY OUT THEIR WORK IN ACCORDANCE WITH ALL GOVERNING STATE, COUNTY AND LOCAL CODES AND O.S.H.A.
8. CONTRACTOR TO OBTAIN ALL PERMITS, PAY PERMIT FEES, AND BE RESPONSIBLE FOR SCHEDULING INSPECTIONS.
9. COMPLETE JOB SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF JOB ACCEPTANCE BY OWNER. ANY WORK, MATERIAL OR EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE CONTRACTOR.
10. ALL CONDUIT SHALL HAVE A PULL WIRE OR ROPE.
11. PROVIDE PROJECT MANAGER WITH ONE SET OF COMPLETE ELECTRICAL "AS INSTALLED" DRAWINGS AT THE COMPLETION OF THE JOB, SHOWING ACTUAL DIMENSIONS, ROUTINGS AND CIRCUITS.
12. ALL BROCHURES, OPERATING MANUALS, CATALOGS, SHOP DRAWINGS, ETC., SHALL BE TURNED OVER TO THE OWNER AT JOB COMPLETION.
13. USE T-TAP CONNECTIONS ON ALL MULTI-CIRCUITS WITH COMMON NEUTRAL CONDUCTOR FOR LIGHTING FIXTURES.
14. ALL CONDUCTORS SHALL BE COPPER.
15. ALL CIRCUIT BREAKERS, FUSES AND ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING SHORT CIRCUIT CURRENT TO WHICH THEY MAY BE SUBJECTED, AND A MINIMUM OF 10,000 A.I.C.
16. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES.
17. PATCH, REPAIR AND PAINT ANY AREA THAT HAS BEEN DAMAGED IN THE COURSE OF THE ELECTRICAL WORK.
18. PENETRATIONS IN FIRE RATED WALLS SHALL BE FIRE STOPPED IN ACCORDANCE WITH APPLICABLE LOCAL BUILDING CODES.
19. WIRE AND CABLE CONDUCTORS SHALL BE COPPER #12 AWG MINIMUM UNLESS SPECIFICALLY NOTED OTHERWISE ON DRAWINGS.
20. GROUNDING CONDUCTORS SHALL BE SOLID TINNED COPPER UNLESS OTHERWISE NOTED.
21. ALL MATERIALS SHALL BE U.L. LISTED.
22. CONDUIT
    A. RIGID CONDUIT SHALL BE U.L. LABEL GALVANIZED ZINC COATED WITH ZINC INTERIOR AND SHALL BE USED WHEN INSTALLED IN OR UNDER CONCRETE SLABS IN CONTACT WITH THE EARTH, UNDER PUBLIC ROADWAYS, IN MASONRY WALLS OR EXPOSED ON BUILDING EXTERIOR. RIGID CONDUIT IN CONTACT WITH EARTH SHALL BE 1/2 LAPPED WRAPPED WITH HUNTS WRAP PROCESS NO. 3
    B. ELECTRICAL METALLIC TUBING SHALL HAVE U.L. LABEL, FITTING SHALL BE GLAND RING COMPRESSION TYPE. EMT SHALL BE USED ONLY FOR INTERIOR RUNS.
    C. FLEXIBLE METALLIC CONDUIT SHALL HAVE U.L. LISTED LABEL AND MAY BE USED WHERE PERMITTED BY CODE. FITTINGS SHALL BE "JAKE" OR "SQUEEZE" TYPE, SEAL TIGHT FLEXIBLE CONDUIT. ALL CONDUIT SHALL HAVE FULL SIZE EQUIPMENT GROUND WIRE.
    D. CONDUIT RUNS SHALL BE SURFACE MOUNTED UNLESS INDICATED OTHERWISE. CONDUIT INDICATED SHALL RUN PARALLEL OR AT RIGHT ANGLES TO CEILING, FLOOR OR BEAMS. VERIFY EXACT ROUTING OF ALL EXPOSED CONDUIT WITH THE OWNER PRIOR TO INSTALLING. NO HORIZONTAL CONDUITS SHALL BE BELOW 7'-6" A.F.F. NO BX OR ROMEX CABLE IS PERMITTED.
    E. PARALLEL UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 (UNLESS NOTED OTHERWISE) AT A MINIMUM DEPTH OF 30" BELOW GRADE - STACKED UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 (UNLESS NOTED OTHERWISE) AT A MINIMUM DEPTH OF 24" BELOW GRADE.
    F. ABOVE GROUND CONDUIT SHALL BE P.V.C. SCHEDULE 80 (UNLESS NOTED OTHERWISE).
23. ALL ELECTRICAL EQUIPMENT SHALL BE LABELED WITH PERMANENT ENGRAVED PLASTIC LABELS.
24. UPON COMPLETION OF WORK, CONDUCT CONTINUITY, SHORT CIRCUIT, AND FALL OF POTENTIAL GROUND TESTS FOR APPROVAL. SUBMIT TEST REPORTS TO PROJECT MANAGER. CLEAN PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION.

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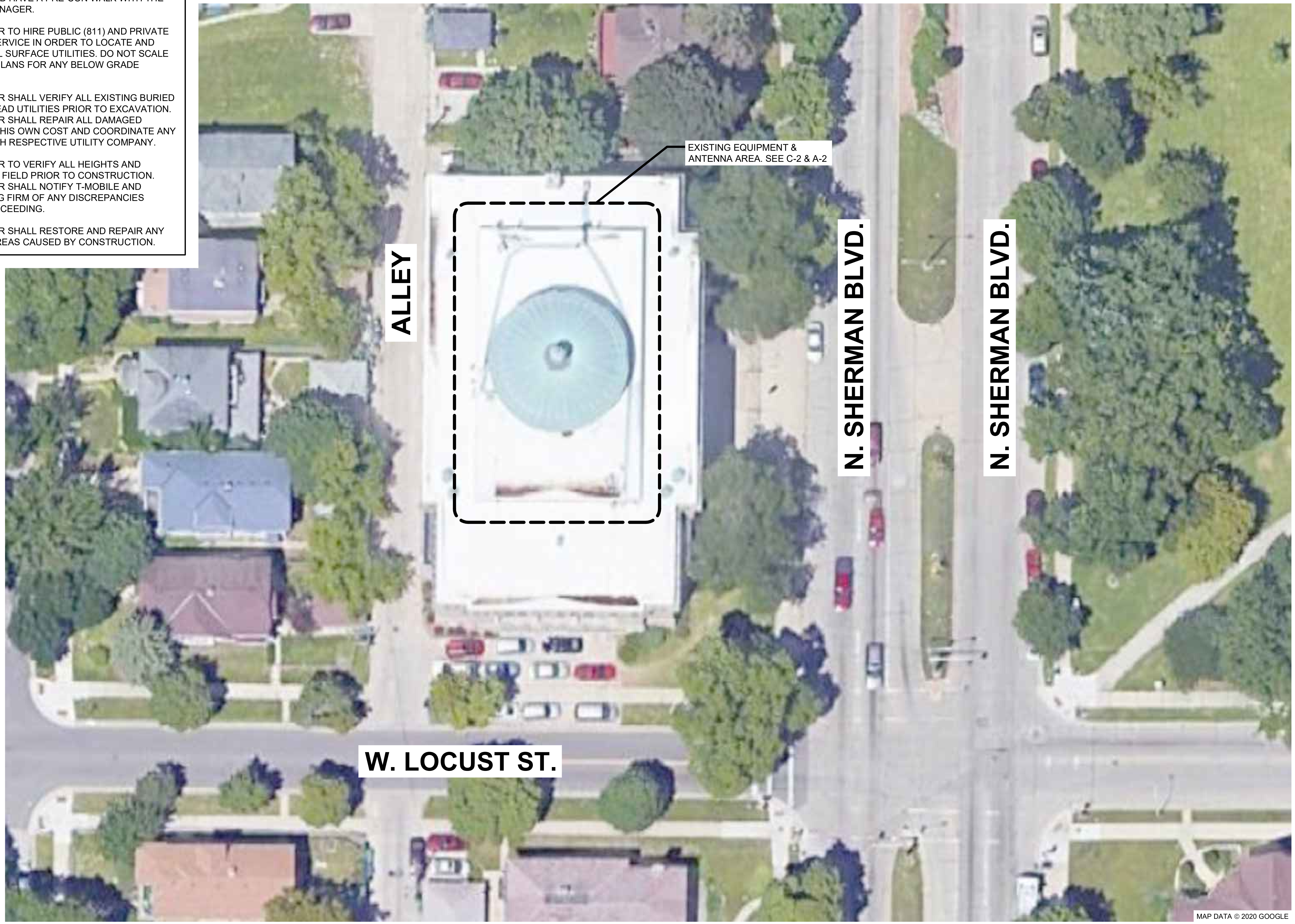
T-3
GENERAL NOTES & SPECIFICATIONS

IMPORTANT SITE NOTES:

1. CONTRACTOR WILL NOT START CONSTRUCTION UNTIL AFTER THEY HAVE RECEIVED THE PRE-CON PACKAGE AND HAVE A PRE-CON WALK WITH THE PROJECT MANAGER.
2. CONTRACTOR TO HIRE PUBLIC (811) AND PRIVATE LOCATING SERVICE IN ORDER TO LOCATE AND PROTECT ALL SURFACE UTILITIES. DO NOT SCALE OFF THESE PLANS FOR ANY BELOW GRADE UTILITIES
3. CONTRACTOR SHALL VERIFY ALL EXISTING BURIED AND OVERHEAD UTILITIES PRIOR TO EXCAVATION. CONTRACTOR SHALL REPAIR ALL DAMAGED UTILITIES AT HIS OWN COST AND COORDINATE ANY REPAIRS WITH RESPECTIVE UTILITY COMPANY.
4. CONTRACTOR TO VERIFY ALL HEIGHTS AND AZIMUTHS IN FIELD PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY T-MOBILE AND ENGINEERING FIRM OF ANY DISCREPANCIES BEFORE PROCEEDING.
5. CONTRACTOR SHALL RESTORE AND REPAIR ANY DAMAGED AREAS CAUSED BY CONSTRUCTION.



OVERALL SITE PLAN 1

SCALE: 1" = 40'-0"

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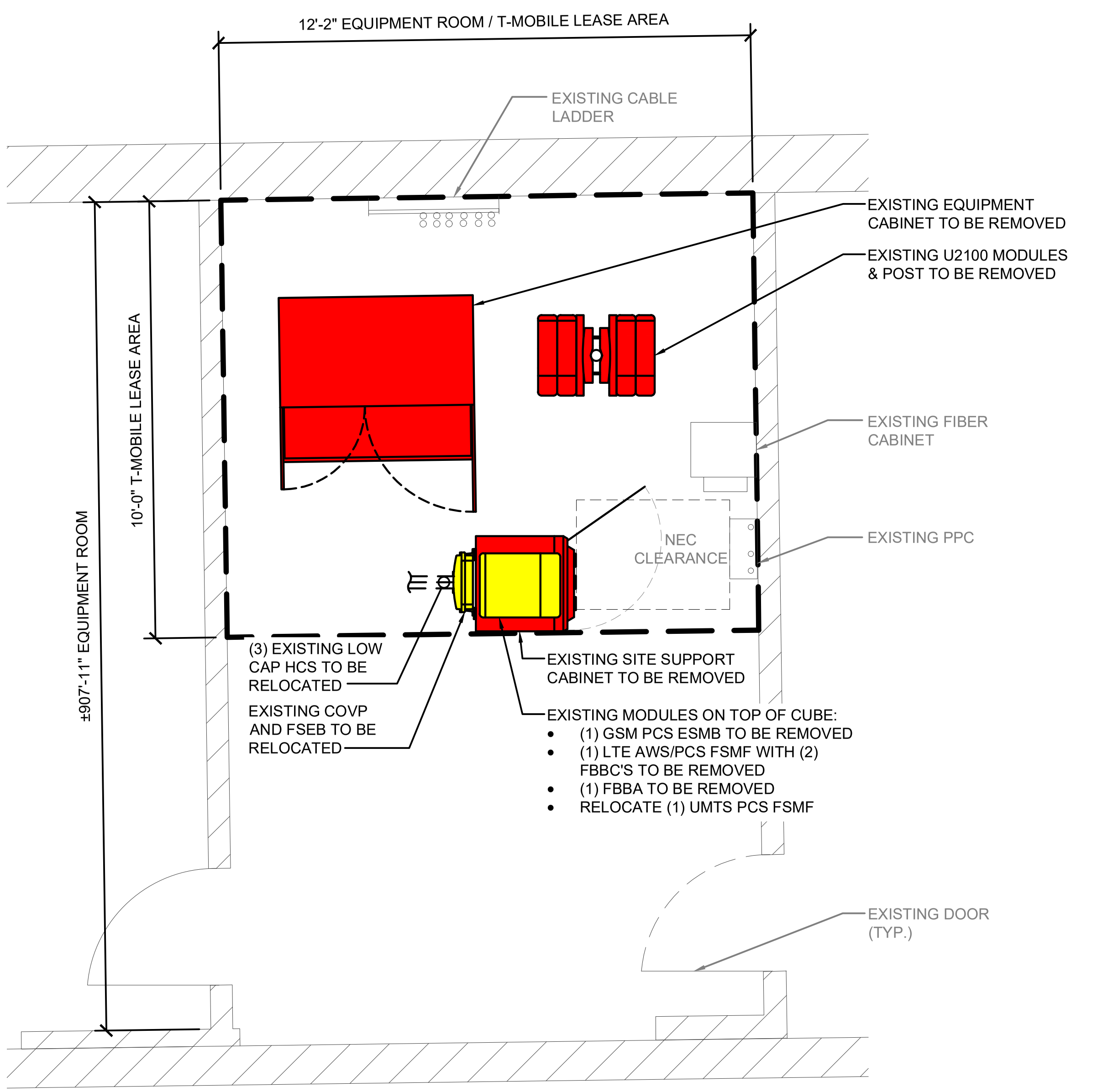
C-1
OVERALL SITE PLAN

LEGEND

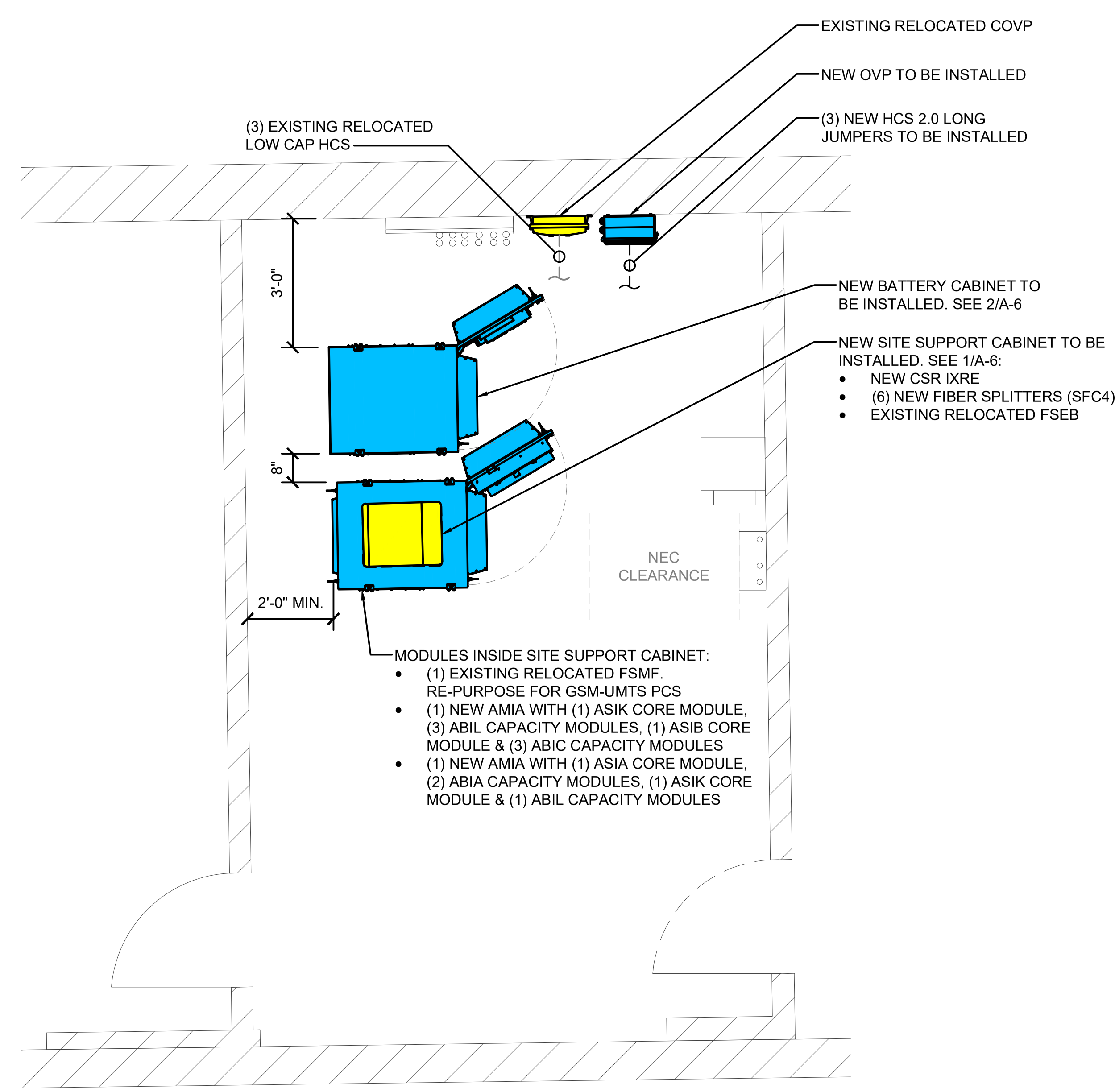
(white)	EXISTING EQUIPMENT
(red)	REMOVED EQUIPMENT
(yellow)	RELOCATED EQUIPMENT
(blue)	NEW EQUIPMENT

NOTE:
CONTRACTOR TO FIELD VERIFY LOCATION OF FYGA GPS ANTENNA TO BE UTILIZED.



EXISTING SITE PLAN

SCALE: 1/4" = 1'-0" | 1



NEW SITE PLAN

SCALE: 1/4" = 1'-0" | 2

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C-2
EXISTING & NEW SITE PLANS

IMPORTANT SITE NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING FINAL RF CONFIGURATION AND NOTIFY T-MOBILE AND ENGINEERING FIRM WITH ANY DISCREPANCIES.
2. CONTRACTOR SHALL VERIFY ALL FINAL CONNECTION LOCATIONS WITH T-MOBILE ENGINEER, RF ENGINEER, AND NET-OPS PRIOR TO INSTALLATION.
3. CONTRACTOR TO USE PROPER TORQUE WRENCH WHEN INSTALLING AND TIGHTENING CONNECTORS TO INSURE PROPER FIT.
4. CONTRACTOR TO ARRANGE NEW MODULES/EQUIPMENT TO AVOID INTERFERING WITH SAFETY CLIMB.

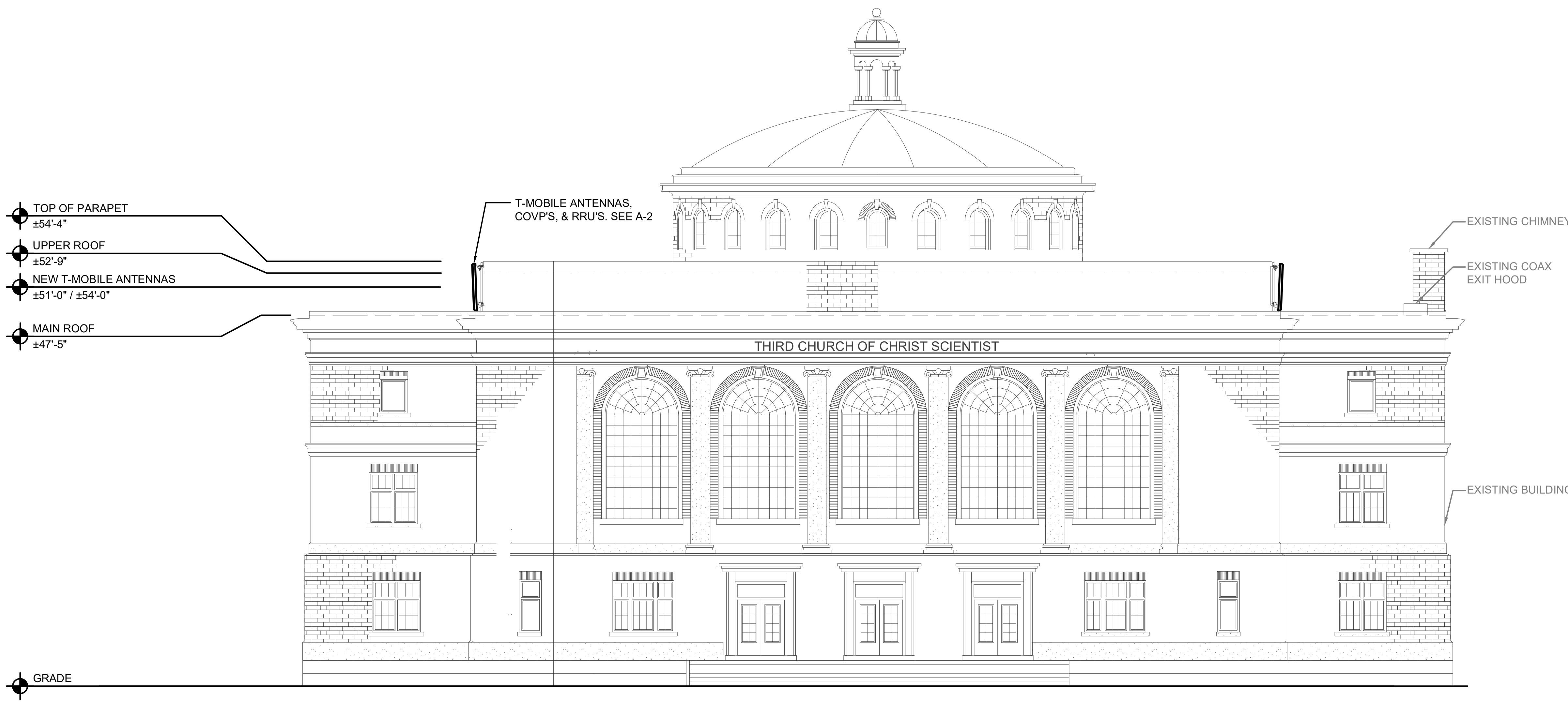
NOTE:
W-T'S SCOPE OF WORK DOES NOT INCLUDE A STRUCTURAL EVALUATION OF THIS TOWER OR STRUCTURE. NEW ANTENNAS AND EQUIPMENT SHOWN ON THIS PLAN HAVE NOT BEEN EVALUATED TO VERIFY THE TOWER OR STRUCTURE HAS THE CAPACITY TO ADEQUATELY SUPPORT THESE ANTENNAS. PRIOR TO ANY ANTENNA OR EQUIPMENT INSTALLATION, A STRUCTURAL EVALUATION OF THE TOWER OR STRUCTURE, INCLUDING ALL ANTENNA MOUNTING SYSTEMS & HARDWARE SHALL BE PERFORMED.

NOTES:
1. CONTRACTOR SHALL PAINT NEW ANTENNAS, COAX, & MOUNTING HARDWARE TO MATCH EXISTING BRICK COLOR.
2. CONTRACTOR SHALL INSTALL NEW MOUNTING HARDWARE INTO THE MORTAR LINE AND NOT THE BRICK FACE.

NOTE:
TOP LINE OF AAHF ANTENNAS MUST MATCH THE TOP LINE OF OTHER ANTENNAS.

LEGEND

- EXISTING EQUIPMENT
- REMOVED EQUIPMENT
- RELOCATED EQUIPMENT
- NEW EQUIPMENT



ELEVATION

SCALE: 1/16" = 1'-0"

1

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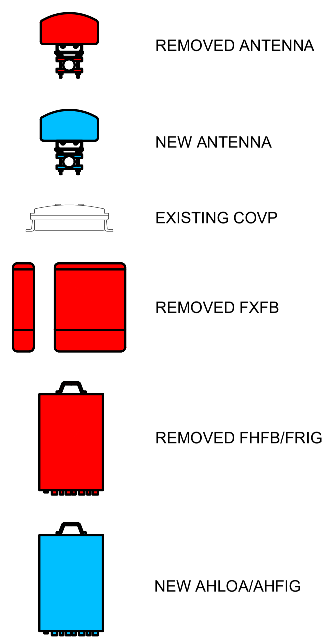
A-1
ELEVATION

LEGEND



ANTENNA & CABLE SCHEDULE

SECTOR	ALPHA		BETA		GAMMA	
LOCATION	A-2	A-1	B-2	B-1	C-2	C-1
TECHNOLOGY	LTE 5G B41	GSM-LTE-UMTS PCS/ LTE AWS-600/N600	LTE 5G B41	GSM-LTE-UMTS PCS/ LTE AWS-600/N600	LTE 5G B41	GSM-LTE-UMTS PCS/ LTE AWS-600/N600
AZIMUTH	0°		120°		240°	
RAD CENTER	±54'-0"	±51'-0"	±54'-0"	±51'-0"	±54'-0"	±51'-0"
COLOR CODING	RED	RED (1-8)	GREEN	GREEN (1-8)	BLUE	BLUE (1-8)
MODEL #	AAHF (ACTIVE ANTENNA-MASSIVE MIMO)	COMMSCOPE FFHH-65C-R3	AAHF (ACTIVE ANTENNA-MASSIVE MIMO)	COMMSCOPE FFHH-65C-R3	AAHF (ACTIVE ANTENNA-MASSIVE MIMO)	COMMSCOPE FFHH-65C-R3
MECHANICAL DOWNTILT	-	-	-	-	-	-
ELECTRICAL DOWNTILT	-	-	-	-	-	-
RRU TYPE	AAHF (INTEGRATED)	AHLOA AHFIG	AAHF (INTEGRATED)	AHLOA AHFIG	AAHF (INTEGRATED)	AHLOA AHFIG
HCS DIA. & TYPE	-	EXISTING LOW CAP HCS	-	EXISTING LOW CAP HCS	-	EXISTING LOW CAP HCS
HCS ACTUAL LENGTH	-	-	-	-	-	-
HCS FACTORY LENGTH	-	±100'-0"	-	±175'-0"	-	±75'-0"
JUMPER TYPE FROM COVP/OVP TO RRU	HCS 2.0 LONG JUMPER	HYBRID JUMPER	HCS 2.0 LONG JUMPER	HYBRID JUMPER	HCS 2.0 LONG JUMPER	HYBRID JUMPER
JUMPER LENGTH	±120'-0"	±15'-0" / ±15'-0"	±180'-0"	±15'-0" / ±15'-0"	±90-0"	±15'-0" / ±15'-0"
JUMPER TYPE FROM RRU TO ANTENNA	-	RF JUMPER	-	RF JUMPER	-	RF JUMPER
JUMPER LENGTH	-	±15'-0" / ±15'-0"	-	±15'-0" / ±15'-0"	-	±15'-0" / ±15'-0"

NOTE:
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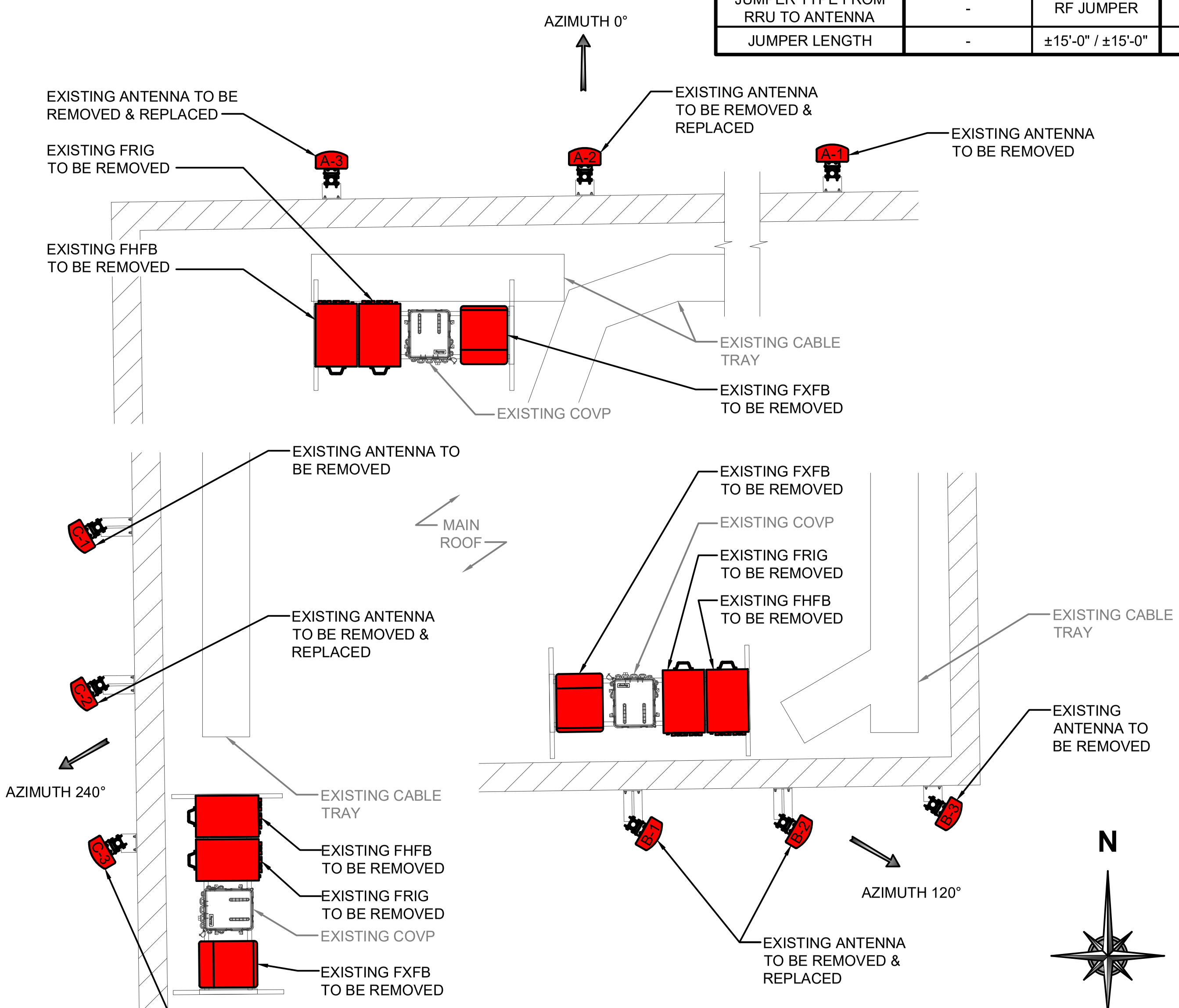
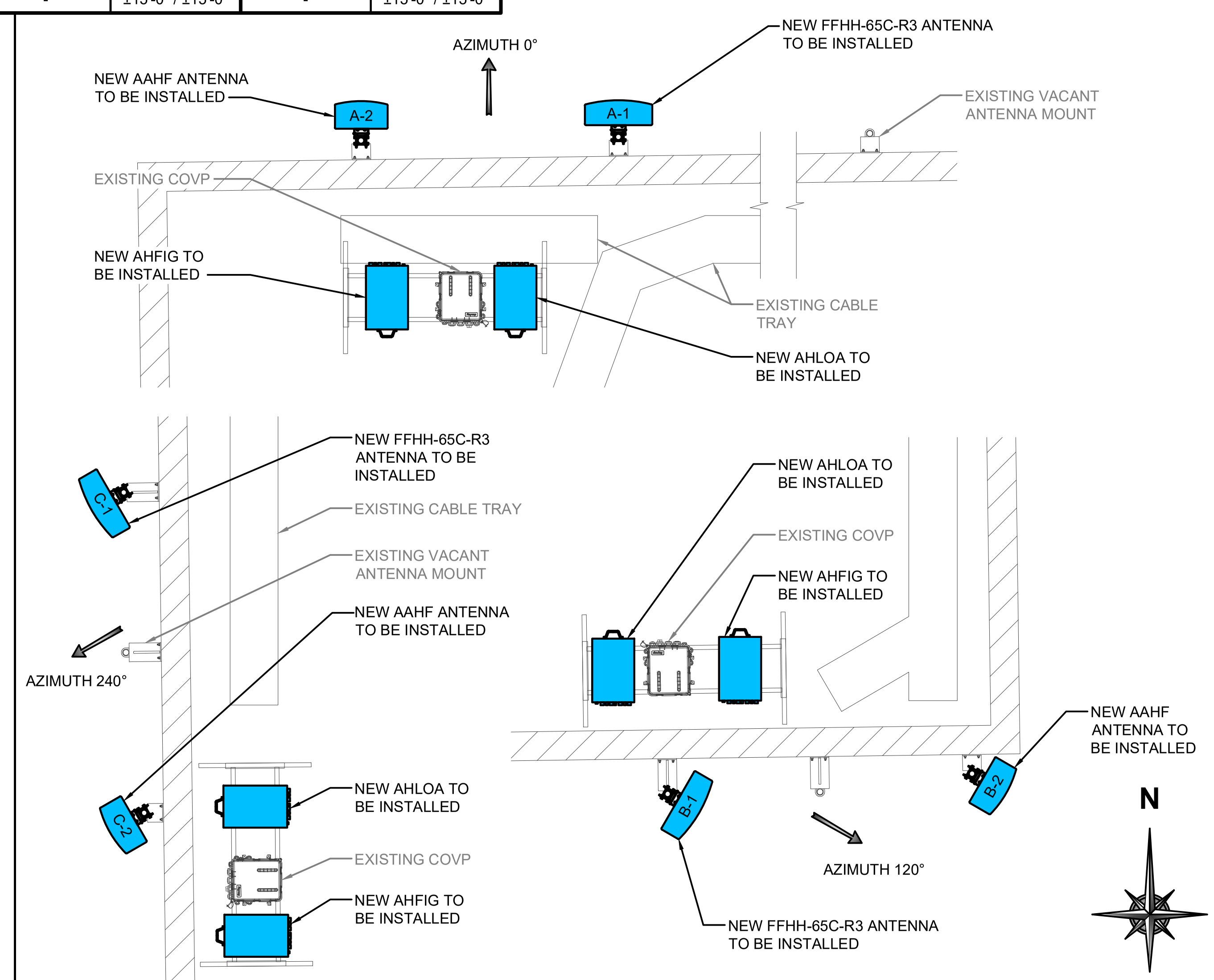
NOTE:
ANTENNA INFORMATION OBTAINED FROM T-MOBILE RF DATA CONFIGURATION SHEET DATED 04/14/2020. CONTRACTOR TO OBTAIN THE MOST CURRENT RFDS FROM T-MOBILE PRIOR TO CONSTRUCTION

NOTE:
CONTRACTOR TO REPLACE EXISTING ANTENNA MAST PIPE WITH NEW MAST PIPE TO ACCOMMODATE NEW ANTENNA



EXISTING ANTENNA PLAN 1

SCALE: NONE



NEW ANTENNA PLAN 2

SCALE: NONE

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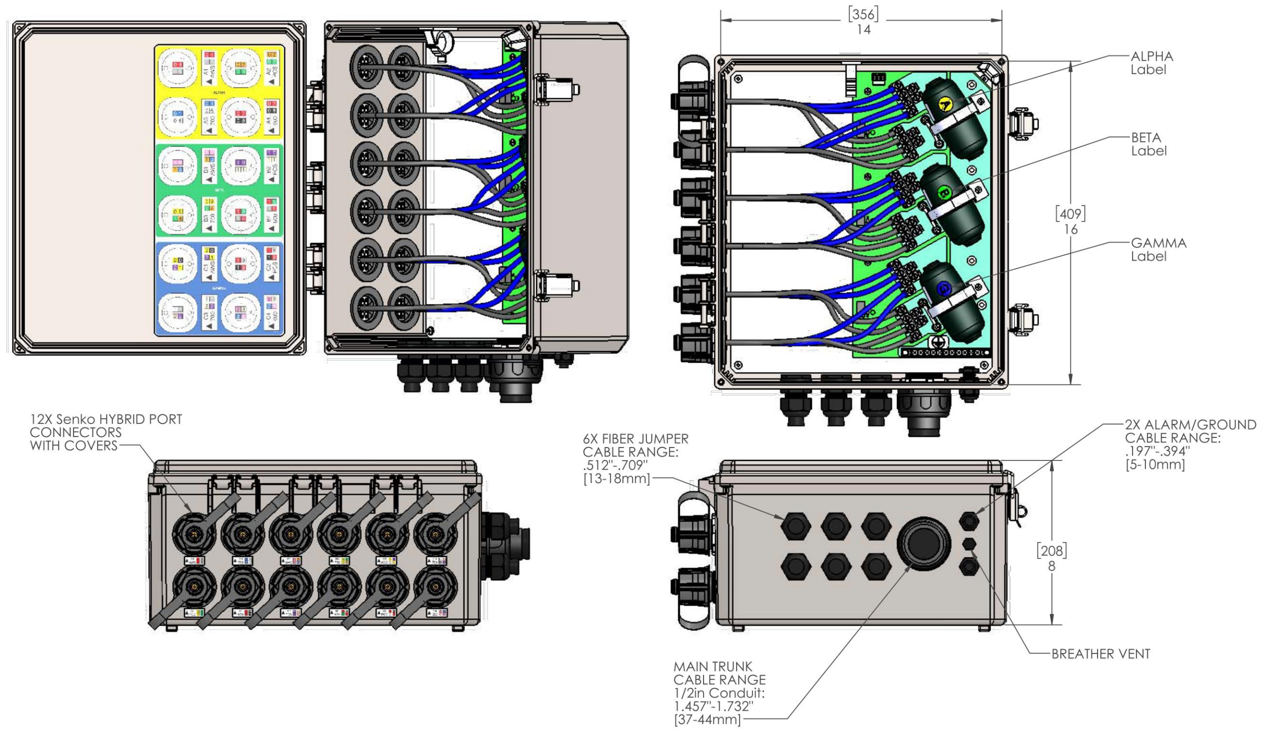
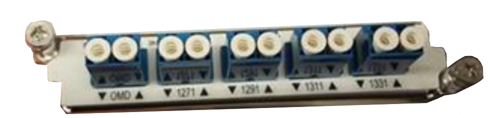
A-2
ANTENNA PLANS & SCHEDULE



OVP DETAIL
SCALE: NONE
1

FRONT



SIDE

NOKIA SFC4
SIZE (L x W x D): T.B.D.
WEIGHT: T.B.D.

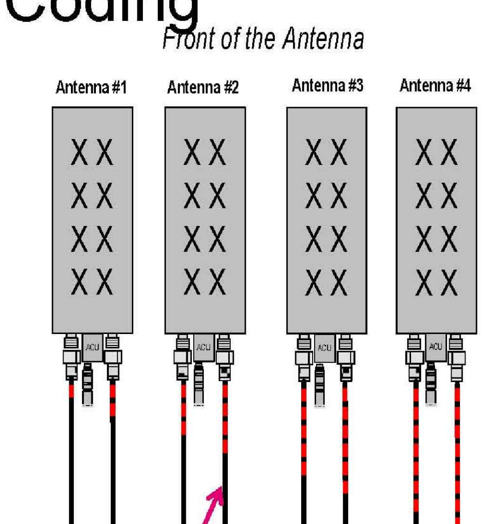
MOUNTING (SITE SUPPORT CABINET)

FIBER SPLITTER DETAIL
SCALE: NONE
2

Coax Color Coding

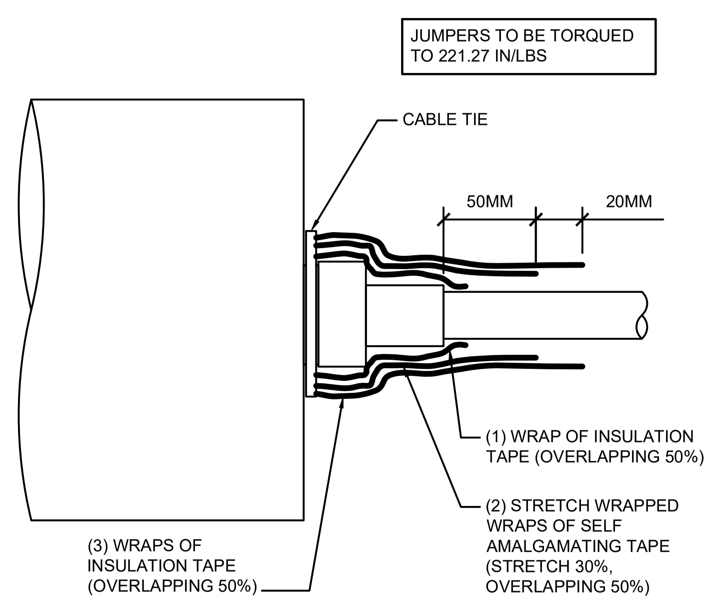
- ❑ Antennas will be labeled (back of antenna view) Right to left 1 - X ports
- ❑ Coax/Jumper lines will be identified by sector color and by number of bands around the coax/jumper

Sector A	Red
Sector B	Green
Sector C	Blue
Sector D	Yellow
Sector E	White
Sector F	Purple
LMU	Brown + Sector Color Bands (1,2)
Fiber ID	Gray
Unused Coax	Pink
Microwave	Orange
PWE T-1's + GPS Downlink cable	ID w/Label Maker

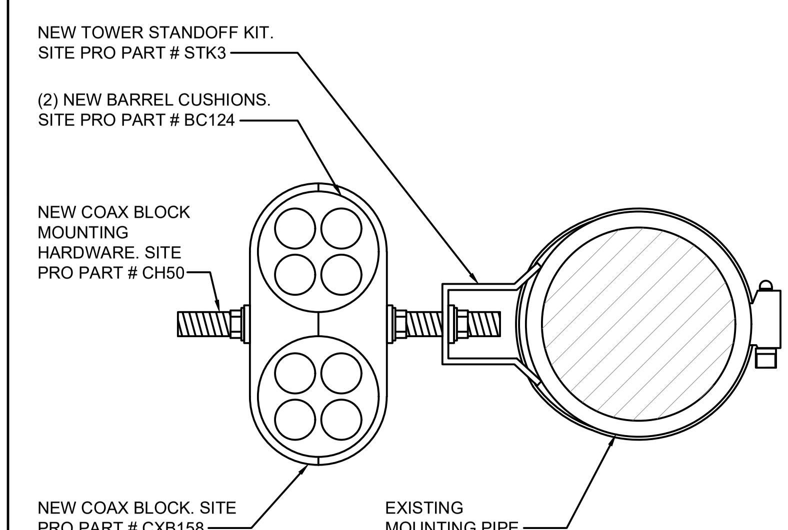


- ❑ Example – Coax with *four bands* of *RED* tape will represent *Alpha sector* and *the 4th port of antenna*.

COAX COLOR CODING
SCALE: NONE
3



RF JUMPER CONNECTION DETAIL
SCALE: NONE
4



RF JUMPER MOUNTING DETAIL
SCALE: NONE
5

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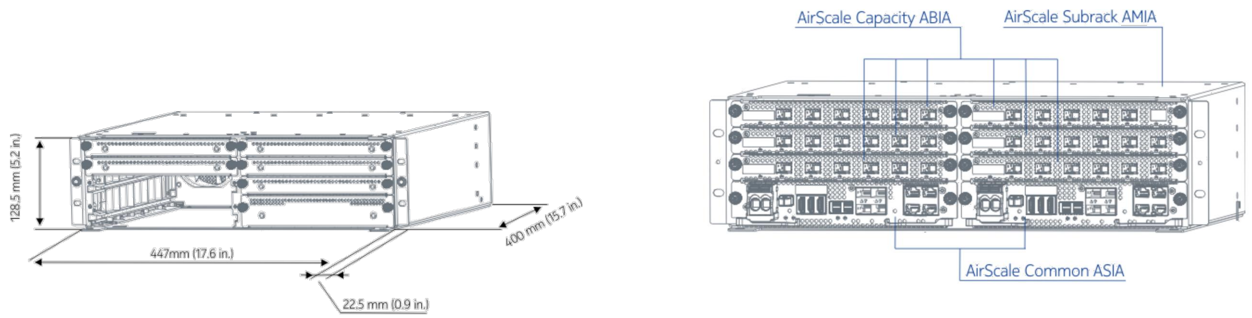
A-3
EQUIPMENT SPECIFICATIONS

Nokia AirScale System Module Indoor consists of the following items:

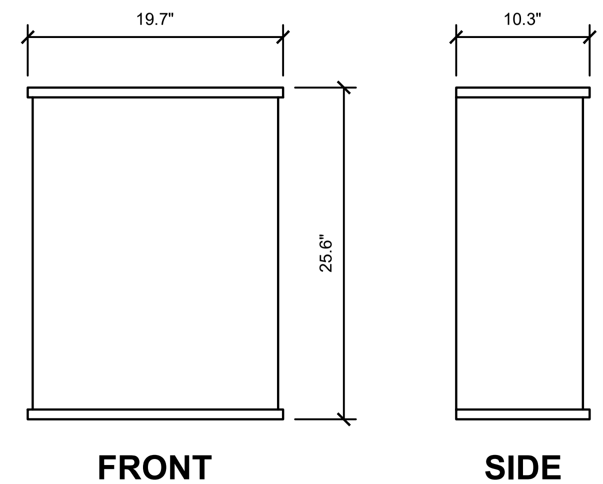
- One Nokia AirScale Subrack (AMIA), including backplane for high bandwidth connectivity between processing plug-in units
- One or two Nokia AirScale Common (ASIA) plug-in units for transport interfacing and for centralized processing
- Up to six Nokia AirScale Capacity (ABIA) plug-in units for baseband processing and for optical interfaces with radio units

Weight	Empty: 5.1 kg (11.2 lb) With dummy panels: 6.8 kg (15 lb) With all units: 23.9 kg (52.7 lb)

The AirScale Subrack (AMIA) has a 3U height and fits into a standard 19 in. rack. Multiple subracks can be stacked on top of each other. The indoor subrack includes fans, a backplane for internal communication, and the DC-feed. The direction of the cooling air can be changed by rotating fans. The default direction is front-to-back.



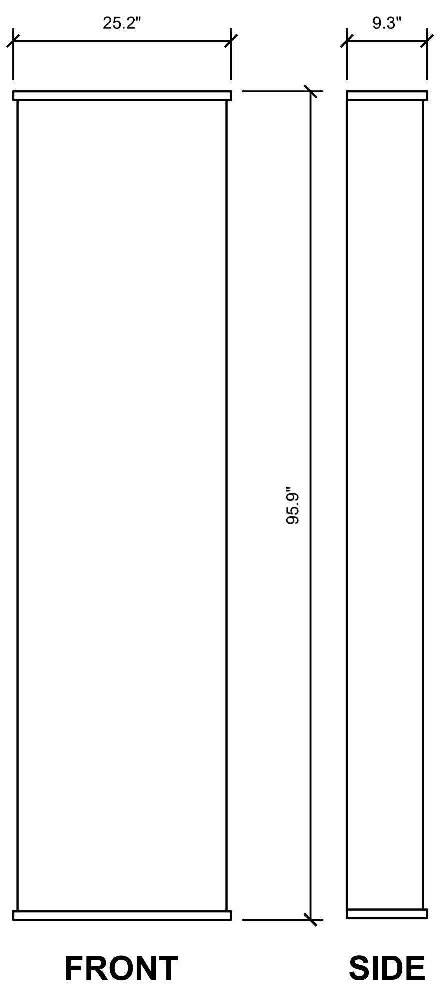
AMIA DETAIL
SCALE: NONE
1



NOKIA AAHF
SIZE (L x W x D): 25.6" x 19.7" x 10.3"

WEIGHT (W/O MOUNTING KIT): 103.6 LBS

ANTENNA DETAIL
SCALE: NONE
2



COMMSCOPE FFHH-65C-R3
SIZE (L x W x D): 95.9" x 25.2" x 9.3"

WEIGHT (W/O MOUNTING KIT): 127.6 LBS

ANTENNA DETAIL
SCALE: NONE
3

NOT USED
SCALE: NONE
4

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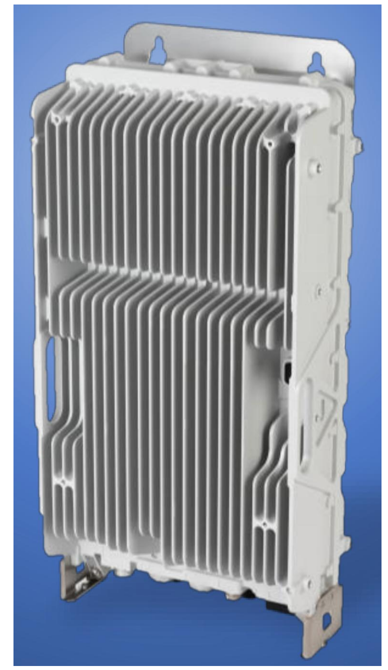
A-4
EQUIPMENT SPECIFICATIONS

Supported Frequency bands	3GPP Band 12/71
Frequencies	Band 12 adjusted: Rx 698 – 715 MHz, TX 728 – 745 MHz Band 71: RX 663 MHz – 698 MHz, TX 617 MHz – 652 MHz
Number of TX/RX paths/pipes	4 pipes; 2T2R, 2T4R, 4T4R for both bands
Instantaneous Bandwidth IBW	16 MHz for B12 and 35MHz for B71 1 MHz below B12 NB IoT future use
Occupied Bandwidth OBW	52 MHz total across bands
Output Power	60W per TX shared between bands
Supply Voltage / Range	DC-48 V / -36 V to -60 V
Typical Power Consumption	664W [ETSI Busy Hour Load at 4TX@60W (Both Bands Active)] 395W [ETSI Busy Hour Load at 4TX@30W (One Band Active)]
Antenna Ports	4 ports, 4.3-10+
Optical Ports	2 x CPRI 9.8 Gbps
ALD Control Interfaces	AISG3.0 from ANT1, 2, 3, 4 and RET (DC on ANT1 & ANT3)
Other Interfaces	External Alarm MDR-26 Serial connector (4 inputs, 1 Output) DC Circular Power Connector
Physical	560 mm x 308 mm x 189 mm Approximately 38kg with no covers or brackets
Operating Temperature Range	-40°C to 55°C (with no solar load)
Surge Protection	Class II 5A
Installation Options	Vertical & Horizontal Book Mount, Pole & Wall Mount

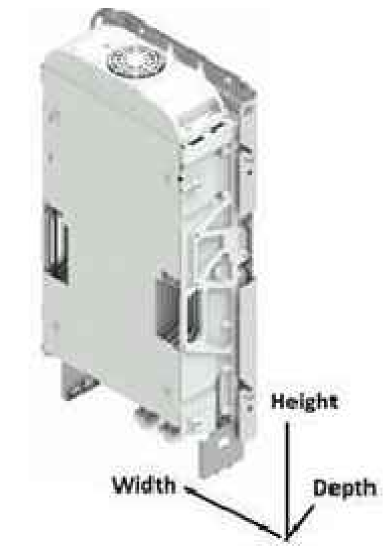


AHLOA DETAIL

SCALE: NONE

1

	Instantaneous BW (DL/UL)	65MHz on Band 25, 80MHz on Band 66
	Supported Modulation schemes	up to 64QAM (UL) and up to 256QAM (DL)
	Supported bandwidths	LTE 1.4,3,5,10,15,20 MHz
	No. of ports	4T4R
	Output Power	80 W for Band 25 and 40 W for Band 66 (Total Power is 480W)
	DC connector	Terminal block
	Optical Fiber connector	2 x 9.8Gbps CPRI, R2CT IP seal
	RF Connector	4.3-10+
	AISG	AISG on all ports, DC on ANT1 and ANT3
	Dimensions (H x W x D) in	27.3 x 12.1 x 5.2
	Weight lbs	70.5 without cover
	HW/SW Availability	Available now – SRAN19A
	5G NR Support	YES
NB-IoT Support	YES (in band, guardband, standalone)	



AHFIG DETAIL

SCALE: NONE

2

NOT USED

SCALE: NONE

3

NOT USED

SCALE: NONE

4

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A-5
EQUIPMENT SPECIFICATIONS

ecifications

el	HPL3 (HP-Large 3 Power Cabinet)
eneral	
itruction	Aluminum enclosure
ensions H x D)	30 x 72 x 34.6 in. (762 x 1829x 879mm), Depth with Door/Hatch: 44.7 in. (1136mm)
ht	~595 lbs (~270kg) (without customer equipment or batteries)
nal rack dimension	Total Equipment space 30RU: Horizontal rack: 19" x 27RU Vertical rack: 19" x 3RU Power System space: 23" x 12RU
nting options	Pad-mount, plinth option
h	Polyester Power Paint (Tan)
y	UL Listed , IEC / EN 60950
vironment	
ating temperature	-40°C to +50°C (-40°F to +122°F) with solar load. IP 55
ection class	designed to GR-487
stics	65dBA @5000W heat load , 70dBA @ 6000W
idity (relative)	95%, non-condensing (Max.)
ermal Management	
ng Equipment:	Direct Air Cooling, 6000W capacity, 5°C delta T
ing Equipment:	Forced air heating (2) 1000W AC heaters
uipment	
e entry	Knock-out plate on each upper side wall / Additional knockouts on side (1) 3" conduit hole with hole plug
latch	3 point latching, 5/16 nut driver tool, pad-locking capability
ary ground	10 double-hole ¼"-20 threaded holes on 5/8" center ground bar
g Ears	4 Lifting Tabs
ı	Optional 6" plinth available
dard equipment	AC Load Center: 240V split phase, dual feed / (1) 200A + (1)100A 208V 3-phase, single feed / (1) 200A AC Surge Protection for each breaker feed GFCI Receptacle 120V Temp Probes (6 form-C) Alarm Termination block 605A/ 54V (336kW) redundant Power System with DIN rail distribution 12 rectifier positions (3x55A DPR3000 rectifiers included) 48 poles for load (2x10A, 3x50A, and 6x100A load breakers included) 16 poles for battery (2) SB350 / (2) SB175 Battery connections (3) SB350 Generator connections
: Door:	(6) DC powered centrifugal fans with (3) MERV-13 filters, (GORE option Clogged Filter alarm pressure switch Door intrusion alarm (2) 1000W AC powered heaters LED interior cabinet light
Hatch:	Exhaust vent with (3) MERV-13 filters, (GORE option)
dering information	
net	ESOA600-HCU01 HP-Large 3 600A Power / Equipment Cabinet
fier	ESR-48/60A A-T 48V / 56A 3000W, 96.4%, CAN communication
roller (Spare)	TPS1020028AU17 Orion TOUCH Controller
ı, 6"	37993318816900-S Plinth for V1/V2, HPL2, HPL3, LB2 and LB3

ecifications are subject to change without prior notice

SITE SUPPORT CABINET

SCALE: NONE

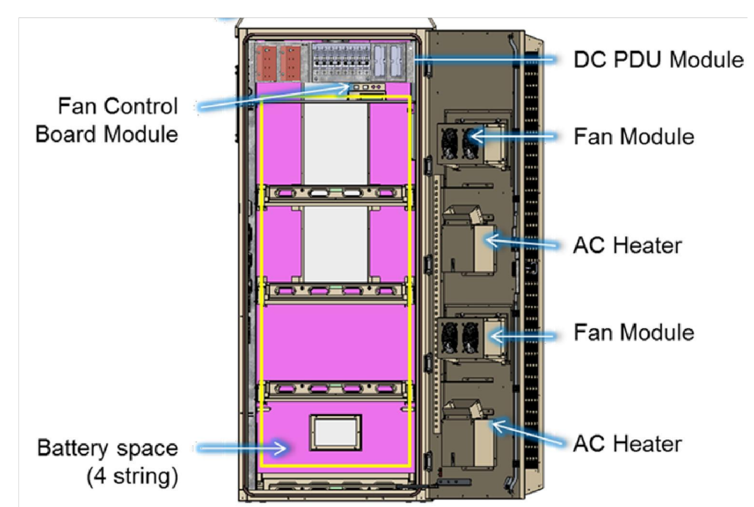
1

Smarter. Greener. Together.

Specifications

Model	Large 3 Battery (LB3) Cabinet
1. General	
Construction	Aluminum enclosure
Dimensions (W x H x D)	30 x 72 x 35in. (766 x 1829x 889mm), Depth with door: 41 in. (1045mm)
Weight	~540lbs (245kg) (without batteries)
Internal rack dimension	4 battery trays to support up to 210Ah batteries
Mounting options	Pad-mount, plinth option
Finish	Polyester Powder Paint (Tan)
Safety	UL Listed, IEC / EN 60950
2. Environment	
Operating temperature	-40C to +50C (-40F to +122F) with solar load.
Protection class	IP55 designed to GR-487
Acoustics	65 dBA
Humidity (relative)	95%, non-condensing (Max.)
3. Thermal management	
Cooling	Direct Air Cooling: (4) Axial Fans. Filters: F6 front and rear
Heating	Forced air heating (2) 1000W AC heaters
4. Equipment	
Cable Entry	Knock-out plate on each upper side wall Additional knockouts each side
Door latch	3 point latching, 5/16 Nut driver tool, pad-locking capability
Lifting Ears	4 eye bolts
Standard equipment	AC Load Center with AC Surge protection and GFCI outlet Left or Right side AC entry options (2) 1000W AC powered heater DC Load Center 600A bulk feed bus bar (4) 20050A DIN rail battery breakers (4) 2-hole lug landings (2) Anderson SB350 input connectors to daisy chain 2nd battery cabinet 2AWG battery cables from breakers to trays Configurable trays for (4) strings of up to 210Ah batteries Door intrusion switch LED interior cabinet light Fan Control Board, factory wired alarms via RJ45 output (fan & breaker alarms) Cabinet Connection kit (2) 4/0 cables with SB350 disconnects to connect to power cabinet
5. Ordering information	
Cabinet	ESOF015-ECV04 Large Battery 3 Cabinet
Plinth, 6"	37993318816900-S Plinth for V1/V2, HPL2, LB2 cabinets only

*All specifications are subject to change without prior notice.



BATTERY CABINET

SCALE: NONE

2

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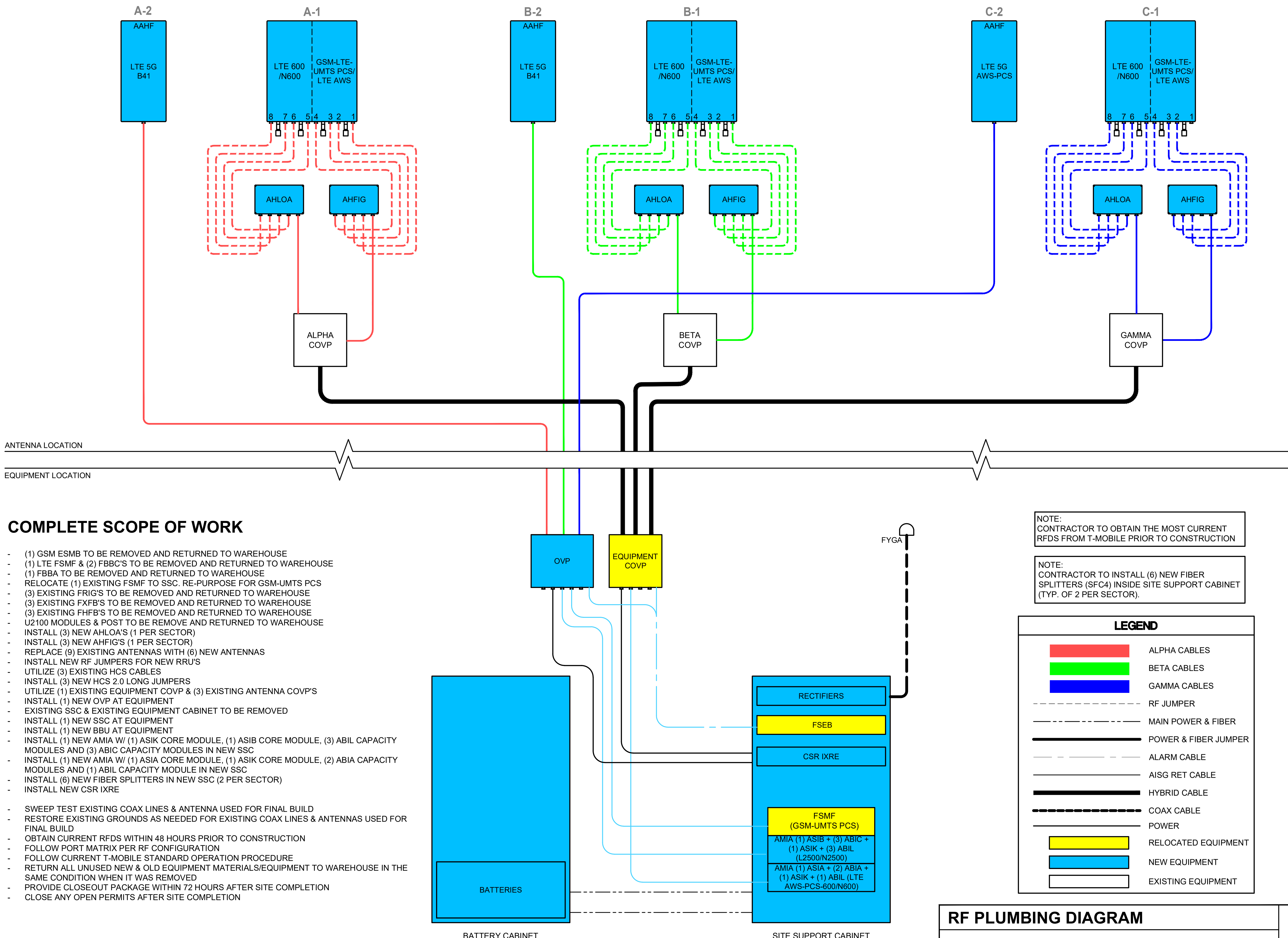
DRAWN: PS
JOB: T1900570

A-6
EQUIPMENT SPECIFICATIONS



COMPLETE SCOPE OF WORK

- (1) GSM ESMB TO BE REMOVED AND RETURNED TO WAREHOUSE
- (1) LTE FSMF & (2) FBBC'S TO BE REMOVED AND RETURNED TO WAREHOUSE
- (1) FBBA TO BE REMOVED AND RETURNED TO WAREHOUSE
- RELOCATE (1) EXISTING FSMF TO SSC. RE-PURPOSE FOR GSM-UMTS PCS
- (3) EXISTING FRIG'S TO BE REMOVED AND RETURNED TO WAREHOUSE
- (3) EXISTING FXFB'S TO BE REMOVED AND RETURNED TO WAREHOUSE
- (3) EXISTING FHFB'S TO BE REMOVED AND RETURNED TO WAREHOUSE
- U2100 MODULES & POST TO BE REMOVE AND RETURNED TO WAREHOUSE
- INSTALL (3) NEW AHLOA'S (1 PER SECTOR)
- INSTALL (3) NEW AHFIG'S (1 PER SECTOR)
- REPLACE (9) EXISTING ANTENNAS WITH (6) NEW ANTENNAS
- INSTALL NEW RF JUMPERS FOR NEW RRU'S
- UTILIZE (3) EXISTING HCS CABLES
- INSTALL (3) NEW HCS 2.0 LONG JUMPERS
- UTILIZE (1) EXISTING EQUIPMENT COVP & (3) EXISTING ANTENNA COVP'S
- INSTALL (1) NEW OVP AT EQUIPMENT
- EXISTING SSC & EXISTING EQUIPMENT CABINET TO BE REMOVED
- INSTALL (1) NEW SSC AT EQUIPMENT
- INSTALL (1) NEW BBU AT EQUIPMENT
- INSTALL (1) NEW AMIA W/ (1) ASIK CORE MODULE, (1) ASIB CORE MODULE, (3) ABIL CAPACITY MODULES AND (3) ABIC CAPACITY MODULES IN NEW SSC
- INSTALL (1) NEW AMIA W/ (1) ASIA CORE MODULE, (1) ASIK CORE MODULE, (2) ABIA CAPACITY MODULES AND (1) ABIL CAPACITY MODULE IN NEW SSC
- INSTALL (6) NEW FIBER SPLITTERS IN NEW SSC (2 PER SECTOR)
- INSTALL NEW CSR IXRE

- SWEEP TEST EXISTING COAX LINES & ANTENNA USED FOR FINAL BUILD
- RESTORE EXISTING GROUNDS AS NEEDED FOR EXISTING COAX LINES & ANTENNAS USED FOR FINAL BUILD
- OBTAIN CURRENT RFDS WITHIN 48 HOURS PRIOR TO CONSTRUCTION
- FOLLOW PORT MATRIX PER RF CONFIGURATION
- FOLLOW CURRENT T-MOBILE STANDARD OPERATION PROCEDURE
- RETURN ALL UNUSED NEW & OLD EQUIPMENT MATERIALS/EQUIPMENT TO WAREHOUSE IN THE SAME CONDITION WHEN IT WAS REMOVED
- PROVIDE CLOSEOUT PACKAGE WITHIN 72 HOURS AFTER SITE COMPLETION
- CLOSE ANY OPEN PERMITS AFTER SITE COMPLETION

NOTE:
CONTRACTOR TO OBTAIN THE MOST CURRENT RFDS FROM T-MOBILE PRIOR TO CONSTRUCTION

NOTE:
CONTRACTOR TO INSTALL (6) NEW FIBER SPLITTERS (SFC4) INSIDE SITE SUPPORT CABINET (TYP. OF 2 PER SECTOR).

RF PLUMBING DIAGRAM

SCALE: NONE

1

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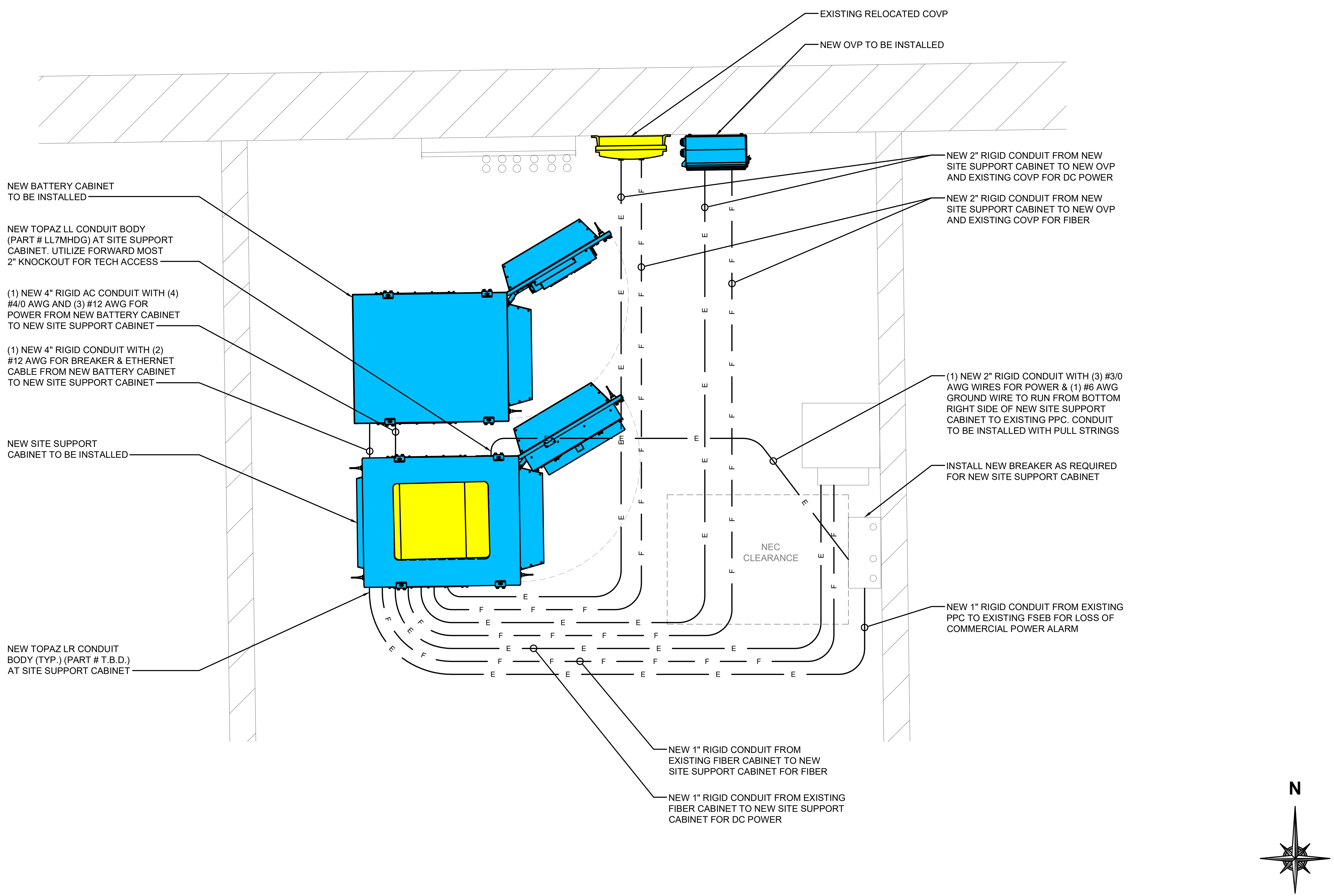
JOB: T1900570

A-7
RF PLUMBING DIAGRAM

PPC NOTES:
- LOW VOLTAGE CONDUIT FROM PPC TO SSC
- (2) RUNS OF BELDEN 27916A 18 AWG 2 CONDUCTOR TYPE TC CABLE, 600V WIRE
- WIRE TO NORMALLY CLOSED RELAY FOR LOCP
- WIRE TO NORMALLY OPEN RELAY FOR GENERATOR RUN

LEGEND

F — FIBER LINE
E — ELECTRIC LINE



UTILITY PLAN

SCALE: 1/2" = 1'-0"

1

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JOB: T1900570

E-1
UTILITY PLAN

GROUNDING STANDARDS:

1.0 DEFINITIONS

AGB: ANTENNA GROUND BAR

AWG: AMERICAN WIRE GAUGE

CADWELDING: AN EXOTHERMIC WELDING PROCESS WHICH CREATES POSITIVE CONTACT OF POSITIVE CONTACT OF GROUNDING CONDUCTORS

EMT: ELECTRICAL METAL TUBING (LIGHT GAUGE METALLIC CONDUIT)

MGB: MASTER GROUND BAR

PVC: POLYVINYL CHLORIDE CONDUIT

RFI: RADIO FREQUENCY INTERFERENCE

TGB: TOWER GROUND BAR

THWN: LETTER TYPE DESIGNATION FOR CONDUCTOR INSULATION THAT IS A MOISTURE AND HEAT RESISTANT THERMOPLASTIC WITH A MAXIMUM OPERATING TEMPERATURE OF 75 DEGREES CELSIUS OR 167 DEGREES FAHRENHEIT

T/I: TENANT IMPROVEMENT

2.0 BACKGROUND

2.1 AREAS OF CONCERN: WHEN DESIGNING A GROUNDING SYSTEM FOR A MOBILE RADIO FACILITY THERE ARE FOUR INTERRELATED AREAS OF CONCERN. THE BASIC OBJECTIVE FOR EACH IS:

1. LIGHTNING PROTECTION -TO MAINTAIN ALL EQUIPMENT AT THE SAME POTENTIAL DURING A LIGHTNING IMPULSE.
2. RFI FOR NOISE INDUCTION CONTROL -TO ESTABLISH THE LOWEST POSSIBLE IMPEDANCE AMONG ALL EQUIPMENT.
3. ELECTROSTATIC CONTROL -TO REDUCE ELECTROSTATIC DISCHARGE PROBLEMS.
4. PERSONNEL SAFETY -TO MAINTAIN A MINIMUM VOLTAGE DIFFERENCE BETWEEN ANY TWO METALLIC OBJECTS WHICH PERSONNEL MIGHT CONTACT SIMULTANEOUSLY.

2.2 A/C GROUNDING: IN THIS GROUNDING SYSTEM THE A/C SERVICE GROUND SHALL BE KEPT ISOLATED FROM THE EQUIPMENT FRAME WORK AND LIGHTNING PROTECTION GROUND SYSTEMS EXCEPT FOR ONE SPECIFIC POINT. THIS POINT IS THE MAIN GROUNDING POINT OF THE SYSTEM. THIS WOULD TYPICALLY BE CONNECTING THE A/C SERVICE GROUND AT THE COMMERCIAL POWER RISER POLE DISCONNECT/METER BASE TO THE EXTERNAL GROUND RING. ALL GROUNDING CONNECTIONS INSIDE OF CABINETS SHALL BE SCRAPED TO BARE METAL AND COATED WITH NOALOX.

2.3 LIGHTNING CONSIDERATIONS: LIGHTNING DAMAGE OCCURS FROM EITHER INDUCTION OR FROM AN ACTUAL DIRECT STRIKE TO THE BUILDING, USUALLY TAKEN THROUGH THE TOWER AND/OR ANTENNAS. STRIKES TO OTHER NEARBY OBJECTS INDUCE HIGH ENERGY INTO POWER OR TELEPHONE CABLES ENTERING THE BUILDING. THIS TYPE OF EFFECT HISTORICALLY CAUSES MOST OF THE DAMAGE TO THE BUILDING AND ITS CONTENTS.

3.0 STATION GROUNDING SYSTEM

3.1 MATERIALS:

1. #2 AWG, BARE SOLID TINNED COPPER WIRE, FOR ALL EXTERIOR CONDUCTORS AND TOWER GROUND BAR CONDUCTORS OR AS OTHERWISE SPECIFIED. GROUNDS TO THE RF MODULES SHALL BE NO. 6 STANDARD GREEN INSULATED JUMPERS. THE GROUND WIRE TO THE MGB SHALL BE GREEN JACKETED STRANDED #2 TINNED WIRE BURNDY CONNECTED TO THE BUSS BAR AND CONNECTED TO THE GROUND RING ON A GROUND ROD.
2. #2 AWG, INSULATED STRANDED COPPER CABLE IS ACCEPTABLE FOR INTERIOR GROUND BAR CONDUCTORS ON TENANT IMPROVEMENT SITES.
3. 5/8" X 10" GROUND RODS OF SOLID COPPER, STAINLESS STEEL OR COPPER CLAD HIGH STRENGTH STEEL.
4. ABOVE GRADE CONNECTIONS SHALL BE BURNDY HYGROUND COMPRESSION. BELOW GRADE CONNECTIONS SHALL BE EXOTHERMIC WELD OR OTHER APPROVED EXOTHERMIC WELDING SYSTEM FOR BONDING AS SPECIFIED.
5. XIT OR ADVANCED GROUNDING ELECTRODE (AGE), ALL CHEMICAL GROUND RODS SHALL BE UL APPROVED.
6. SOLID COPPER PLATES OF MINIMUM 3'X3'X1/4" SIZE AS SPECIFIED.
7. NOALOX OR APPROVED EQUAL CONDUCTIVE MEDIUM MATERIAL SHALL BE USED IN ALL MECHANICAL CONNECTIONS.
8. #2 AWG STRANDED INSULATED (GREEN) FOR ALL INTERNAL EQUIPMENT GROUNDING.
9. MECHANICAL FASTENERS (I.E., DOUBLE LUGS, SPLIT BOLTS PARALLEL CONNECTORS) SHALL BE BRONZE, BRASS, COPPER OR STAINLESS STEEL AND HAVE NOALOX BETWEEN CONDUCTOR AND CONNECTION.
10. BOLTS, NUTS AND SCREWS USED TO FASTEN MECHANICAL CONNECTORS SHALL BE STAINLESS STEEL WITH STAR TYPE STAINLESS STEEL LOCK WASHERS.
11. ALL LUG TUBE FASTENERS SHALL PROVIDE TWO HOLES TO ALLOW A DOUBLE BOLT CONNECTION.

3.2 MASTER GROUND BAR (MGB): THE PURPOSE OF THE MASTER GROUND BAR IS TO GROUND THE BTS AND ANY OTHER METALLIC OBJECTS AROUND THE BTS. IF AN MGB IS NOT PROVIDED WITH THE BTS, THE MGB SHALL BE AS FOLLOWS: THE MGB IS A COPPER BAR MEASURING 4"W X 24"L X 1/4" LOCATED AS CLOSE TO THE BTS AS POSSIBLE. THE MGB SHALL HAVE A MINIMUM NUMBER OF (28) 3/8" HOLES. GROUND BAR SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. (2) #2 TINNED SHALL BE MECHANICALLY ATTACHED (2-HOLE COMPRESSION LUG 3/8" HOLES, 1" CENTER TO CENTER SPACING) TO THE MGB AND DOWN LEADS THEN TAKEN THROUGH CONDUIT TO THE GROUND RING. THIS CONDUCTOR SHALL BE KEPT SEPARATE AND ISOLATED UNTIL TERMINATING AT THE MAIN GROUNDING POINT, (I.E. EXTERIOR GROUND RING OR BUILDING STEEL).

3.3 ANTENNA GROUND BAR (AGB): THE PURPOSE OF THE ANTENNA GROUND BAR IS PRIMARILY FOR LIGHTNING PROTECTION. COAXIAL CABLE IS USUALLY THE ONLY ITEM GROUNDED TO THIS BAR. HOWEVER IT IS ACCEPTABLE TO BOND EXTERIOR; CABLE TRAY, WAVE GUIDE PORTS AND CANTILEVERED WAVE GUIDE BRIDGES TO THE AGB. THE AGB IS A COPPER BAR MEASURING 4"W X 24"L X 1/4". THERE SHALL BE TWO AGBS, ONE LOCATED AT THE TOP OF THE TOWER AT THE START OF THE VERTICAL RUN OF COAX, THE OTHER AT THE BOTTOM OF THE VERTICAL RUN OF COAX BEFORE IT MAKES ITS BEND. (IF THE TOWER IS OVER 200' THERE SHALL BE A THIRD AGB LOCATED AT THE MIDDLE OF THE TOWER).THE AGB SHALL HAVE A MINIMUM OF (28) 3/8" HOLES. GROUND BARS SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. USE #2 AWG SOLID TINNED WIRE W/ 2-HOLE SHORT BARREL COMPRESSION LUGS 3/8" HOLES, 1" CENTER TO CENTER SPACING). THIS CONDUCTOR SHALL BE KEPT SEPARATE AND ISOLATED UNTIL TERMINATING AT THE MAIN GROUNDING POINT (I.E. EXTERIOR GROUND RING, OR BUILDING STEEL.)

3.4 SURGE ARRESTOR GROUND BAR: THE PURPOSE OF THE SURGE ARRESTOR GROUND BAR IS FOR LIGHTNING PROTECTION. THE SURGE ARRESTOR GROUND BAR IS A BENT (3" X 3") X 1/4" X 24" COPPER BAR. IT IS LOCATED ON THE WAVEGUIDE BRIDGE SUPPORT CLOSEST TO THE EQUIPMENT. ONE FACE OF THE BAR SHALL HAVE A MINIMUM OF (28) 3/8" DIA. HOLES. HOLES SHALL BE IN PAIRS THAT ARE 1" CENTER TO CENTER. THE OTHER FACE SHALL HAVE 3/8" DIA. HOLES AS REQUIRED TO ATTACH AND GROUND COAXIAL SURGE ARRESTORS. THE GROUND BAR SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS.

3.5 ANTENNA GROUNDING: EACH ANTENNA COAXIAL CABLE SHALL TYPICALLY BE GROUNDED AT THREE POINTS USING A HARD-SHELL COAXIAL CABLE KIT FROM THE MANUFACTURER OF THE ANTENNA CABLE. A TYPICAL INSTALLATION SHALL BE AS FOLLOWS:

A. THE FIRST GROUND CONNECTION SHALL OCCUR AS CLOSE TO THE ANTENNA AS POSSIBLE, BELOW THE FIRST POINT THE COAX CABLE BEGINS TO RUN VERTICAL DOWN THE TOWER. THIS GROUND SHALL TERMINATE DIRECT TO THE TOP AGB. ON A T/I, GROUND TO THE AGB AT THE ANTENNA MOUNTS.

B. THE SECOND GROUND SHALL BE MADE AT THE BOTTOM OF THE VERTICAL RUN OF THE COAXIAL CABLE AS IT TURNS OUT AWAY FROM THE TOWER TOWARDS THE BTS. THIS GROUND SHALL BE TERMINATED AT THE TGB. THE TGB SHALL HAVE TWO (2) LEADS OF #2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE ENCASED IN PVC PIPE.

C. THE THIRD GROUND SHALL BE ON THE SURGE ARRESTOR. GROUND TO BE ATTACHED TO THE CABLE ON STRAIGHT RUNS (NOT WITHIN BENDS) AND BE WEATHERPROOFED PER THE MANUFACTURER'S SPECIFICATIONS. THE SURGE ARRESTORS SHALL BE GROUNDED TO THE GROUND BAR. THE SAGB SHALL HAVE TWO (2) LEADS OF #2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE ENCASED IN PVC PIPE.

3.6 EXOTHERMIC WELD & BURNDY CONNECTIONS: EXOTHERMIC WELDS AND BURNDY CONNECTIONS SHALL BOND ALL UNDERGROUND AND DAMP LOCATION CONNECTIONS, SHELTER SKID GROUNDS, TOWER OR MONOPOLE GROUNDS, FENCING CORNER AND GATE POSTS, ANTENNA GROUND BARS, (AGB) SURGE ARRESTER GROUND BAR, AND THE MASTER GROUND BAR (MGB). MECHANICAL CONNECTIONS SHALL BE TYPICALLY USED TO BOND ALL INTERIOR EQUIPMENT, COAX CABLE BRIDGES AND COAXIAL CABLE GROUND KITS. ALL LUG TYPE MECHANICAL CONNECTORS TO THE MGB OR AGB SHALL BE TWO HOLE TYPE CONNECTED WITH STAINLESS STEEL BOLTS AND NUTS WITH STAINLESS STEEL LOCK WASHERS AND NOALOX ON EITHER SIDE OF THE BUSS BAR.

3.7 LIMITS OF BEND RADIUS: IT IS IMPORTANT THAT THE GROUNDING CONDUCTOR CONNECTING THE INSIDE AND OUTSIDE GROUND SYSTEMS BE AS STRAIGHT AS POSSIBLE, WITH NO TURN OR BEND SHORTER THAN ONE FOOT RADIUS WITH A THREE FOOT RADIUS PREFERRED. NO RIGHT ANGLE OR SHARP BENDS SHALL BE ALLOWED.

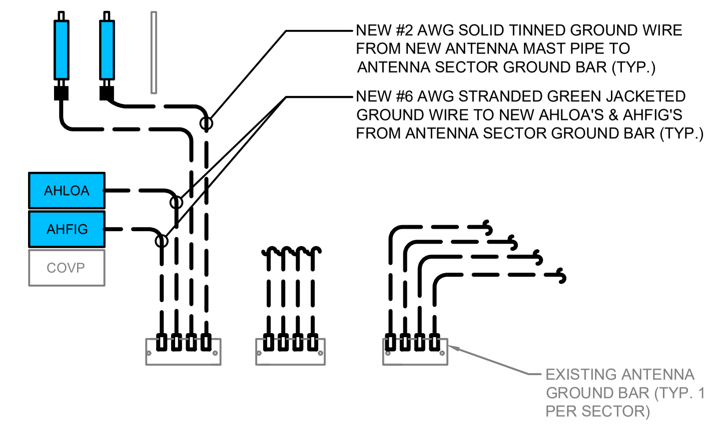
3.8 BONDING PREPARATION & FINISH: ALL SURFACES REQUIRE PREPARATION PRIOR TO BONDING OF EITHER EXOTHERMIC WELD OR BURNDY FASTENERS. GALVANIZED SURFACES SHALL BE GROUND OR SANDED TO THE POINT OF EXPOSING THE STEEL SURFACE BELOW, PRIOR TO BONDING THE GROUND CONDUCTOR. FOR OTHER SURFACES INCLUDING COPPER BUSS BARS ALL PAINT, RUST TARNISH AND GREASE SHALL BE REMOVED PRIOR TO BONDING THE GROUND CONDUCTOR. EXOTHERMIC WELD TYPE BONDS SHALL BE FINISHED WITH THE APPLICATION OF COLD GALVANIZATION AND WHEN APPLICABLE, FINISH PAINTED WITH AN APPROPRIATE COLOR AS REQUIRED. MECHANICAL TYPE BONDS ON BUSS BARS SHALL BE FINISHED WITH THE APPLICATION OF NOALOX OR OTHER APPROVED CONDUCTIVE MEDIUM MATERIAL BETWEEN CONNECTOR AND BUSS BAR. MECHANICAL TYPE BONDS ON ALL OTHER SURFACES SHALL BE FINISHED WITH THE APPLICATION OF COLD GALVANIZATION AND/OR THE APPROPRIATE PAINT TO MATCH AS REQUIRED.

3.9 TESTING: THE OUTSIDE GROUND RING SHALL BE TESTED AFTER INSTALLATION BUT PRIOR TO BACKFILLING THE GROUND RING TRENCH. THE GROUND FIELD RESISTANCE SHALL MEASURE 5 OHMS OR LESS TO GROUND. ANY DIFFICULTY IN ACHIEVING THIS LEVEL OF RESISTANCE MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT MANAGER. THE RESISTANCE TO GROUND SHALL BE MEASURED USING THE FALL OF POTENTIAL METHOD. TESTING SHALL BE PERFORMED BY AN OWNER PROVIDED INDEPENDENT TESTING LABORATORY FROM WHICH A WRITTEN REPORT SHALL BE PRODUCED FOR REVIEW BY THE PROJECT MANAGER.

3.10 GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE.
2. ALL GROUNDING SHALL COMPLY WITH THE NATIONAL ELECTRICAL CODE.
3. ALL ELECTRICAL ITEMS SHALL BE U.L. APPROVED OR LISTED.
4. CONTRACTOR TO OBTAIN ALL PERMITS, PAY PERMIT FEES, AND BE RESPONSIBLE FOR SCHEDULING INSPECTIONS.
5. PROVIDE ALL LABOR AND MATERIAL DESCRIBED ON THIS DRAWING, AND ALL ITEMS INCIDENTAL TO COMPLETING AND PRESENTING THIS PROJECT AS FULLY OPERATIONAL.
6. GROUNDING CONNECTIONS SHALL BE EXOTHERMIC TYPE ("EXOTHERMIC WELD") TO ANTENNA MASTS, AND THE GROUND BARS. REMAINING GROUNDING CONNECTIONS SHALL BE COMPRESSION FITTINGS.
7. GROUND COAXIAL CABLE SHIELDS AT BOTH ENDS WITH COAX CABLE GROUNDING KITS & INSTALL WEATHER PROOFING KIT AT EACH CONNECTION.
8. ALL EQUIPMENT FURNISHED BY OTHERS SHALL BE PROVIDED WITH PROPER MOTOR STARTERS, DISCONNECTS, CONTROLS, ETC. BY THE ELECTRICAL CONTRACTOR UNLESS SPECIFICALLY NOTED OTHERWISE. THE ELECTRICAL CONTRACTOR SHALL INSTALL AND COMPLETELY WIRE ALL ASSOCIATED EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S WIRE DIAGRAMS AND AS REQUIRED FOR A COMPLETE OPERATING INSTALLATION. ELECTRICAL CONTRACTOR SHALL VERIFY AND COORDINATE ELECTRICAL CHARACTERISTICS AND REQUIREMENTS OF EQUIPMENT PRIOR TO ROUGH-IN OF CONDUIT AND WIRING TO AVOID CONFLICTS WHERE APPLICABLE.
9. GROUNDING CONDUCTORS SHALL BE COPPER OR SOLID TINNED COPPER. ALL CONNECTIONS MADE BELOW GRADE SHALL BE SOLID TINNED COPPER. ALL CONNECTIONS ABOVE GRADE STRANDED IS PERMITTED.
10. ALL EXOTHERMIC WELDS ABOVE FINISHED GRADE SHALL BE PAINTED WITH CO-GALVANIZED ZINC ENRICHED PAINT TO MATCH COLOR OBJECT BONDED TO.
11. CONNECT COAX GROUND KITS TO MASTER GROUND BAR AT BASE OF TOWER.
12. CONNECT COAX GROUND KITS TO GROUND BUS AT TOP OF TOWER.
13. CONNECT RF MODULE GROUND TO GROUND BUS AT TOP OF TOWER.
14. PLAN DRAWINGS SHOWN HEREIN DO NOT NECESSARILY DEPICT ELECTRICAL REQUIREMENTS OF INDIVIDUAL EQUIPMENT AND DEVICES SUCH AS THE EQUIPMENT GROUNDING REQUIREMENTS, POWER REQUIREMENTS AND TELCO RACEWAY REQUIREMENTS.
15. PLAN DRAWINGS SHOWN HEREIN ARE DIAGRAMMATIC AND DO NOT NECESSARILY DEPICT THE EXACT EQUIPMENT QUANTITIES, LOCATION, LAYOUT AND CONFIGURATION. REFER TO ARCHITECTURAL PLANS FOR EXACT EQUIPMENT LOCATION, LAYOUT AND CONFIGURATION.
16. NUMBER OF ANTENNAS REPRESENTED IN THIS DETAIL ARE FOR SHOWING CLARITY OF GROUND SYSTEM REQUIREMENTS ONLY. SEE RF INFO FOR ANTENNA QUANTITY.
17. CONTRACTOR TO 'NOALOX' ALL CONNECTIONS TO GROUND BARS.

TYPICAL ANTENNA SECTOR



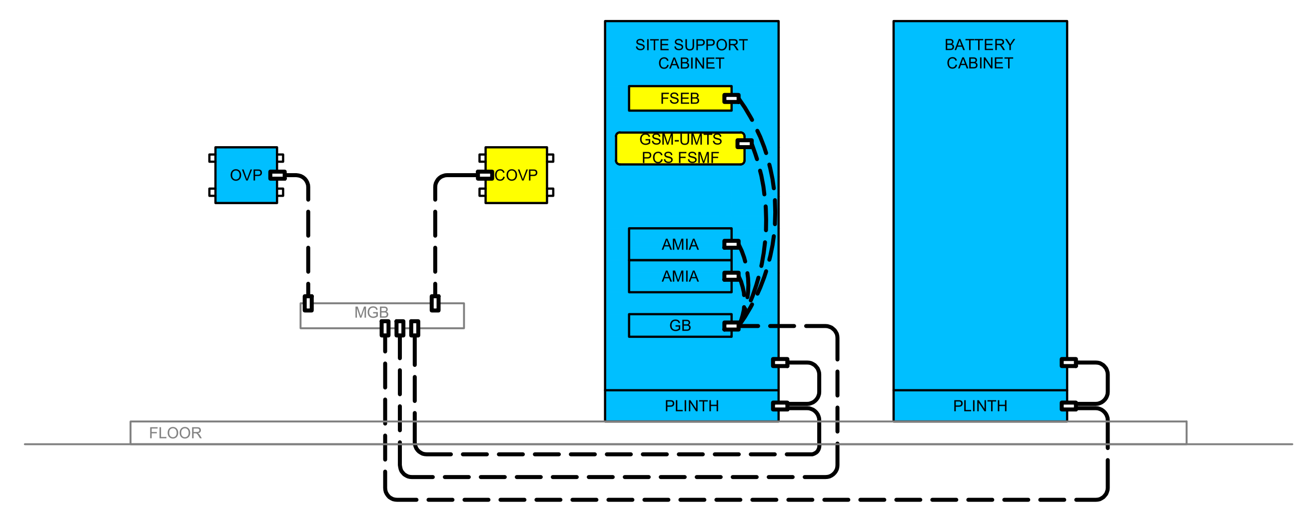
LEGEND

Symbol	Description
— — —	NEW GROUNDING WIRE
■	EXOTHERMIC WELD
▭	MECHANICAL CONNECTION/DOUBLE HOLE LUG TYPE CONNECTION
(white box)	EXISTING ANTENNA/EQUIPMENT
(yellow box)	RELOCATED ANTENNA/EQUIPMENT
(blue box)	NEW ANTENNA/EQUIPMENT

NOTES:

- SYSTEM MODULE TO CABINET GROUND BAR: #6 AWG STRANDED GREEN JACKETED GROUND WIRE
- AMIA TO CABINET GROUND BAR: #6 AWG STRANDED GREEN JACKETED GROUND WIRE
- DELTA CABINETS TO PLINTH: #2 AWG STRANDED GREEN JACKETED GROUND WIRE
- CABINET PLINTH TO MASTER GROUND BAR: #2 AWG STRANDED GREEN JACKETED GROUND WIRE
- FSEB TO CABINET GROUND BAR: #6 AWG STRANDED GREEN JACKETED GROUND WIRE
- COVP/OVP TO MASTER GROUND BAR: #2 AWG STRANDED GREEN JACKETED GROUND WIRE

NOTE:
CONTRACTOR TO INSTALL/REPLACE NEW OR MISSING GROUND BARS AS REQUIRED.



GROUNDING RISER

SCALE: NONE

1

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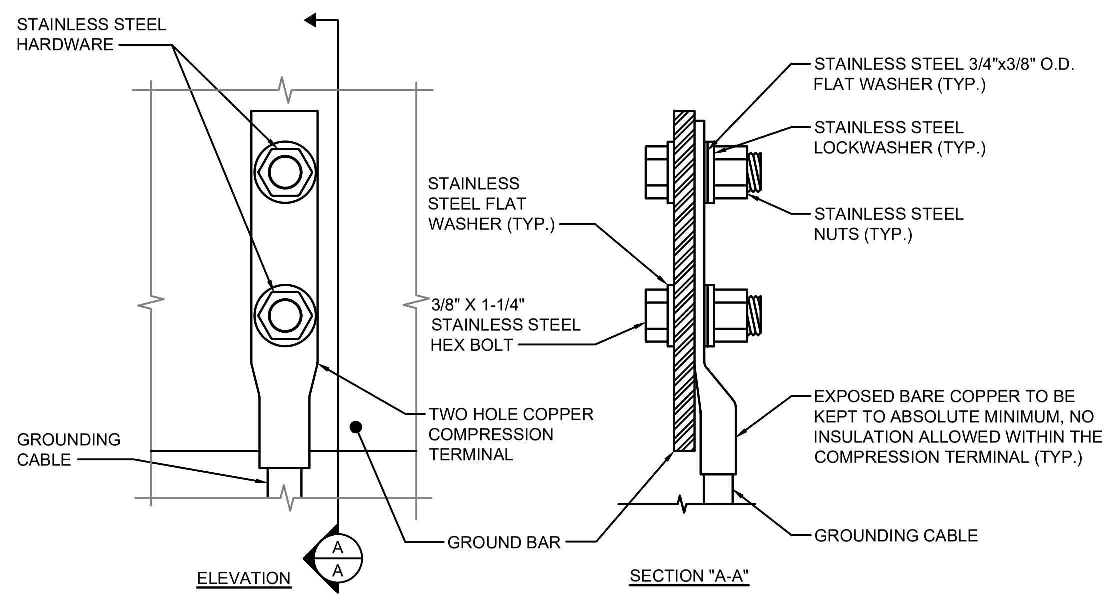
PLUMBING \ ELECTRICAL \ LAND SURVEYING
ACCESSIBILITY CONSULTING \ STRUCTURAL

CHECK: JKR
DRAWN: PS
JOB: T1900570

GR-1

GROUNDING DETAILS

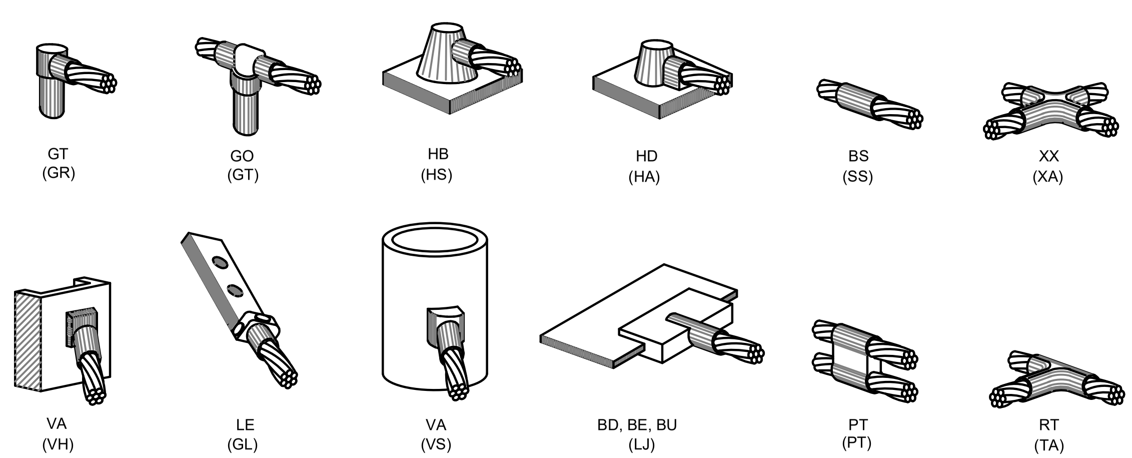


1. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATIONS
2. NO CRIMPING OF SOLID #2. USE EXOTHERMIC WELD ONLY

GROUND BAR CONNECTION DETAIL 1

SCALE: NONE

NOTE:
THE FOLLOWING SYMBOLS SHOWN ARE HARGER ULTRAWELD EXOTHERMIC CONNECTIONS WITH PART NUMBERS BELOW. THESE CONNECTIONS MAY BE CROSS-REFERENCED WITH CADWELD CONNECTIONS WHICH ARE SHOWN IN PARENTHESIS

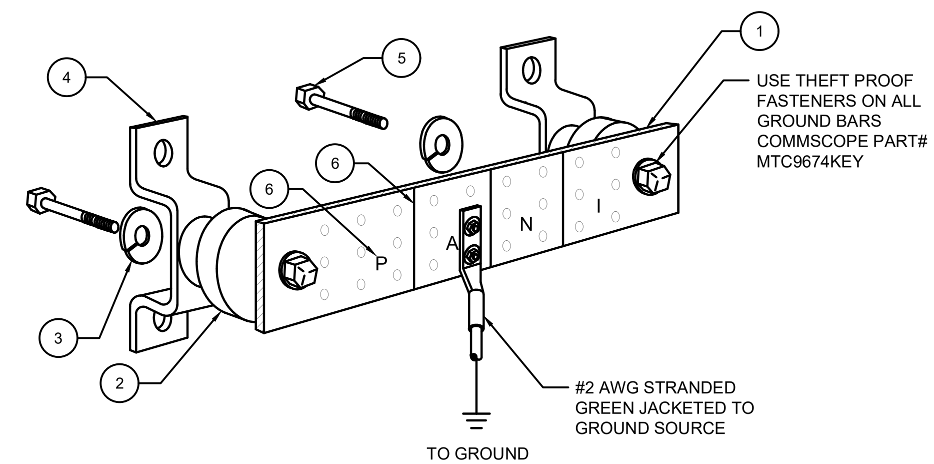


EXOTHERMIC WELD TYPES 2

SCALE: NONE

KEY NOTES:

1.	1/4" THK ELECTRICAL TINNED GROUND BAR HARGER OR APPROVED EQUAL. HOLE CENTERS TO MATCH NEMA DOUBLE LUG CONFIGURATION
2.	INSULATORS (UNLESS NOTED OTHERWISE)
3.	3/8" STAINLESS STEEL LOCKWASHERS
4.	WALL MOUNTING BRACKET
5.	3/8" STAINLESS STEEL BNLF BOLTS
6.	CONTRACTOR SHALL USE PERMANENT MARKER TO DRAW THE LINES BETWEEN EACH SECTION AND LABEL EACH SECTION ("P", "A", "N", "I") WITH 1" HIGH LETTERS



EACH GROUND CONDUCTOR TERMINATING ON ANY GROUND BAR SHALL HAVE AN IDENTIFICATION TAG ATTACHED AT EACH END THAT WILL IDENTIFY ITS ORIGIN AND DESTINATION

SECTION "P" - SURGE PRODUCERS

- COLLECTOR GROUND BAR
- GENERATOR FRAMEWORK (IF AVAILABLE)
- TELCO GROUND BAR
- COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND
- FIBER GROUND BAR
- EQUIPMENT ROOM COLLECTOR GROUND BAR
- HVAC
- RECTIFIER FRAMES

SECTION "A" - SURGE ABSORBERS

- INTERIOR GROUND RING
- EXTERNAL EARTH GROUND FIELD (BURIED GROUND RING)
- METALLIC COLD WATER PIPE (IF AVAILABLE)
- BUILDING STEEL (IF AVAILABLE)
- AC POWER

SECTION "N" - NON-ISOLATED GROUND ZONE EQUIPMENT

- MISCELLANEOUS NON-ISOLATED GROUND ZONE EQUIPMENT
- CABLE TRAY SYSTEM
- EQUIPMENT FRAMES
- BATTERY RACKS
- DC POWER

SECTION "I" - ISOLATED GROUND ZONE

- ISOLATED EQUIPMENT FRAMES
- ISOLATED GROUND BAR - IGB

NOTES:
-EXTERIOR GROUND BARS TO BE TIN PLATED
-HARDWARE SHALL BE STAINLESS STEEL
-CONTRACTOR SHALL GROUP INCOMING WIRES
-CONTRACTOR TO APPLY 'KOPR-SHIELD' TO ALL CONNECTIONS

NOTE:
CONTRACTOR TO INSTALL/REPLACE NEW OR MISSING GROUND BARS AS REQUIRED.

GROUND BAR DETAIL 3

SCALE: NONE

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CHECK: JKR
DRAWN: PS
JOB: T1900570

GR-2
GROUNDING DETAILS

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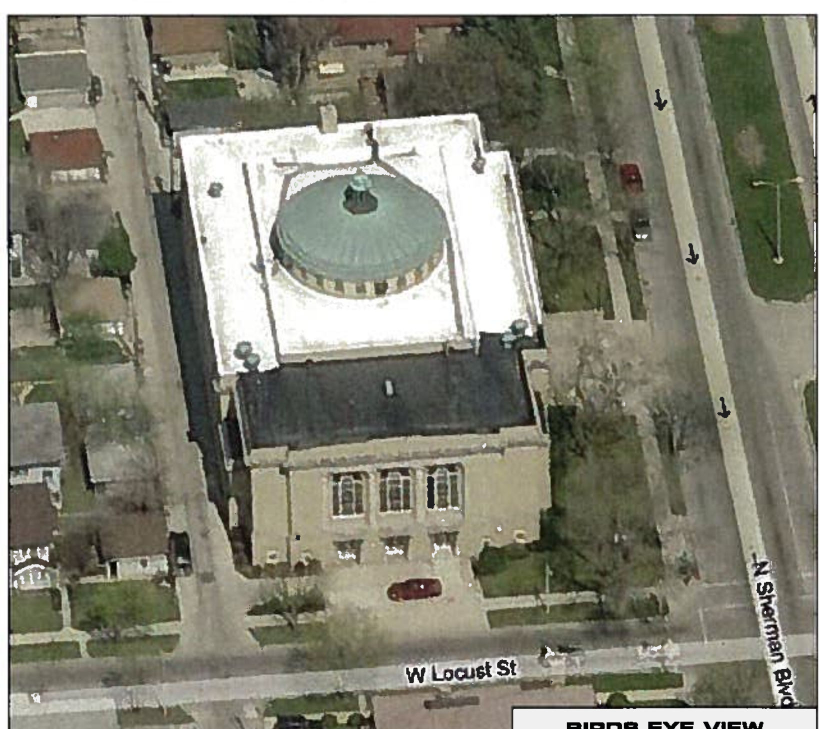
VICINITY MAP



BIRDS EYE VIEW

SITE MODERNIZATION

SITE NUMBER:	**ML42100A**
SITE NAME:	**SCHRAGER**
SITE TYPE:	**ROOFTOP**
SITE ADDRESS:	**2915 N. SHERMAN BLVD MILWAUKEE, WI 53210**
COUNTY:	**MILWAUKEE COUNTY**
JURISDICTION:	**CITY OF MILWAUKEE**

PROJECT DESCRIPTION:

STRUCTURE HEIGHT:	+/- 54.3' (ANTENNA C.L. = 51')
STRUCTURE TYPE:	ROOFTOP
ANTENNA QUANTITY:	(6) EXISTING UMTS/GSM ANTENNA PANELS TO BE REPLACED (9) PROPOSED PCS/GSM/LTE ANTENNA PANELS
LEASE AREA:	10'-0" x 12'-2"
EQUIPMENT MOUNTING:	EQUIPMENT CABINETS INSIDE BUILDING ON 2ND FLOOR

COORDINATES:

LATITUDE/LONGINTUDE:	43.0719° / 87.9679°
GROUND ELEV.:	703.7'
UPPER ROOFTOP ELEV.:	756.5'

PROPERTY SUMMARY:

PROPERTY ADDRESS:
2915 N. SHERMAN BLVD
MILWAUKEE, WI 53210
ASSESSOR'S PARCEL NUMBER (APN): 307-0114-000-8

APPLICABLE CODES

IN ABSENCE OR CONFLICT WITH LOCAL CODES ALL WORK SHALL COMPLY WITH:
- INTERNATIONAL BUILDING CODE 2010
- NEC 2010

SPECIAL REQUIREMENTS

AS REQUIRED BY THE WI STATE HISTORICAL PRESERVATION OFFICER SPECIAL PAINTING AND MOUNTING PROCEDURES ARE NECCESSARY. SEE A-1 & A-3 FOR DETAILS.

CONTACTS:

APPLICANT:
8550 W. BRYN MAWR AVE., SUITE 100
CHICAGO, ILLINOIS 60631
CONTACT: STERLING MCMATH
OFFICE: (469) 360-0026

PROPERTY OWNER CONTACT:
SCHRAGER & ASSOCIATES, LTD.
P.O. BOX 100043
MILWAUKEE, WI 53210

PROJECT TEAM:

SITE CONSULTANT:
SURESITE CONSULTING GROUP, LLC
CONTACT: JEFF NANCE
OFFICE: 773.867.2960
MOBILE: 312.914.9441
FAX: 216.593.0401

A/E FIRM:
EDGE CONSULTING ENGINEERS, INC
624 WATER STREET
PRAIRIE DU SAC, WI 53578
OFFICE: 608.644.1449
CONTACT: DAVID LYSHEK

APPROVALS:

	PRINT NAME:	SIGNATURE:	DATE:
PROPERTY OWNER:			
SAC/ ZONING:			
CONSTRUCTION:			
REAL ESTATE:			
R.F. ENGINEER			
GENERAL MANAGER:			
OPERATIONS:			
UTILITIES:			

SHEET INDEX:

SHEET #	DESCRIPTION:	REV
T-1	TITLE SHEET	1
C-1	SITE PLAN	0
C-2	SITE AND UTILITY PLAN	0
C-3	EQUIPMENT DETAILS	0
C-4	LAYOUT CHANGE PLAN	0
A-1	BUILDING ELEVATION	1
A-2	ANTENNA CONFIGURATION	0
A-3	ANTENNA DETAILS	1
A-4*	RF DATA CONFIGURATION SHEET	0
RF-1	GROUNDING AND ANTENNA CONFIGURATION	0
GN-1	GENERAL NOTES AND SPECIFICATIONS	0
*	PROVIDED BY OTHERS	N/A

STRUCTURAL REVIEW NOTE:

STRUCTURAL ANALYSIS COMPLETED BY EDGE CONSULTING ENGINEERS, INC. CONTRACTOR TO REVIEW STRUCTURAL REPORT IN ITS ENTIRETY. ANY DISCREPANCIES OR DISAGREEMENTS BETWEEN THE REPORT AND THESE PLANS SHOULD BE RESOLVED PRIOR TO CONSTRUCTION.

UTILITY INFORMATION:

TO OBTAIN LOCATION OF PARTICIPANTS' UNDERGROUND FACILITIES BEFORE YOU DIG IN WISCONSIN, CALL
DIGGER'S HOTLINE
TOLL FREE
1-800-242-8511
FAX A LOCATE 1-800-338-3860
WI STATUTE 182.0175 (1974) REQUIRES MIN. OF 3 WORK DAYS NOTICE BEFORE YOU EXCAVATE

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SEAL: WISCONSIN DAVID C. LYSHEK 39472 PRAIRIE DU SAC, WI PROFESSIONAL ENGINEER

DATE SIGNED: 12/11/2012

PROJECT NO: 7465

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CHECKED BY: DCL

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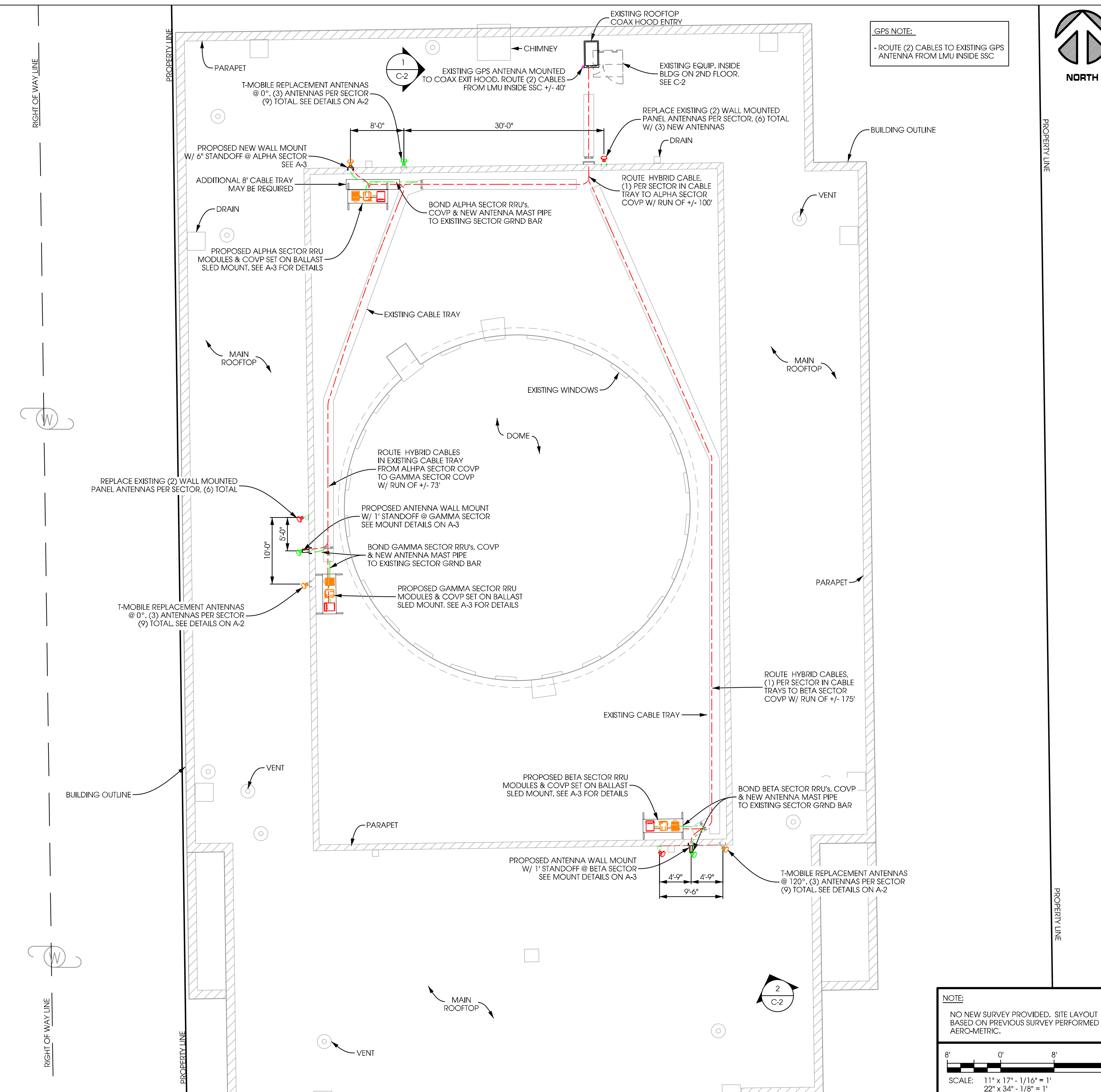
TITLE SHEET

T-1

1 C-1 **ROOF OVERVIEW @ ENTRY HOOD [LOOKING EAST]**

2 C-1 **ROOF OVERVIEW [LOOKING NORTH]**



GPS NOTE:
- ROUTE (2) CABLES TO EXISTING GPS ANTENNA FROM LMU INSIDE SSC

INSTALLATION NOTE:
- (3) ADDITIONAL ANTENNA WALL MOUNTS REQUIRED (1) PER SECTOR. MATCH EXISTING
- BETA & GAMMA SECTOR WALL MOUNT W/ 1' STANDOFF REQUIRED.
- PAINT REPLACEMENT ANTENNAS AND MOUNTS TO MATCH EXISTING

ANTENNA INSTALLATION NOTE:

PROPOSED ANTENNAS WILL BE INSTALLED ON EXISTING MOUNTS. IT IS ASSUMED THAT ALL MOUNTS WERE PROPERLY CONSTRUCTED AS PART OF THE ORIGINAL INSTALLATION. THE CONTRACTOR SHOULD THOROUGHLY INSPECT THE EXISTING MOUNTS PRIOR TO INSTALLING NEW ANTENNAS. ANY INDICATION THAT THE EXISTING INSTALLATION IS CAUSING CRACKING IN THE BUILDING FACADE (IF APPLICABLE), OR IF THE MOUNT IS INADEQUATE FOR THE PROPOSED ANTENNAS, ETC. SHOULD BE REPORTED TO THE ENGINEER AND T-MOBILE.

NOTE:
NO NEW SURVEY PROVIDED. SITE LAYOUT BASED ON PREVIOUS SURVEY PERFORMED BY AERO-METRIC.

SCALE: 11" x 17" - 1/16" = 1'
22" x 34" - 1/8" = 1'
8' 0' 8' 16'

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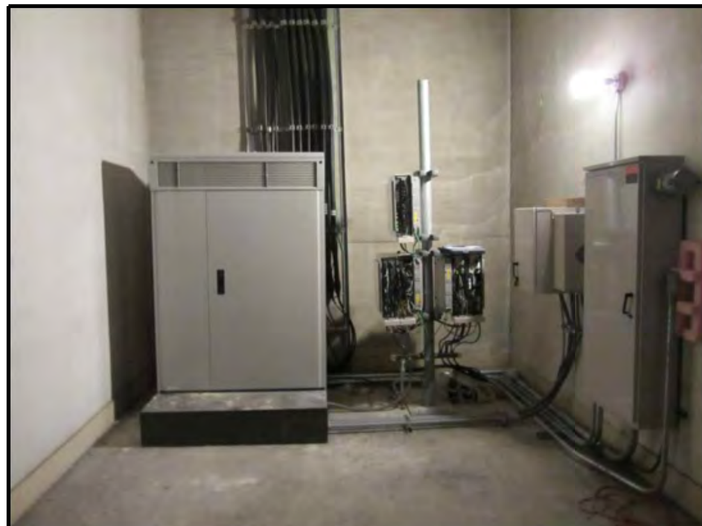
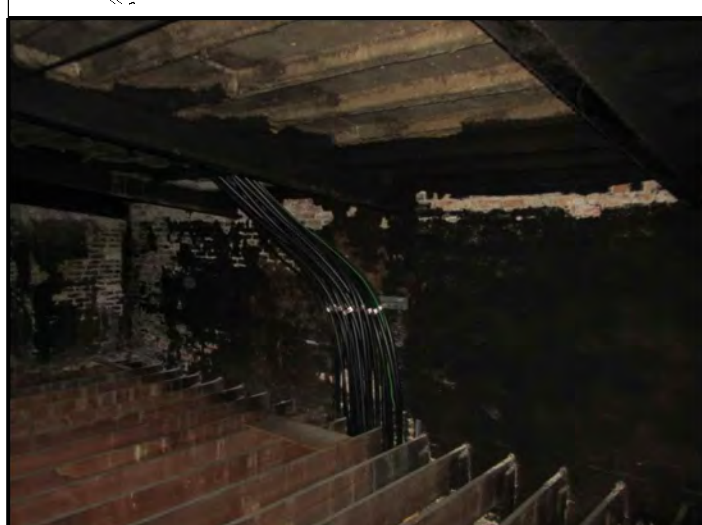
SITE PLAN

C-1

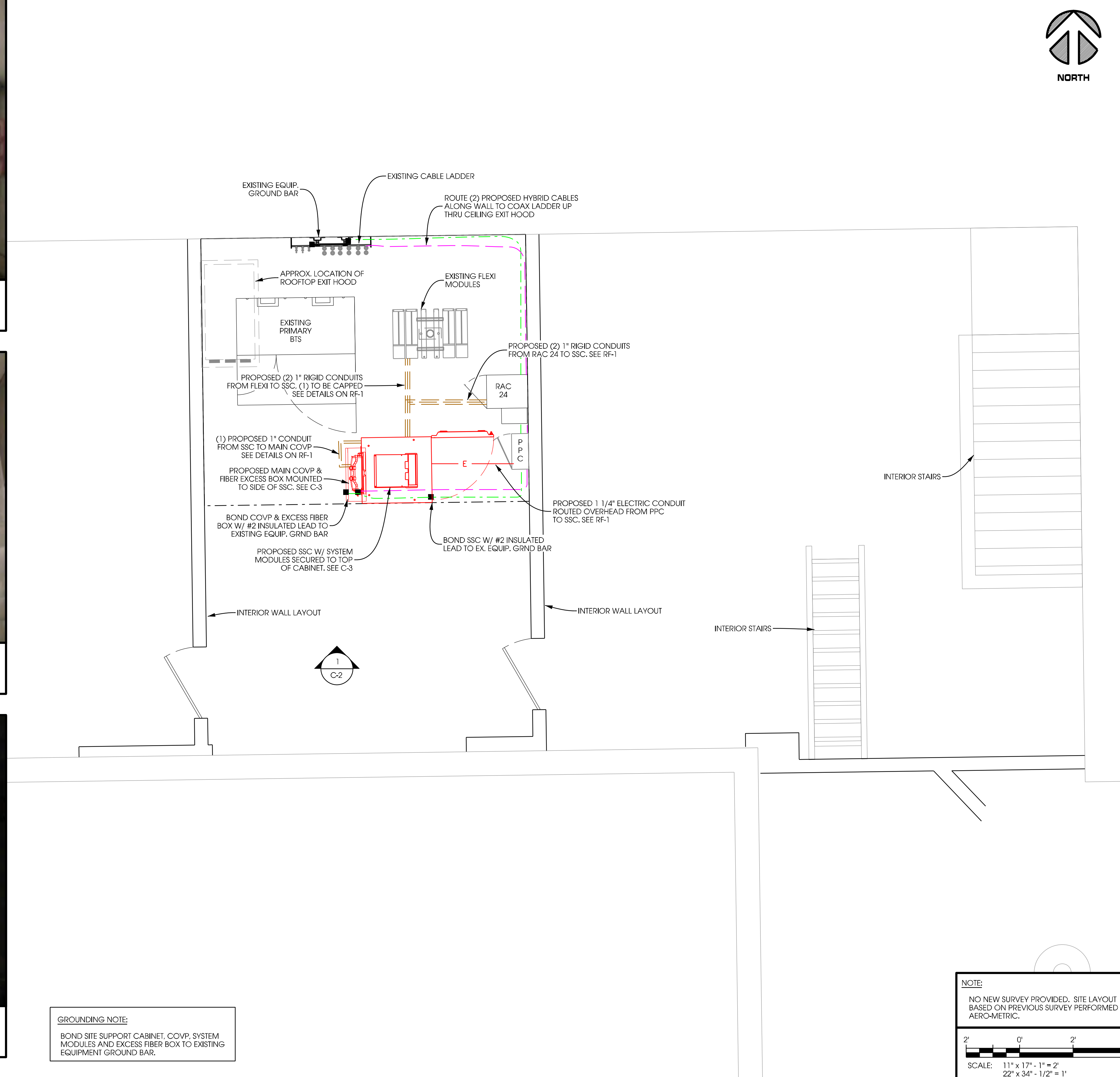


1 / C-2 **EXISTING EQUIP. ROOM OVERVIEW (LOOKING NORTH)**

EXISTING COAX LADDER



EXISTING COAX ROUTING TO EXIT HOOD



GROUNDING NOTE:

BOND SITE SUPPORT CABINET, COVP, SYSTEM MODULES AND EXCESS FIBER BOX TO EXISTING EQUIPMENT GROUND BAR.

NOTE:

NO NEW SURVEY PROVIDED. SITE LAYOUT BASED ON PREVIOUS SURVEY PERFORMED BY AERO-METRIC.

2' 0' 2' 4'

SCALE: 11" x 17" - 1" = 2'
22" x 34" - 1/2" = 1'

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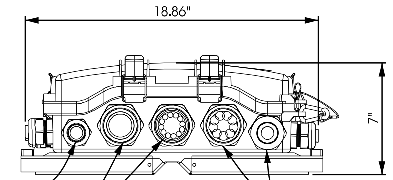
SITE AND UTILITY PLAN

C-2

H G F E D C B A

8 7 6 5 4 3 2 1

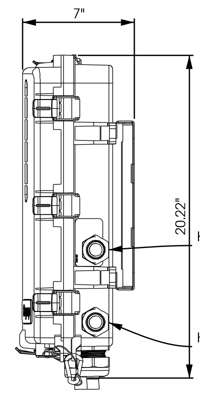


BOTTOM VIEW

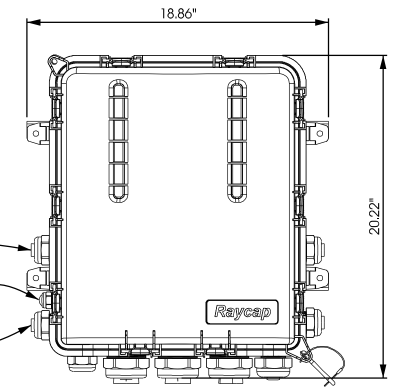
MOUNTING BRACKET INCLUDED:

UTILIZE INNER SLOTS FOR POLE MOUNTING (1-3/8" - 4" DIAMETER)

UTILIZE OUTER SLOTS FOR MONOPOLE MOUNTING (> 4" DIAMETER)



SIDE VIEW

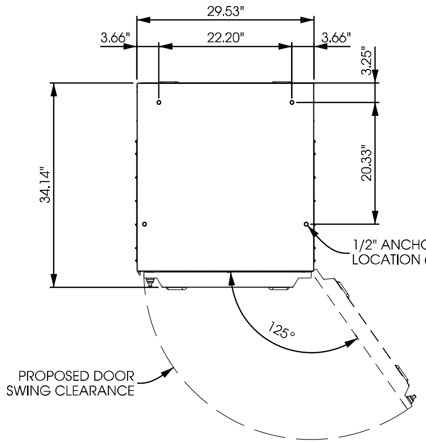


FRONT VIEW

COVP JUMPER LENGTH NOT TO EXCEED 15'.

1 C-3 COVP DETAILS

SCALE: NTS RNSDC-7771-PF-48

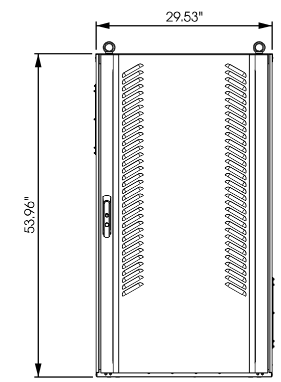


PLAN VIEW

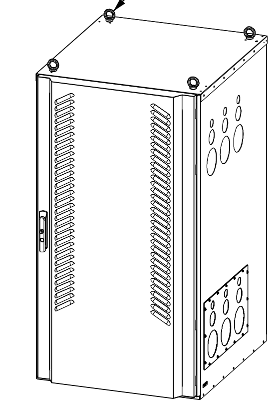
ESOA200-CCU01 (MEDIUM-SS):

CLASS:	MEDIUM SSC CABINET
MANUFACTUER:	DELTA ELECTRONICS, INC.
SIZE:	1370.5 H x 750.0 W x 867 D (MM) 53.96" H x 29.53" W x 34.16" D
WEIGHT:	1200 LBS (APPROX.)

SYSTEM MODULES, COVP, AND FIBER BOX MOUNTED TO SSC AS SPECIFIED BY T-MOBILE/SSC MNFG.



ELEVATION VIEW



ISOMETRIC VIEW

2 C-3 SITE SUPPORT CABINET DETAILS

SCALE: NTS

REMOTE RADIO HEAD WEIGHTS:

FXFB (FLEXI 3-SECTOR RF MODULE 1900): 55 LBS (25 KG)

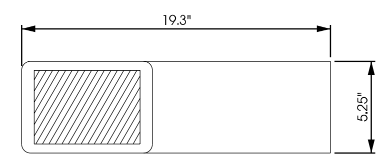
FRIA (FLEXI 3-SECTOR RF MODULE 1.7/2.1): 55 LBS (25 KG) (GROUND MOUNTED)

SYSTEM MODULE WEIGHTS:

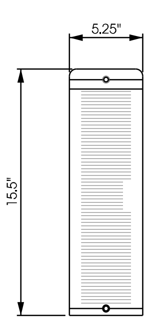
ESMB (FLEXI MULTIRADIO BTS SYSTEM MODULE): 33 LBS (15 KG)

FSME (FLEXI MULTIRADIO BTS SYSTEM MODULE): 50.6 LBS (23 KG)

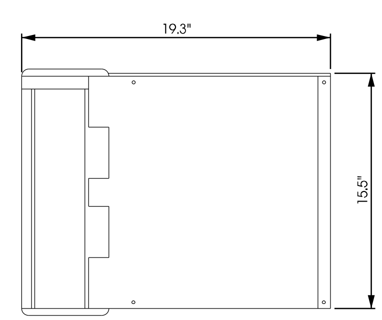
FSMF (FLEXI MULTIRADIO BTS SYSTEM MODULE): 33 LBS (15 KG)



TOP VIEW



SIDE VIEW



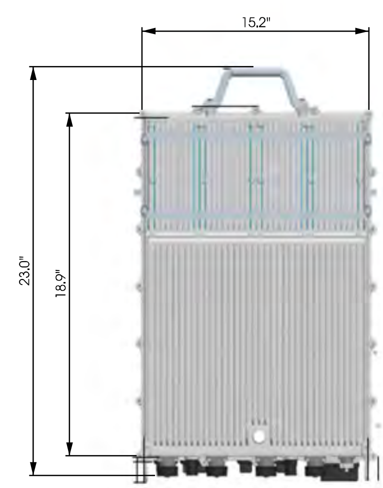
FRONT VIEW

3 C-3 RRU AND SYSTEM MODULE DETAILS

SCALE: NTS

FRIG REMOTE RADIO HEAD SPECIFICATIONS:

WIDTH:	15.2" (387 MM)
HEIGHT:	18.9" (480 MM)
DEPTH:	6.0" (151.85 MM)
WEIGHT:	57 LBS (26 KG)



FRONT VIEW

SIDE VIEW

4 C-3 FRIG RRU DETAIL (LTE)

SCALE: NTS

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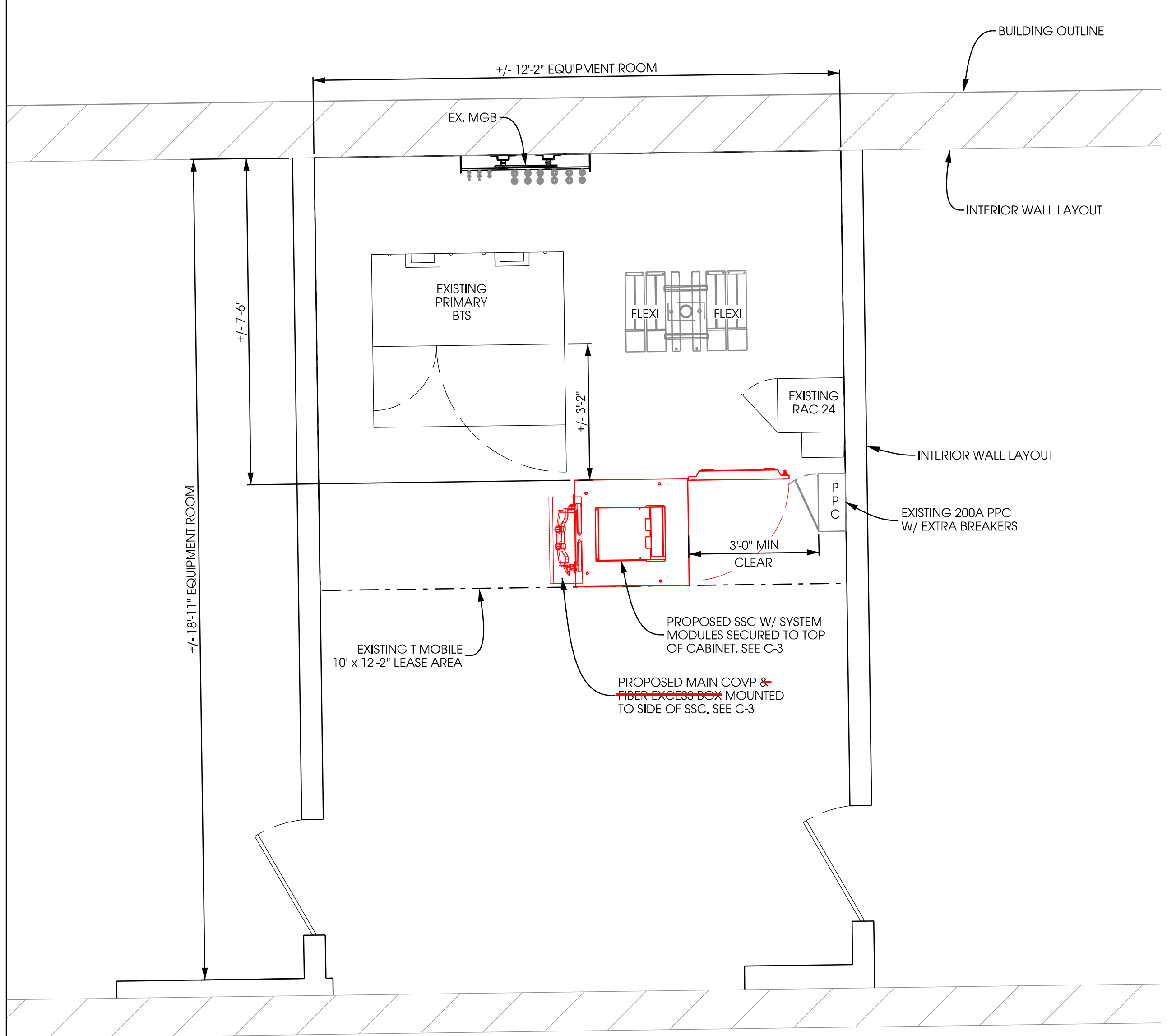
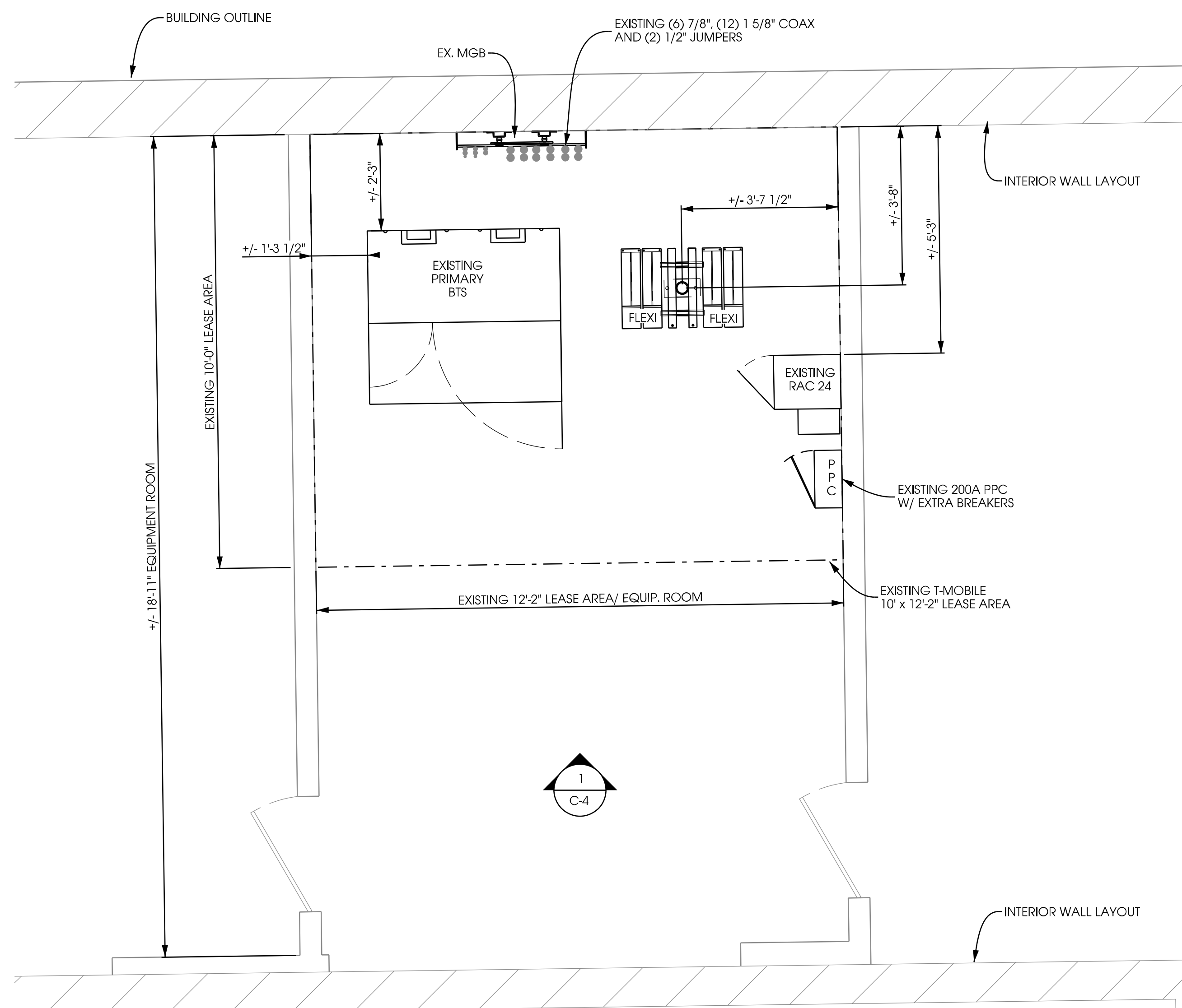
EQUIPMENT DETAILS

C-3



PROPOSED EQUIPMENT LAYOUT

1 C-4 **EXISTING EQUIP. ROOM OVERVIEW [LOOKING NORTH]**



EXISTING EQUIPMENT LAYOUT

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LAYOUT CHANGE PLAN

C-4

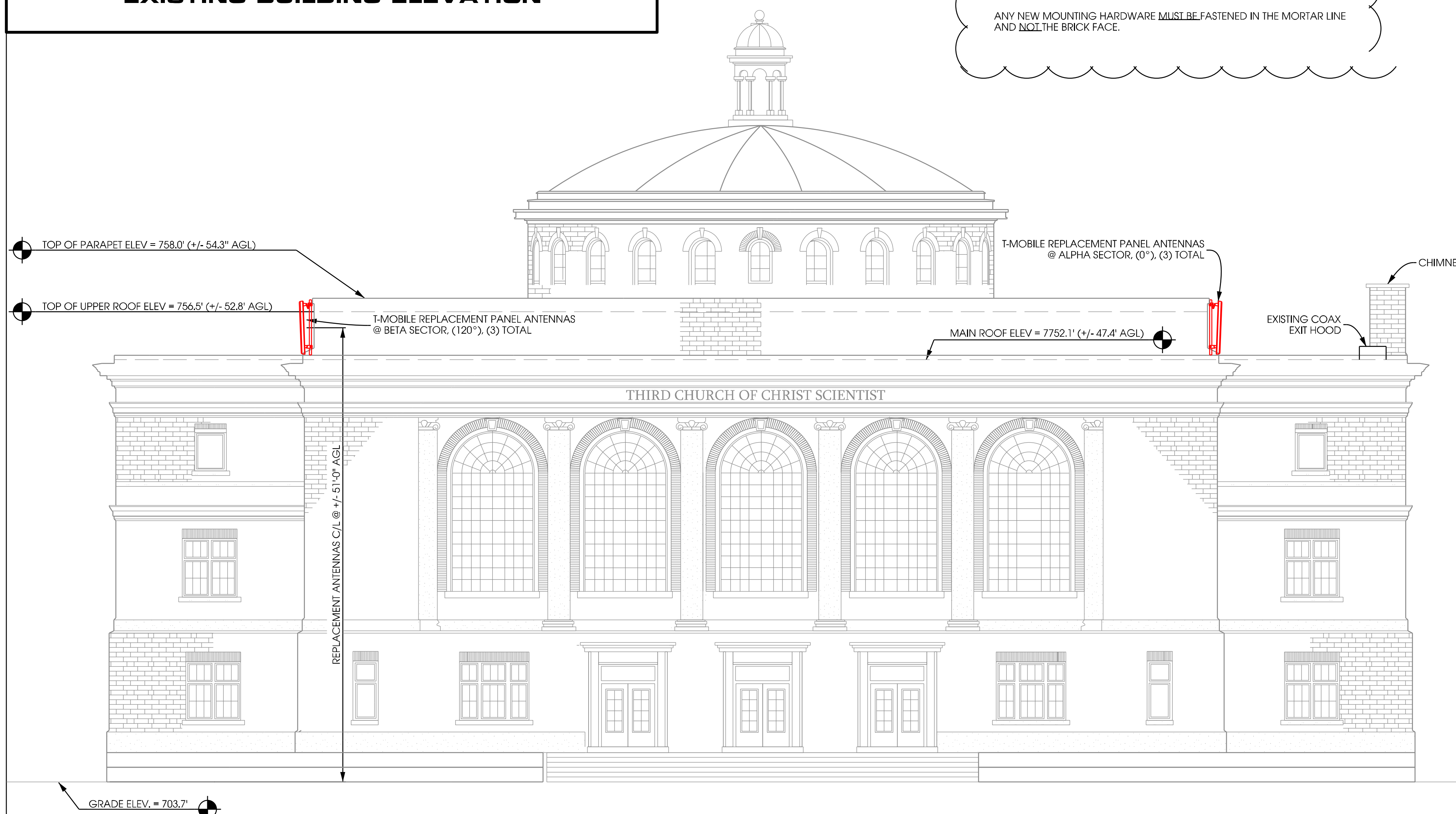
EXISTING BUILDING ELEVATION

ANTENNA PAINTING & MOUNTING NOTES:

REQUIREMENTS AS STIPULATED BY THE WI STATE PRESERVATION OFFICE.

ANTENNAS TO BE PAINTED TO MATCH THE EXISTING BRICK COLOR.

ANY NEW MOUNTING HARDWARE MUST BE FASTENED IN THE MORTAR LINE AND NOT THE BRICK FACE.



1 / A-1 **BUILDING ELEVATION (EAST ELEVATION)**

SCALE: 11" x 17" - 1'-0" = 16'-0"
22" x 34" - 1'-0" = 8'-0"

EXISTING T-MOBILE ANTENNAS
- ALPHA SECTOR -

EXISTING T-MOBILE ANTENNAS
- BETA SECTOR -

EXISTING T-MOBILE ANTENNAS
- GAMMA SECTOR -

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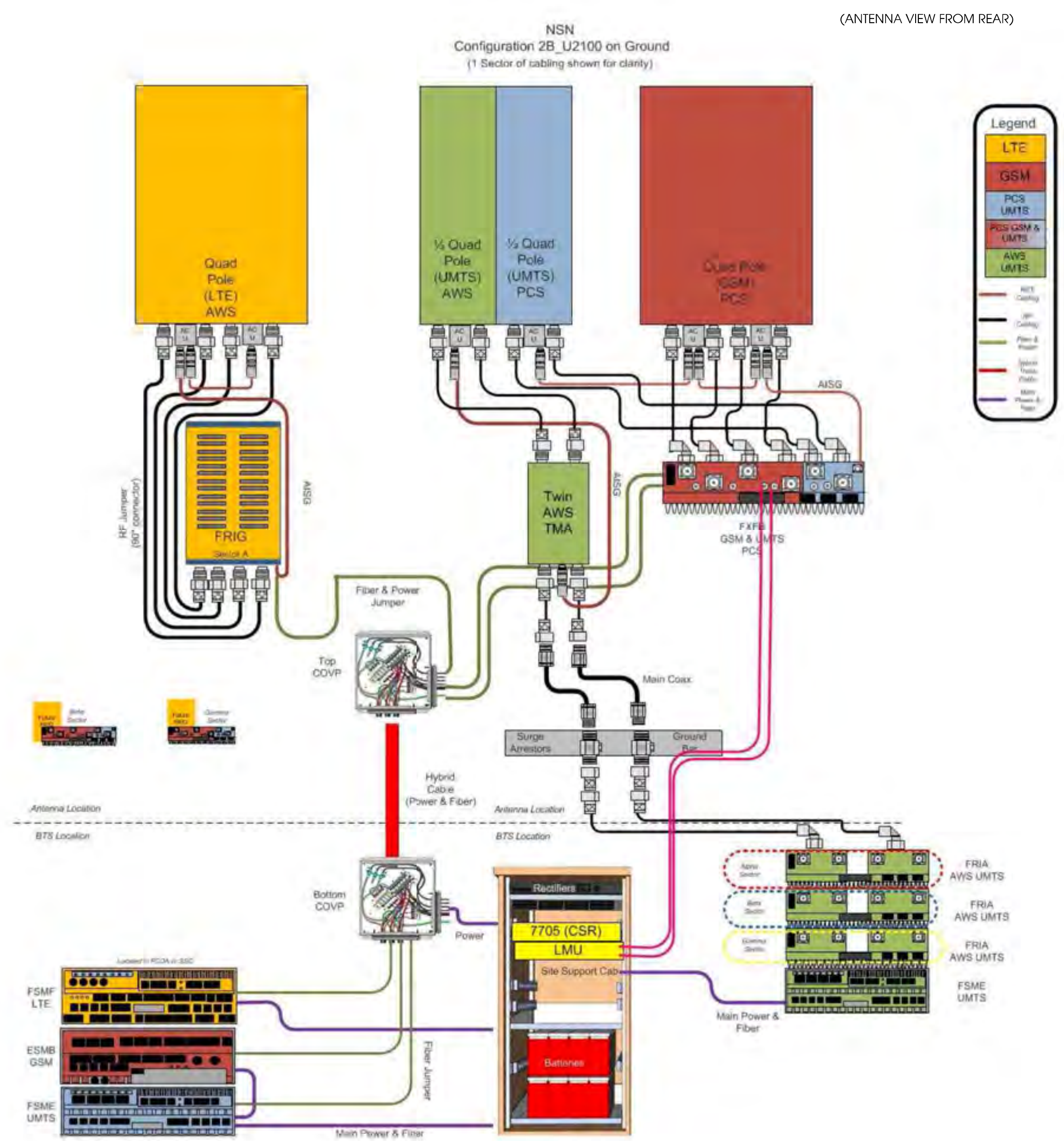
BUILDING ELEVATION

A-1

(ANTENNA VIEW FROM REAR)



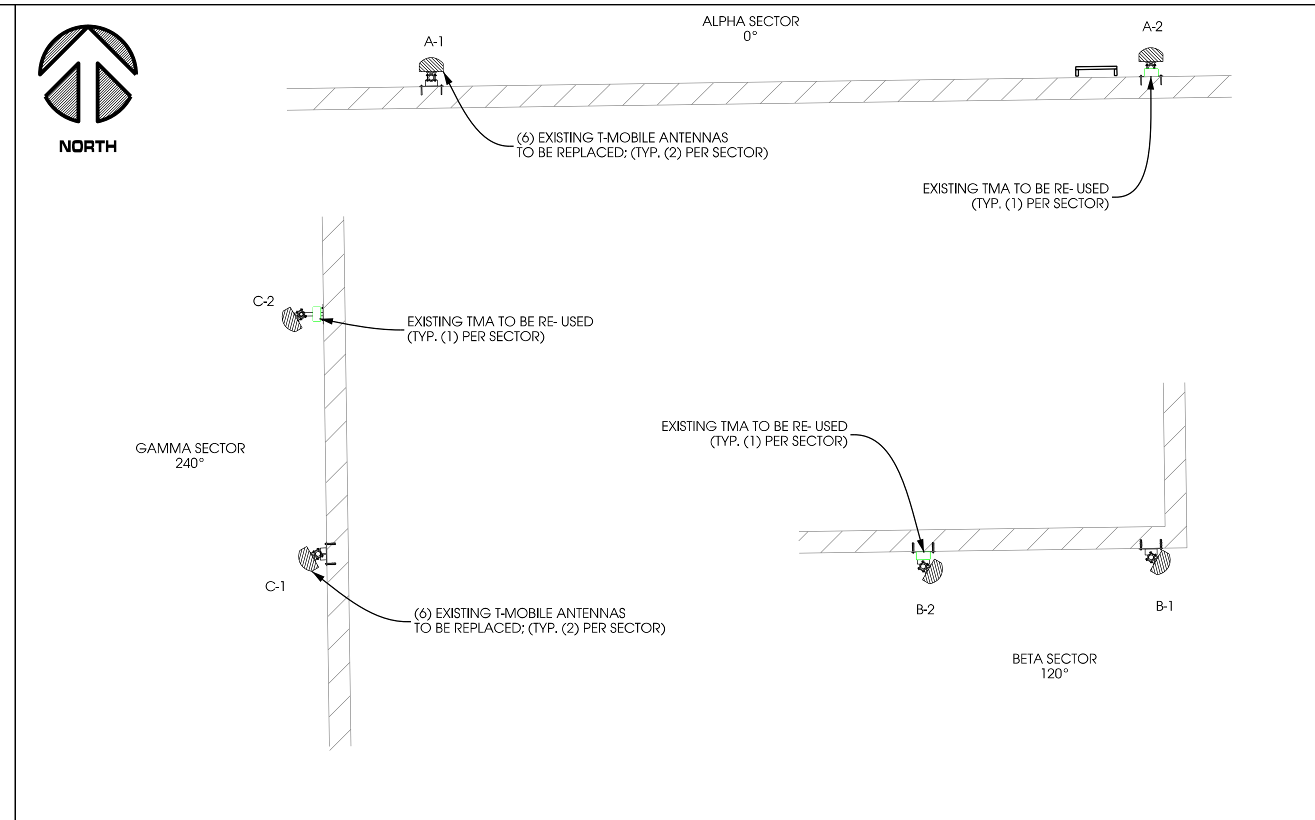
HCS CABLE NOTE:
- (1) HCS CABLE ROUTED TO ALPHA & BETA SECTOR COVP TYP. (2) TOTAL
- (1) HCS CABLE ROUTED FROM ALPHA SECTOR COVP TO GAMMA SECTOR COVP

All HCS at 1.24"

	ANTENNA NUMBER	TECHNOLOGY	ANTENNA VENDOR	MODEL NUMBER	ANTENNA RAD CENTER	AZIMUTH	TMA	DIPLEXER	RRU TYPE	HCS CABLE SIZE	HYBRID CABLE LENGTHS: CABLE	HYBRID CABLE LENGTHS: JUMPER
ALPHA SECTOR	A-1	LTE	ANDREW	TMBXX-6517-A2M	51'	0°	N/A	N/A	FRIG	7/8" HYBRID	100' ROUND TO 125'	15'
	A-3	UMTS	ANDREW	TMBXX-6517-A2M	51'	0°	RE- USE EXISTING	N/A	SHARE	SHARED W/ ALPHA LTE	N/A	15'
	A-2	GSM	ANDREW	TMBXX-6517-A2M	51'	0°	N/A	N/A	FXFB	SHARED W/ ALPHA LTE	N/A	15'
BETA SECTOR	B-1	LTE	ANDREW	TMBXX-6517-A2M	51'	120°	N/A	N/A	FRIG	7/8" HYBRID	175' ROUND TO 200'	15'
	B-3	UMTS	ANDREW	TMBXX-6517-A2M	51'	120°	RE- USE EXISTING	N/A	SHARE	SHARED W/ BETA LTE	N/A	15'
	B-2	GSM	ANDREW	TMBXX-6517-A2M	51'	120°	N/A	N/A	FXFB	SHARED W/ BETA LTE	N/A	15'
GAMMA SECTOR	C-1	LTE	ANDREW	TMBXX-6517-A2M	51'	240°	N/A	N/A	FRIG	7/8" HYBRID	150' ROUND TO 175'	15'
	C-3	UMTS	ANDREW	TMBXX-6517-A2M	51'	240°	RE- USE EXISTING	N/A	SHARE	SHARED W/GAMMA LTE	N/A	15'
	C-2	GSM	ANDREW	TMBXX-6517-A2M	51'	240°	N/A	N/A	FXFB	SHARED W/GAMMA LTE	N/A	15'

75' per RFDS

1 / A-2 **PROPOSED ANTENNA AND COAXIAL CABLE SCHEDULE**
SCALE: NTS
COLOR CODING TO BE VERIFIED BY T-MOBILE

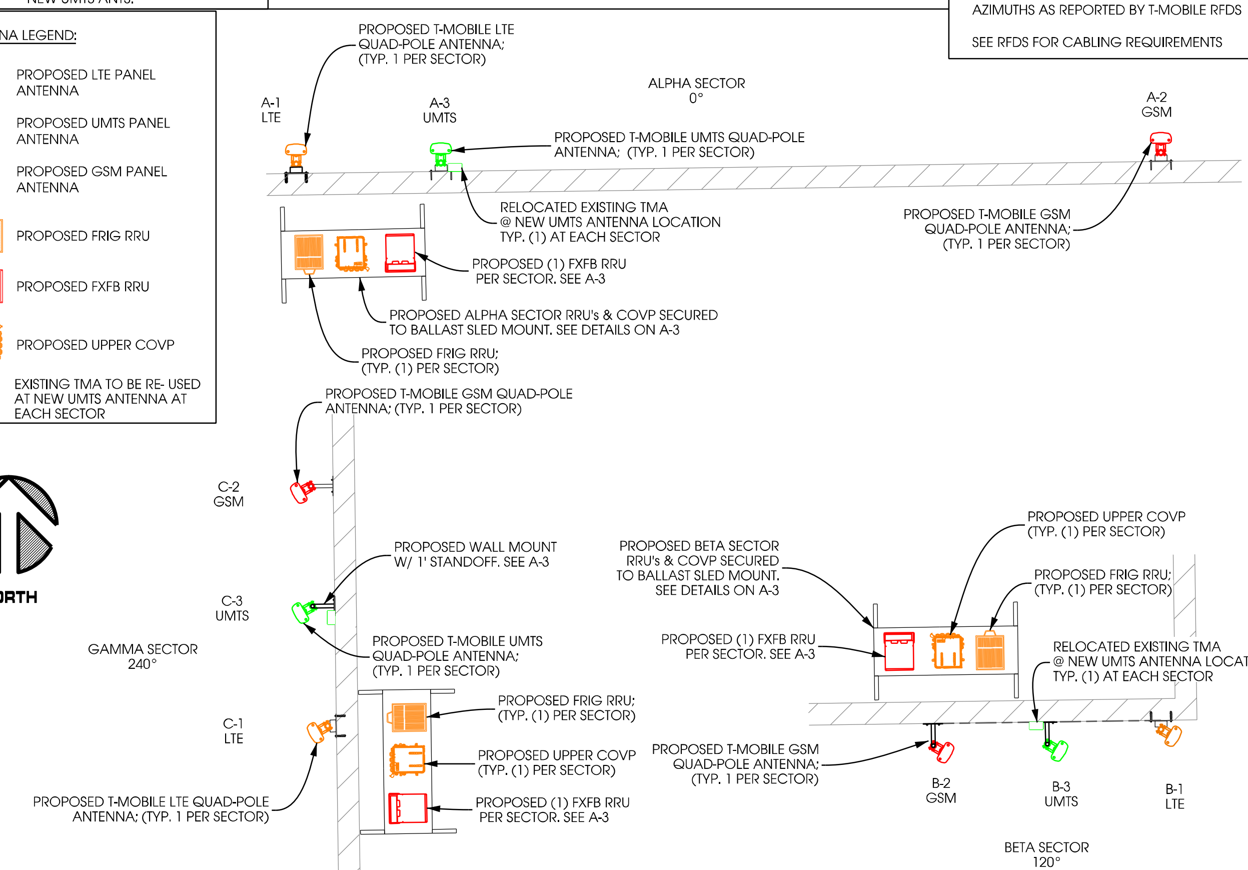


ANTENNA LEGEND:
- EXISTING PANEL ANTENNA: TO BE REPLACED
- EXISTING TMA: TO BE RE- USED AT NEW UMTS ANTS.

2 / A-2 **EXISTING ANTENNA PLAN**
SCALE: NTS

NOTE:
AZIMUTHS AS REPORTED BY T-MOBILE RFDS
SEE RFDS FOR CABLING REQUIREMENTS

ANTENNA LEGEND:
- PROPOSED LTE PANEL ANTENNA
- PROPOSED UMTS PANEL ANTENNA
- PROPOSED GSM PANEL ANTENNA
- PROPOSED FRIG RRU
- PROPOSED FXFB RRU
- PROPOSED UPPER COVP
- EXISTING TMA TO BE RE- USED AT NEW UMTS ANTENNA AT EACH SECTOR



3 / A-2 **PROPOSED ANTENNA PLAN**
SCALE: NTS
(TYPE 2B RF CONFIG)

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8550 W. Bryn Mawr Ave.
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OFFICE: (773) 444-5400
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608.644.1549 fax
www.edgeconsult.com

PROJECT NO: 7465
DRAWN BY: CV
CHECKED BY: DCL

REV.	DATE:	DESCRIPTION:
A	6/12/12	PERMIT CD's
B		
C		
0	7/24/12	FINAL CD's
1		
2		

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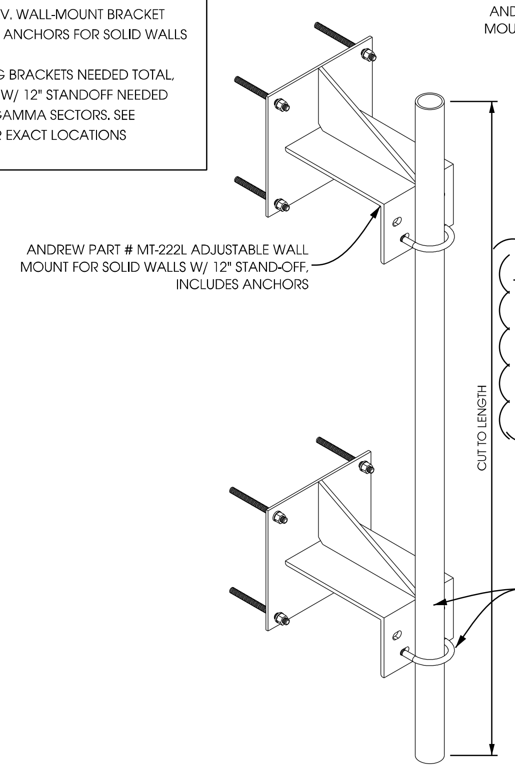
MILWAUKEE, WI 53210

ANTENNA CONFIGURATION

A-2

ANTENNA WALL MOUNT SUPPORT BRACKET

- ANDREW GALV. WALL-MOUNT BRACKET OR EQUIV. W/ ANCHORS FOR SOLID WALLS
- (3) MOUNTING BRACKETS NEEDED TOTAL, (2) BRACKETS W/ 12" STANDOFF NEEDED AT ALPHA & GAMMA SECTORS. SEE SITE PLAN FOR EXACT LOCATIONS

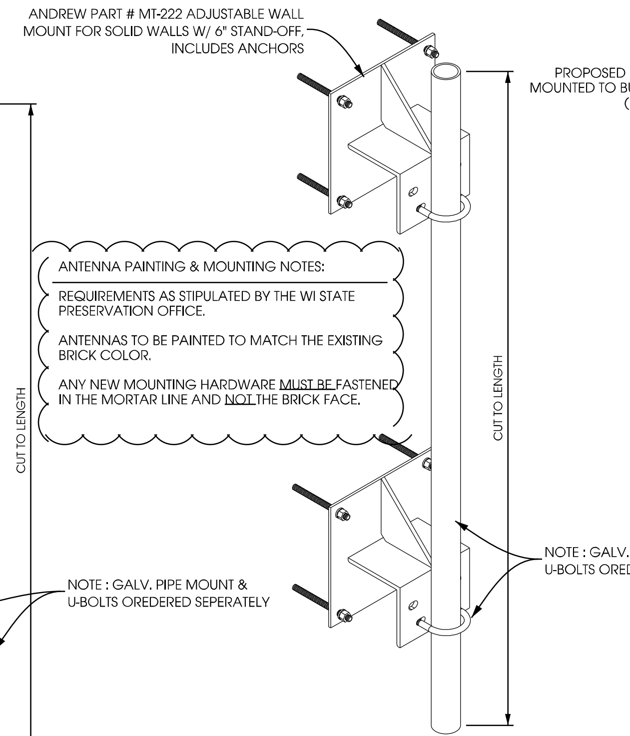


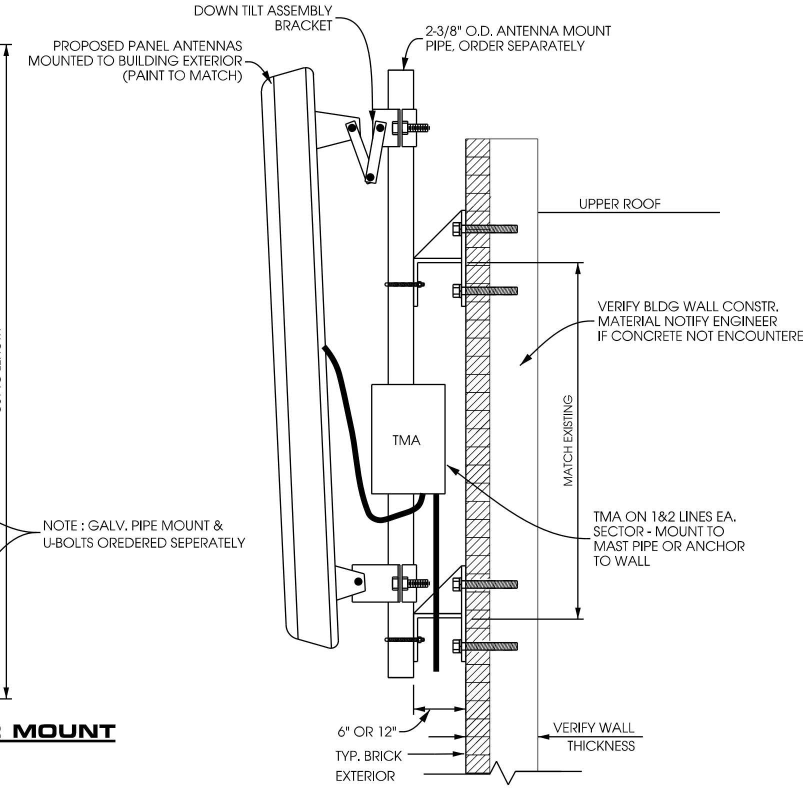
ANTENNA PAINTING & MOUNTING NOTES:

REQUIREMENTS AS STIPULATED BY THE WI STATE PRESERVATION OFFICE.

ANTENNAS TO BE PAINTED TO MATCH THE EXISTING BRICK COLOR.

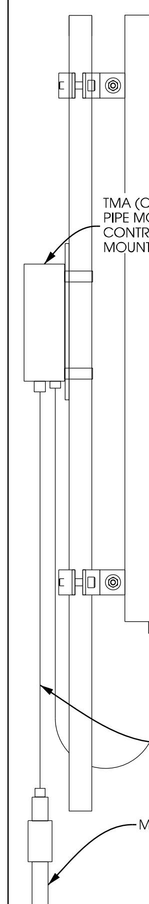
ANY NEW MOUNTING HARDWARE MUST BE FASTENED IN THE MORTAR LINE AND NOT THE BRICK FACE.



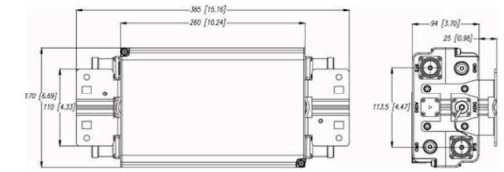


1 / A-3 ANTENNA WALL MOUNT DETAIL

ANDREWS P/N#: ANTENNA WALL-MOUNT: MT-222 W/ 6" STANDOFF OR EQUIV.
MT-222L W/ 12" STANDOFF OR EQUIV.



EQUIPMENT OVERVIEW



EQUIPMENT DIMENSIONS

EXISTING TMA NOTE:

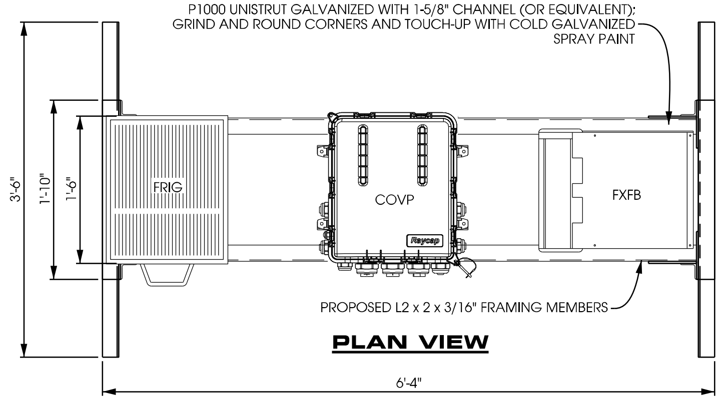
- RE-USE EXISTING TMA AT NEW UMTS ANTENNA LOCATIONS AT EACH SECTOR TYP

3 / A-3 TMA MOUNTING DETAILS

SCALE: NTS

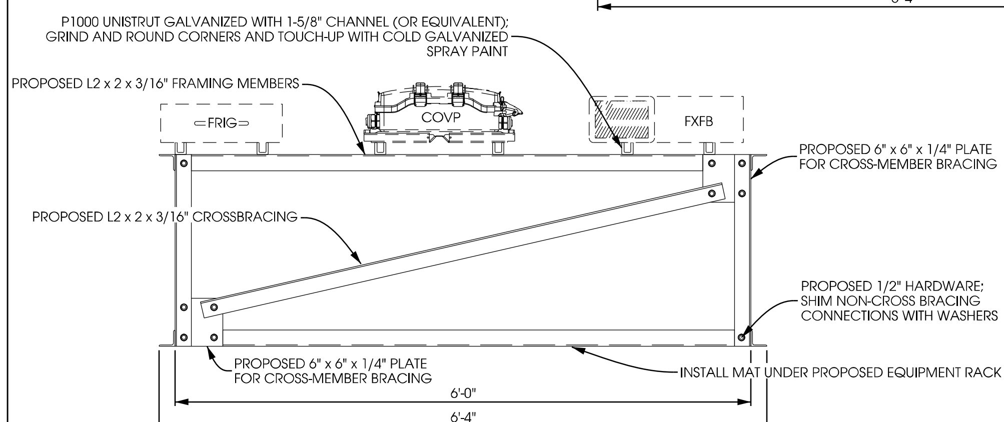
BALLAST REQUIREMENTS:

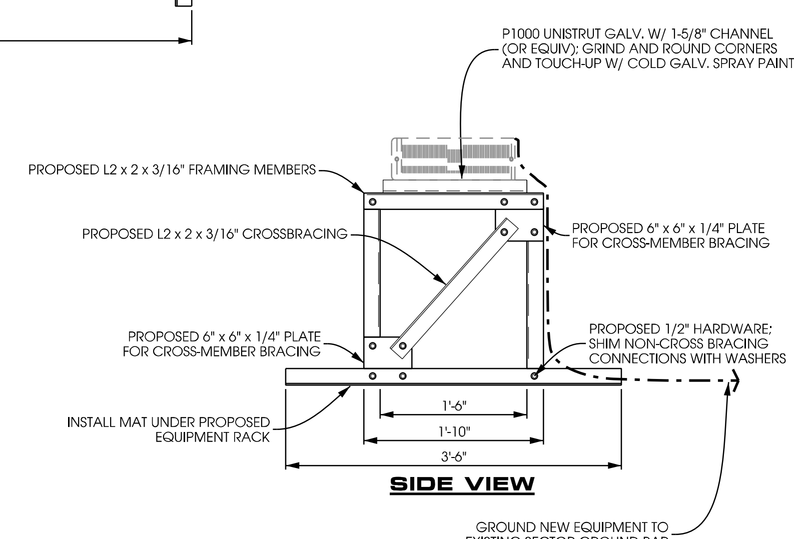
NO BALLAST REQUIRED. SELF-WEIGHT OF EQUIPMENT AND FRAME DETERMINED TO BE ADDEQUATE.



STEEL CONSTRUCTION NOTES:

1. STRUCTURAL STEEL DESIGN AND FABRICATION SHALL BE IN ACCORDANCE WITH THE LATEST AISC ASD STEEL CONSTRUCTION MANUAL.
2. ALL STRUCTURAL STEEL SHAPES SHALL CONFORM TO ASTM A36 (Fy = 36ksi) UNLESS NOTED OTHERWISE.
3. PLATE STEEL SHALL CONFORM TO ASTM A36 (Fy = 36 ksi).
4. ALL STEEL FRAMING MEMBERS, CONNECTION PLATES, FASTENERS AND ANCHOR BOLTS TO HAVE HOT-DIPPED GALVANIZED FINISH. APPLY COATING BY THE HOT-DIP PROCESS FOR GALVANIZING ACCORDING TO ASTM A 123.
5. ALL CONNECTION BOLTING IS TO BE WITH 1/2" DIAMETER A-325 X BOLTS UNLESS NOTED OTHERWISE. BOLTS NEED ONLY BE TIGHTENED TO THE SNUG-TIGHT CONDITION. SNUG-TIGHT IS DEFINED AS TIGHTNESS OBTAINED BY A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL EFFORT OF A PERSON USING AN ORDINARY SPUD WRENCH.



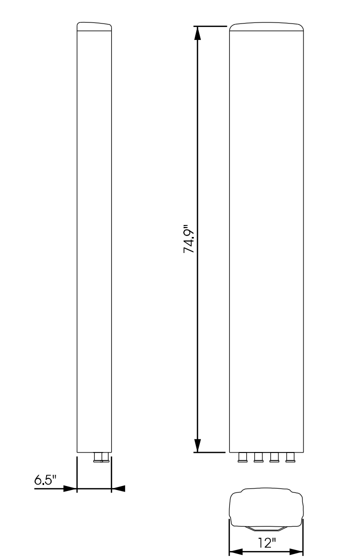


2 / A-3 RRU/COVP SUPPORT RACK DETAILS

SCALE: NTS

ANDREW ANTENNA TMBXX-6517-R2M OR TMBXX-6517-A2M

DIMENSIONS, H x W x D:	1903 x 305 x 166 mm (74.9" x 12.0" x 6.5")
WEIGHT:	40.8 lbs
CONNECTOR:	(4) 7/16 DIN FEMALE



4 / A-3 ANTENNA DETAIL

SCALE: NTS

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8550 W. Bryn Mawr Ave.
Suite 100
Chicago, Illinois 60631
OFFICE: (773) 444-5400
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624 Water Street
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PROJECT NO: 7465

DRAWN BY: CV

CHECKED BY: DCL

REV.	DATE:	DESCRIPTION:
A	6/12/12	PERMIT CD's
B		
C		
0	7/24/12	FINAL CD's
1	12/11/12	REV. FINAL CD's
2		

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ANTENNA DETAILS

A-3

RF DATA CONFIGURATION SHOWN ON THIS PAGE PROVIDED BY OTHERS. CONTRACTOR TO VERIFY EQUIPMENT MODELS AND SPECIFICATIONS WITH MOST RECENT T-MOBILE DATA SHEET PRIOR TO INSTALLATION

New RFDS 9/14/12 @ 12:00AM

User: SYOUSUF1

T · ·Mobile·

RFDS Data Configuration Sheet

Back to RFDS home

Date: 7/20/2012

Go Back

Print RFDS

Site Information:

Market:	ML	Radio Vendor:	NSN	Plan Year:	2012
Site Id:	ML42100A	Site Name:	Schrager	Type/Class:	Building / Roof Top Mount
Address:	2915 N. Sherman Blvd	City:	Milwaukee	State:	WI Zip: 53210
Latitude:	43.07193769	Longitude:	-87.9679357	Created Date	Apr 20 2012
RF Manager:	Dominador Galicinao	RF Engineer:	Galen Belen	Last Save Date:	Jul 20 2012 11:04AM

Cell Site Configuration

Configuration Type: Configuration 2B_U2100 on Ground	Final Configuration (Antenna/Line/TMA/RRU): 9/12/3/6	Solution Type: Rooftop	RFDS Status: Final

Sector Information

PCS GSM Design	A	B	C	D	E	F
Antenna RAD Center:	51	51	51	0	0	0
Antenna Azimuth:	0	120	240	0	0	0
Mechanical Tilt:	0	0	0	0	0	0
Electrical Tilt:	4	4	4	0	0	0

PCS UMTS Design	A	B	C	D	E	F
Antenna RAD Center:	51	51	51	0	0	0
Antenna Azimuth:	0	120	240	0	0	0
Mechanical Tilt:	0	0	0	0	0	0
Electrical Tilt:	3	4	5	0	0	0

AWS UMTS Design	A	B	C	D	E	F
Antenna RAD Center:	51	51	51	0	0	0
Antenna Azimuth:	0	120	240	0	0	0
Mechanical Tilt:	0	0	0	0	0	0
Electrical Tilt:	3	4	5	0	0	0

AWS LTE Design	A	B	C	D	E	F
Antenna RAD Center:	51	51	51	0	0	0
Antenna Azimuth:	0	120	240	0	0	0
Mechanical Tilt:	0	0	0	0	0	0
Electrical Tilt:	3	4	5	0	0	0

Antenna Configuration (Site Level)	PCS GSM	PCS UMTS	AWS UMTS	AWS LTE
Antenna ReUse Existing:	Re-Use Existing			
Antenna ReUse Existing Qty:	3			
Antenna Model:	Andrew - TMBXX-6517-A2M		Andrew - TMBXX-6517-A2M	Andrew - TMBXX-6517-A2M
Antenna Qty:	3	0	3	3
Antenna and (or) Ports Shared:	No	Antenna Shared with AWS UMTS	Antenna Shared with PCS UMTS	No

TMA Configuration (Site Level)	PCS GSM	PCS UMTS	AWS UMTS	AWS LTE
TMA(Re-use existing TMA/New/Not Needed):			Re-use Existing	
TMA Model:			Andrew Twin AWS - ETW200VS12UB	
TMA Qty:	0	0	3	0

Diplexer/Combiner Configuration	A	B	C	D	E	F
Diplexer Model (1):						
Diplexer Qty (1):						
Diplexer Model (2):						
Diplexer Qty (2):						
Combinere/Duplexer Model:						
Combinere/Duplexer Qty:						

Antenna Fiber/ Coax Solution (Site Level)	
Use HCS (Yes/No)?	Yes
Use NSN Fiber & OVP for Rooftop (Yes/No)?	No
Use Coax Cable (Yes/No)?	Yes

Hybrid Cable Configuration (Site Level)	
Hybrid Cable Type:	
Hybrid Cable Length:	
Hybrid Cable Qty:	

Hybrid Cable Config(Sector Level)	A	B	C	D	E	F
HCS run between Sectors (e.g. Rooftop/ Watertank etc.)	Low Capacity HCS-7/8"	Low Capacity HCS-7/8"	Low Capacity HCS-7/8"			
Hybrid Cable Length (ft):	100	175	75	0	0	0

COVP Configuration (Site Level)			
COVP Type (1):	Large COVP	COVP Qty (1):	2
COVP Type (2):	Large COVP	COVP Qty (2):	2

Coax Configuration	A	B	C	D	E	F
Re-use existing coax for TDOA (Yes/No)?	Yes	Yes	Yes			
Qty. of excess coax lines to remove?						
New Coax Type:						
New Coax Length/Line:						
New Coax Qty:						
RET Home-Run Cable:						
RET Home-Run Cable Length(ft):						

System Modules (Site Level)	PCS GSM	PCS UMTS	AWS UMTS	AWS LTE
System Module Type:	ESMB	FSME	FSME	FSMF
System Module Qty:	1	1	1	1

RF Modules (Site Level)	PCS GSM	PCS UMTS	AWS UMTS	AWS LTE
RF Module Type:	FXFB	FXFB	FRIA	FRIG
RF Module Qty:	3	0 (Module Shared with PCS GSM, different PAs)	3	3

Comments/Notes

4/20/2012 - Swap existing dual pole antenna with quad pole antenna. Add one quad pole antenna per sector. Total of 3 quad pole antenna per sector.
PCS UMTS antenna tilts were matched with AWS UMTS. PCS GSM antenna tilts were kept the same. Move UMTS AWS FRIAs near the antennas.
HCS Config:100' High Cap to Alpha from equipment.
175' Low Cap to Beta from equipment.
75' Low cap from Alpha to Gamma.
07/10/2012:LowCapHCSType=Sector B=175, Sector C=75
07/10/2012:HighCapHCSType=Sector A=100
07/20/2012 Updated to Ground RRU Config for AWS, TMA Data Edited, and HCS type and length corrected (SY)

Site: ML42100A - Configuration Drawing

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Prairie du Sac, WI 53578
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www.edgeconsult.com

PROJECT NO: 7465

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CHECKED BY: DCL

REV.	DATE:	DESCRIPTION:
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B		
C		
0	7/24/12	FINAL CD's
1		
2		

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ML42100A

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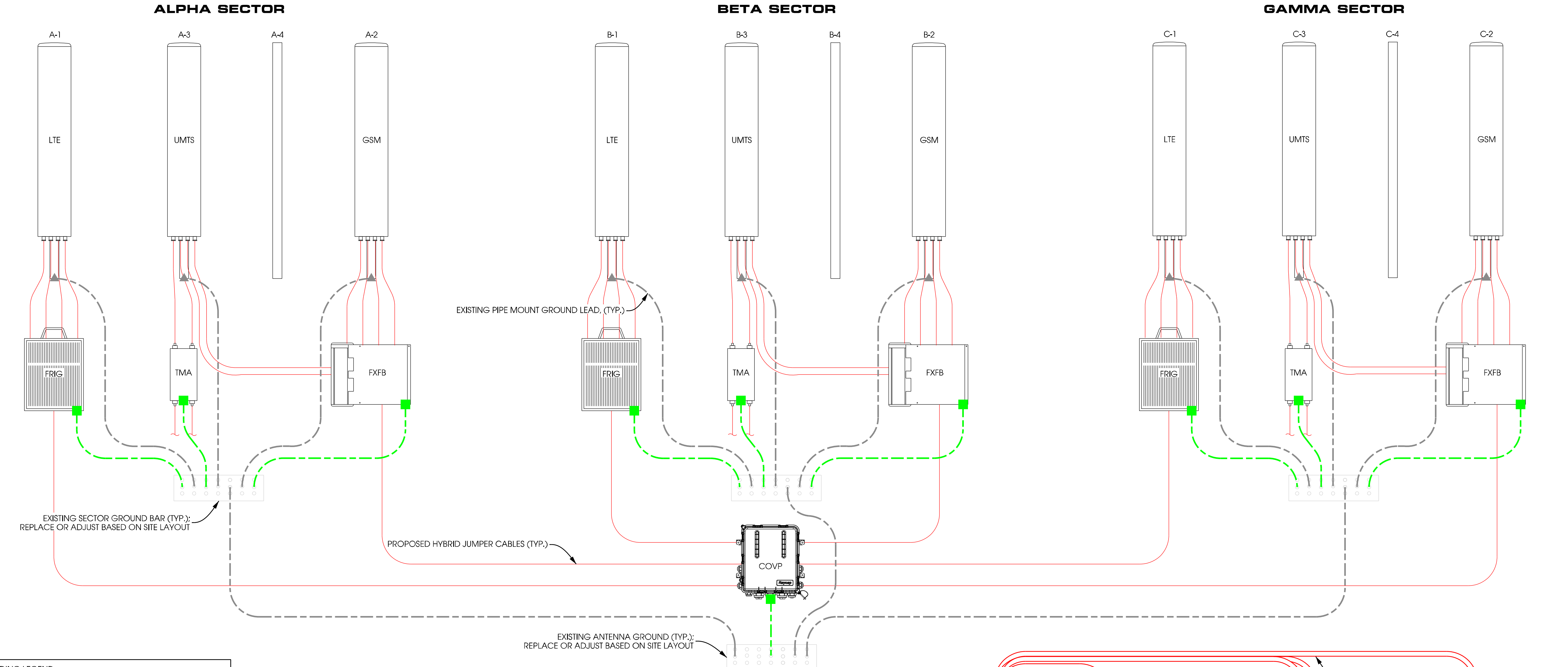
MILWAUKEE, WI 53210

RF DATA CONFIGURATION SHEET

A-4

ALPHA SECTOR · BETA SECTOR · GAMMA SECTOR



TYP. GROUNDING AT ANTENNA LEVEL

GROUNDING LEGEND:

- EXISTING GROUNDING
- PROPOSED #2 SOLID TINNED GROUND LEAD
- PROPOSED #2 INSULATED GROUND LEAD
- EXOTHERMIC WELD CONNECTION
- DOUBLE LUG MECHANICAL CONNECTION

GENERAL NOTES:

RISER DIAGRAM FOR CONCEPTUAL PURPOSES ONLY. SEE SITE PLAN FOR SITE SPECIFIC REQUIREMENTS AND LAYOUT.

SINGLE TYPICAL SECTOR DISPLAYED ONLY. SEE RF DATA SHEET FOR SITE SPECIFIC REQUIREMENTS.

GROUNDING NOTES:

BOND NEW ANTENNA END RRUs AND COVP TO EXISTING SECTOR GROUND BAR OR UPPER ANTENNA GROUND BAR AS SITE LAYOUT DICTATES. VERIFY CAPACITY OF EXISTING GROUND BAR AND REPLACE AS REQUIRED.

ALL NON-INSULATED GROUND LEADS EXTENDING 4"OR MORE ABOVE GRADE TO BE SLEAVED IN CAR-FLEX OR EQUIVALENT.

GROUND SSC AS SPECIFIED BY MANUFACTURER.

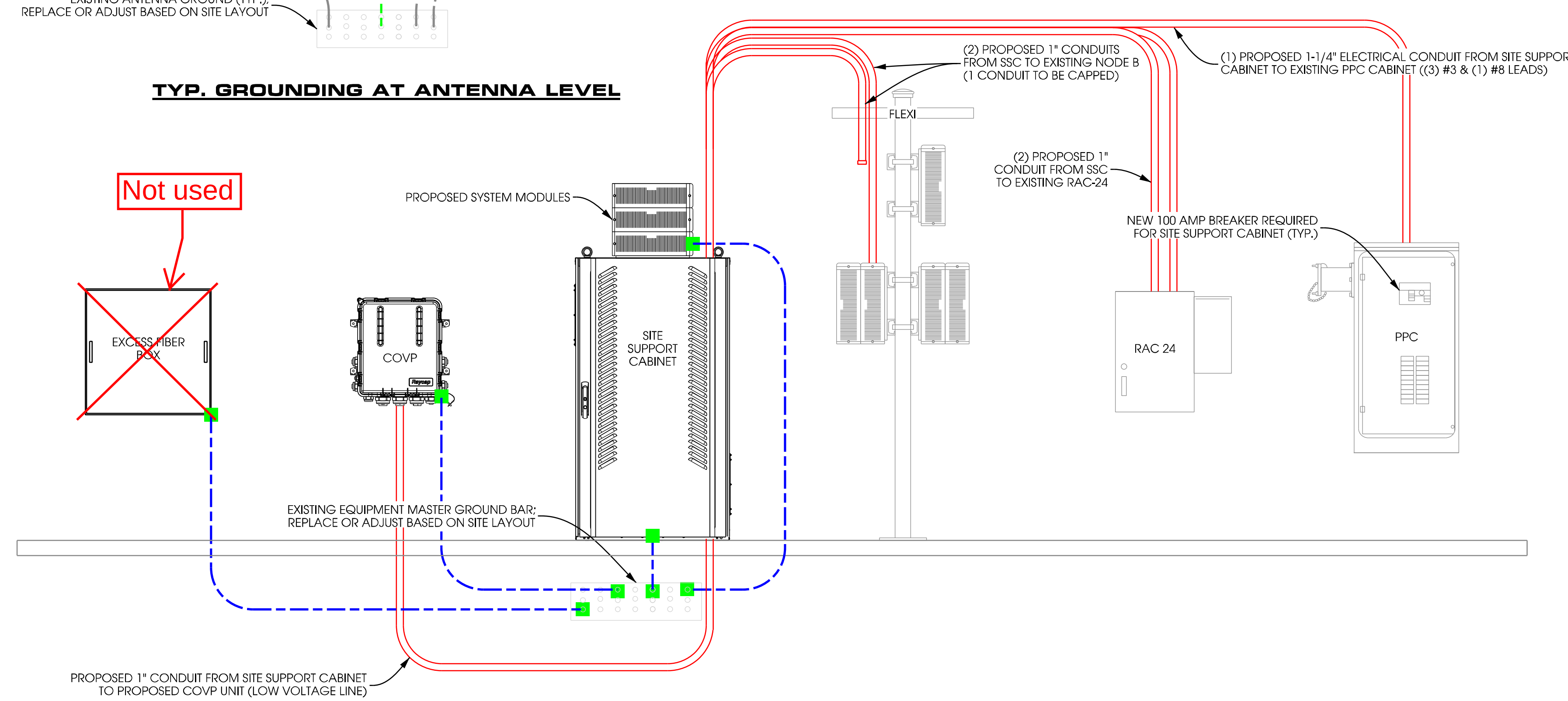
UTILITY NOTES:

MOUNT ALL CONDUITS OVERHEAD WHERE FEASIBLE.

ALL ABOVE GRADE CONDUITS EXPOSED TO FOOT TRAFFIC TO BE EXTERIOR RATED GALVANIZED RIDGID CONDUITS. SUCH ANCHORS TO BE ANCHORED TO CONCRETE, FOLLOW EXISTING CONDUIT PATHS, AND BE PLACED OUTSIDE OF THE SERVICE/WORK ZONE PATH.

EXTERIOR GRADE LIQUID TIGHT FLEXIBLE CONDUIT ALLOWED FOR CONDUIT TRANSITIONING AT LAST 2' OF ROUTE IF LOCATED ON EXISTING SUPPORT, CHASE, OR WALL. NOT ALLOWED ALONG FINISHED GROUND SURFACE.

VERIFY ALL MATERIALS AND INSTALLATION PROCEDURES WITH LOCAL INSPECTOR REQUIREMENTS.



TYP. GROUNDING AT SITE LEVEL

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8550 W. Bryn Mawr Ave.
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Chicago, Illinois 60631
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2		

SCHRAGER
ML42100A

2915 N. SHERMAN BLVD
MILWAUKEE, WI 53210

ANTENNA AND GROUNDING CONFIGURATION

RF-1

PART 1 GENERAL

1.00 GENERAL REQUIREMENTS

- THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLYING WITH ALL SAFETY PRECAUTIONS AND REGULATIONS DURING THE WORK. ALL GENERAL NOTES AND STANDARD DETAILS ARE THE MINIMUM REQUIREMENTS TO BE USED IN CONDITIONS WHICH ARE NOT SPECIFICALLY SHOWN OTHERWISE.
- ALL SYMBOLS AND ABBREVIATIONS ARE CONSIDERED CONSTRUCTION INDUSTRY STANDARDS. IF A CONTRACTOR HAS A QUESTION REGARDING THEIR EXACT MEANING THE ARCHITECT/ENGINEER SHALL BE NOTIFIED FOR CLARIFICATIONS.
- WHERE SPECIFIED, MATERIALS TESTING SHALL BE TO THE LATEST STANDARDS AVAILABLE AS REQUIRED BY THE LOCAL GOVERNING AGENCY RESPONSIBLE FOR RECORDING THE RESULTS.
- THE CONTRACTOR SHALL PROVIDE THE MATERIALS APPROVED BY THE FIRE MARSHALL FOR FILLING OR SEALING PENETRATIONS THROUGH FIRE RATED ASSEMBLIES.
- ALL DIMENSIONS TAKE PRECEDENCE OVER SCALE UNLESS OTHERWISE NOTED.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COMPLETE SECURITY OF THE SITE FROM THE START OF THE PROJECT TO THE COMPLETION OF THE PROJECT. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO BID TO ASSESS CONDITIONS THAT MAY ADVERSELY AFFECT THE WORK OR THE COST OF THE WORK.
- THE CONTRACTOR SHALL FIELD VERIFY THE DIMENSIONS, ELEVATIONS, ETC. NECESSARY FOR THE PROPER CONSTRUCTION OF NEW PORTION OF THE WORK AND ALIGNMENT OF THE NEW PORTION OF THE WORK TO THE EXISTING WORK. THE CONTRACTOR SHALL MAKE ALL MEASUREMENTS NECESSARY FOR FABRICATION AND ERECTION OF STRUCTURAL MEMBERS. ANY DISCREPANCIES SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE A & E.
- NEW CONSTRUCTION ADDED TO EXISTING CONSTRUCTION SHALL BE MATCHED IN FORM, TEXTURE, MATERIAL AND PAINT COLOR EXCEPT AS NOTED IN THE PLANS.
- NO CHANGES ARE TO BE MADE TO THESE PLANS WITHOUT THE KNOWLEDGE AND WRITTEN CONSENT OF THE A & E.
- ANY REFERENCE TO THE WORDS APPROVED OR APPROVAL IN THESE DOCUMENTS SHALL BE HERE DEFINED TO MEAN GENERAL ACCEPTANCE OR REVIEW AND SHALL NOT RELIEVE THE CONTRACTOR AND/OR HIS SUB-CONTRACTORS OF ANY LIABILITY IN FURNISHING THE REQUIRED MATERIALS OR LABOR SPECIFIED.
- THE CONTRACTOR SHALL PROVIDE ALL NECESSARY BLOCKING, BACKING, FRAMING, HANGERS OR SUPPORTS FOR INSTALLATION OF ITEMS INDICATED ON THE DRAWINGS.
- ALL WORK PERFORMED AND MATERIALS INSTALLED SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST EDITIONS OF THE FOLLOWING CODES/SPECIFICATIONS:
  - LATEST LOCAL JURISDICTIONAL BUILDING CODES.
  - ALL APPLICABLE LOCAL, STATE, AND FEDERAL CODES AND REGULATIONS
  - AMERICAN CONCRETE INSTITUTE (ACI)
  - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
  - ANSI/EIA - 222 - E
  - UNIFORM BUILDING CODE (UBC)
  - BUILDING OFFICIALS & CODE ADMINISTRATION (BOCA)
  - NATIONAL ELECTRICAL CODE (NEC) WITH ALL AMENDMENTS
  - AMERICAN INSTITUTE FOR STEEL CONSTRUCTION OR SPECIFICATIONS (AISC)
  - UFE SAFETY CODE NIFFA - 101
  - FEDERAL AVIATION REGULATIONS

1.03 CONFLICTS

A. THE CONTRACTOR AND EACH SUBCONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL MEASUREMENTS AT THE SITE BEFORE ORDERING ANY MATERIALS OR PERFORMING ANY WORK. NO EXTRA CHARGE OR COMPENSATION SHALL BE ALLOWED DUE TO DIFFERENCES BETWEEN ACTUAL DIMENSION AND DIMENSIONS INDICATED ON THE CONSTRUCTION DRAWINGS. ANY SUCH DISCREPANCY IN DIMENSIONS WHICH MAY INADVERTENTLY OCCUR SHALL BE SUBMITTED TO THE SDM OR DESIGNATED REPRESENTATIVES FOR CONSIDERATION BEFORE THE CONTRACTOR PROCEEDS WITH WORK IN THE AFFECTED AREAS.

B. THE CONTRACTOR SHALL NOTIFY A & E OF ANY ERRORS, OMISSIONS, OR DISCREPANCIES AS THEY MAY BE DISCOVERED IN THE PLANS, SPECIFICATIONS AND NOTES PRIOR TO STARTING CONSTRUCTION, INCLUDING BUT NOT LIMITED TO DEMOLITION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECTING ANY ERRORS, OMISSIONS, OR INCONSISTENCIES AFTER THE START OF CONSTRUCTION THAT HAVE NOT BEEN BROUGHT TO THE ATTENTION OF THE A & E AND SHALL INCUR ANY EXPENSES REQUIRED TO RECTIFY THE SITUATION. THE METHOD OF CORRECTION SHALL BE APPROVED BY THE A & E.

C. THE CONTRACTOR, IF AWARDED THE CONTRACT, WILL NOT BE ALLOWED ANY EXTRA COMPENSATION BY REASON OF ANY MATTER OR THING WHICH THE CONTRACTOR MIGHT NOT HAVE FULLY INFORMED HIMSELF PRIOR TO BIDDING.

D. NO PLEA OF IGNORANCE OF CONDITIONS THAT EXIST, OR OF DIFFICULTIES THAT MAY BE ENCOUNTERED OR OF ANY OTHER RELEVANT MATTER CONCERNING THE WORK TO BE PERFORMED WILL BE ACCEPTED AS A REASON FOR ANY FAILURE OR OMISSION ON THE PART OF THE CONTRACTOR TO FULFILL THE REQUIREMENTS OF THE CONTACT DOCUMENTS.

1.07 PROTECTION

A. PROTECT FINISHED SURFACES, INCLUDING JAMBS AND WALLS USED AS PASSAGEWAYS THROUGH WHICH EQUIPMENT AND MATERIALS WILL PASS.

B. PROVIDE PROTECTION FOR EQUIPMENT ROOM SURFACES PRIOR TO ALLOWING EQUIPMENT OR MATERIAL TO BE MOVED OVER SUCH SURFACES.

C. MAINTAIN FINISHED SURFACES CLEAN, UNMARRED AND SUITABLY PROTECTED UNTIL JOB SITE IS ACCEPTED BY THE SDM.

D. PRIOR TO STARTING CONSTRUCTION, THE CONTRACTOR SHALL PROTECT ALL AREAS FROM DAMAGE WHICH MAY OCCUR DURING CONSTRUCTION. ANY DAMAGE TO NEW OR EXISTING SURFACES, STRUCTURES OR EQUIPMENT SHALL BE IMMEDIATELY REPAIRED OR REPLACED TO THE SATISFACTION OF THE PROPERTY OWNER. THE CONTRACTOR SHALL BEAR THE EXPENSE OF REPAIRING OR REPLACING ANY DAMAGED AREAS.

1.08 REPAIRS AND REPLACEMENTS

A. IN EVENT OF DAMAGES, THE CONTRACTOR SHALL NOTIFY OWNER SDM, THEN PROMPTLY MAKE ALL REPLACEMENTS AND REPAIRS AT NO ADDITIONAL COST TO OWNER.

B. ADDITIONAL TIME THAT IS REQUIRED TO SECURE REPLACEMENTS AND TO MAKE REPAIRS WILL NOT BE CONSIDERED BY OWNER TO JUSTIFY EXTENSION IN THE CONTRACT TIME FOR COMPLETION.

1.10 CLEAN UP

A. THE CONTRACTOR SHALL AT ALL TIMES KEEP THE SITE FREE FROM ACCUMULATION OF WASTE MATERIALS OR RUBBISH CAUSED BY THEIR EMPLOYEES AT WORK, AND AT THE COMPLETION OF THE WORK, THEY SHALL REMOVE ALL RUBBISH FROM AND ABOUT THE BUILDING, INCLUDING ALL TOOLS, SCAFFOLDING AND SURPLUS MATERIALS, AND SHALL LEAVE THE WORK AREA CLEAN AND READY FOR USE EACH DAY.

B. EXTERIOR: VISUALLY INSPECT EXTERIOR SURFACES AND REMOVE ALL TRACES OF SOIL, WASTE MATERIAL, DUST, SMUDGES, AND OTHER FOREIGN MATTER.
   1. REMOVE ALL TRACES OF SPLASHED MATERIALS FROM ADJACENT SURFACES.
   2. IF NECESSARY TO ACHIEVE A UNIFORM DEGREE OF CLEANLINESS, HOSE DOWN THE EXTERIOR OF THE STRUCTURE.

C. INTERIOR: VISUALLY INSPECT INTERIOR SURFACES AND REMOVE ALL TRACES OF SOIL, WASTE MATERIAL, SMUDGES AND OTHER FOREIGN MATTER.
   1. REMOVE ALL TRACES OF SPLASHED MATERIALS FROM ADJACENT SURFACES.
   2. REMOVE PAINT DROPPINGS, SPOTS, STAINS AND DIRT FROM FINISHED SURFACES.

D. CONTRACTOR SHALL WASH AND WAX FLOOR PRIOR TO FINAL ACCEPTANCE FROM SDM. WAX SHALL BE THE ANTI-STATIC TYPE.

1.12 RELATED DOCUMENTS AND COORDINATION

A. GENERAL CARPENTRY, ELECTRICAL AND ANTENNA DRAWINGS ARE INTERRELATED. IN PERFORMANCES OF THE WORK EACH CONTRACTOR JUST REFERS ALL DRAWINGS. ALL COORDINATION TO BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

B. THE CONTRACTOR SHALL SUPERVISE AND COORDINATE ALL WORK, USING HIS PROFESSIONAL KNOWLEDGE AND SKILLS. HE IS SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES AND PROCEDURES, AND FOR SUPERVISING, SEQUENCING AND COORDINATING ALL PORTIONS OF THE WORK.

1.13 SHOP DRAWINGS

A. CONTRACTOR TO SUBMIT SHOP DRAWINGS AS REQUIRED AND LISTED IN THESE SPECIFICATIONS AND THROUGH THE GENERAL CONTRACT TO THE SDM FOR APPROVAL.

B. SHOP DRAWINGS FOR ALL STRUCTURAL STEEL SHALL BE SUBMITTED TO THE ENGINEER OF RECORD UNLESS SPECIFICALLY NOTED OTHERWISE; CONTRACTOR SHALL NOT FABRICATE STEEL UNTIL DRAWINGS HAVE BEEN ACCEPTED IN WRITING.

C. ALL SHOP DRAWINGS TO BE REVISED, CHECKED AND CORRECTED BY GENERAL CONTRACTOR PRIOR TO SUBMITTAL TO THE SDM.

1.14 PRODUCTS AND SUBSTITUTIONS

A. SUBMIT 3 COPIES OF EACH REQUEST FOR SUBMISSION. IN EACH REQUEST IDENTIFY THE PRODUCT FABRICATION OR INSTALLATION METHOD TO BE REPLACED BY THE SUBSTITUTION. INCLUDE RELATED INPSECTIONS AND DRAWING NUMBERS, AND COMPLETE DOCUMENTATION SHOWING COMPLIANCE WITH THE REQUIREMENTS FOR SUBSTITUTIONS.

B. ALL NECESSARY PRODUCT DATA AND CUT SHEETS SHOULD PROPERLY INDICATES AND DESCRIBE ITEMS, PRODUCTS AND MATERIALS BEING INSTALLED. THE CONTRACTOR SHALL, IF DEEMED NECESSARY BY THE SDM, SUBMIT ACTUAL SAMPLES TO THE SDM FOR APPROVAL IN LIEU OF CUT SHEETS.

1.15 COMPLIANCE

A. ALL MATERIALS, DESIGN AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH ALL APPLICABLE CODES (SOME ARE LISTED HEREIN) ORDINANCES, AND AUTHORITIES HAVING JURISDICTION OVER THE WORK. UPON THE COMPLETION OF THE WORK, THE CONTRACTOR SHALL PROVIDE CARRIER WITH THE CERTIFICATES OF OCCUPANCY (IF REQUIRED), JOB SITE PERMITTED PLANS AND INSPECTION CARD WITH ALL FINAL INSPECTION SIGNATURES AND OTHER LEGAL DOCUMENTS TO VERIFY SUCH COMPLIANCES. WHERE NO CODES EXIST, THE WORK SHALL CONFORM TO THE UNIFORM BUILDING CODE AND/OR THE SPECIFICATIONS HEREIN, WHICHEVER IS MORE STRINGENT AND A DOCUMENT STATEMENT SHALL BE FURNISHED TO THIS EFFECT.

B. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY COMPLIANCE WITH THE GOVERNING CODES AND TO NOTIFY THE SDM OF ANY DISCREPANCIES PRIOR TO PERFORMING WORK.

C. REFERENCES TO ANY STANDARD OR CODE OF PRACTICES IN THIS SPECIFICATION SHALL BE DEEMED TO MEAN THE EDITION CURRENT AT THE TIME OF AWARD OF THE CONTRACT.

D. THE TELECOMMUNICATIONS EQUIPMENT SPACE SHOWN IN THESE DRAWINGS IS NOT CUSTOMARILY OCCUPIED. WORK TO BE PERFORMED IN THIS FACILITY CANNOT REASONABLY BE PERFORMED BY PERSONS WITH A SEVERE IMPAIRMENT TO MOBILITY, SIGHT OR HEARING, THEREFORE, PER THE APPLICABLE CODES; THIS FACILITY SHALL BE EXEMPTED FROM ALL TITLE 24 ACCESS REQUIREMENTS.

E. THE CONTRACTOR SHALL COMPLY WITH ALL ZONING AND SITE ACQUISITION SPECIAL STIPULATIONS AS OUTLINED IN THE JOB SPECIFICATIONS, OR AS DIRECTED BY THE SDM.
   1. ANSI/EIA - 222 - G
   2. UNIFORM BUILDING CODE (UBC)
   3. BUILDING OFFICIALS & CODE ADMINISTRATION (BOCA)
   4. NATIONAL ELECTRICAL CODE (NEC) WITH ALL AMENDMENTS
   5. AMERICAN INSTITUTE FOR STEEL CONSTRUCTION OR SPECIFICATIONS (AISC)
   6. LIFE SAFETY CODE NFFA - 101
   7. FEDERAL AVIATION REGULATIONS

SERVICE NOTES:

A. ELECTRICAL PLANS, DETAILS, AND DIAGRAMS ARE DIAGRAMMATIC ONLY; VERIFY EXACT LOCATIONS AND MOUNTING HEIGHTS WITH OWNER; PLACEMENT AND ROUTING OF ALL COMPONENTS SHALL BE IN ACCORDANCE WITH ALL APPLICABLE CODES.

B. SERVICE EQUIPMENT SHALL HAVE A FAULT WITHSTAND RATING EQUAL TO OR EXCEEDING THE MAXIMUM AVAILABLE FAULT CURRENT AT THE SUPPLY TERMINAL. INSTALLATION SHALL BE FREE FROM ALL FAULTS AND GROUNDS.

C. ALL ELECTRICAL EQUIPMENT, CONDUITS, AND SUPPORT SHALL BE ABLE TO WITHSTAND 80 M.P.H. WIND SPEED; EXPOSURE C.

D. ALL ELECTRICAL EQUIPMENT SHALL HAVE A PERMANENTLY AFFIXED NEOPRENE PLASTIC LABEL – BLACK ON WHITE; LETTER HEIGHT SHALL BE [illegible]"; ALL NAMEPLATES TO BE FASTENED WITH (2) STAINLESS STEEL SCREWS, NOT ADHESIVE.

E. ALL WIRING SHALL BE COPPER WITH THHN/THWN DUAL RATED 600V, COLOR CODED, #12 AWG MINIMUM UNLESS NOTED OTHERWISE.

CONDUIT NOTES:

F. RIGID CONDUIT SHALL BE U.L. LABEL GALVANIZED ZINC COATED WITH GALVANIZED ZINC INTERIOR AND SHALL BE USED WHEN INSTALLED IN OR UNDER CONCRETE SLABS, IN CONTACT WITH EARTH, UNDER PUBLIC ROADWAYS, IN MASONRY WALLS, OR EXPOSED ON BUILDING EXTERIOR.

G. ELECTRICAL METALLIC TUBING SHALL BE U.L. LABEL; FITTING SHALL BE GLAND RING COMPRESSION TYPE.

H. CORING THROUGH FLOORS AND WALLS SHALL NOT BE DONE WITHOUT FINAL APPROVAL OF BUILDING OWNER OR OWNER REPRESENTATIVE.

I. CORING SHALL NOT BE PERFORMED DURING WORKING HOURS UNLESS OTHERWISE APPROVED BY THE OWNER.

GENERAL NOTES:

J. SUBMITTAL OF BID INDICATES CONTRACTOR IS FAMILIAR WITH ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED AS DETAILED AND OUTLINED IN THESE DRAWINGS.

K. THE ELECTRICAL PORTION OF THESE DRAWINGS IS ONLY A PART OF THE OVERALL DESIGN. IT IS NECESSARY FOR THE ELECTRICIAN TO CONSIDER ALL ASPECTS OF THIS PROJECT WHEN BIDDING AND PLANNING THE WORK.

L. IN THE EVENT OF A CONFLICTING DESIGN OR NOTATION, THE CONTRACTOR SHALL ASSUME THE MOST EXPENSIVE OR RESTRICTIVE METHOD UNTIL A CLARIFICATION IS MADE.

M. ALL THINGS, WHICH IN THE OPINION OF THE CONTRACTOR ARE DEFICIENCIES, OMISSIONS, CONTRADICTIONS, OR AMBIGUITIES, IN THESE DESIGN DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE WORK PROCEEDS; ALL CLARIFICATIONS MUST BE RECEIVED IN WRITING IN ORDER FOE THE MATTER TO BE CONSIDERED RESOLVED.

N. ELECTRICAL WORK SHALL INCLUDE BUT NOT LIMITED TO ALL MATERIALS AND LABOR TO COMPLETE ALL ELECTRICAL SYSTEMS INCLUDING LIGHTING, LOW VOLTAGE SYSTEMS, PANELS, POWER AND TELEPHONE DATA SERVICE, CONTROL WIRING, AND GROUNDING.

O. ALL WORK TO BE EXECUTED IN A WORKMAN LIKE MANNER AND SHALL PRESENT A NEAT, UNIFORM, AND WELL INSTALLED APPEARANCE; THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PROTECTION, CLEAN-UP AND RESTORATION OF OWNER FACILITIES ASSOCIATED WITH THE WORK.

P. SUBMITTAL OF BID INDICATES CONTRACTOR IS AWARE AND WILL CONFORM TO ALL LOADING AND UNLOADING RESTRICTIONS, ELEVATOR RESTRICTIONS, AND UNDERSTANDS OWNER EXPECTATION REGARDING TO THE SCHEDULE OF CORING AND OTHER TENANT IMPACTING ACTIVITIES.

Q. CONTRACTOR TO VERIFY ACCEPTANCE OF THESE PLANS AND DESIGNS WITH THE LOCAL UTILITY COMPANY ENGINEER BEFORE THE START OF ANY WORK AND ORDERING OF ANY MATERIAL.

R. CONTRACTOR TO VERIFY OWNER APPROVAL OF ANY PLANNED OUTAGES PRIOR TO SUBMITTAL OF BID.

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8550 W. Bryn Mawr Ave.
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PROJECT NO: 7465

DRAWN BY: CV

CHECKED BY: DCL

REV.	DATE:	DESCRIPTION:
A	6/12/12	PERMIT CD's
B		
C		
0	7/24/12	FINAL CD's
1		
2		

SCHRAGER
ML42100A

2915 N. SHERMAN BLVD
MILWAUKEE, WI 53210

GENERAL NOTES AND SPECIFICATIONS

GN-1

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STRUCTURAL ANALYSIS REPORT

CARRIER:

T-Mobile

ROOFTOP SITE MODERNIZATION
SCHRAGER RT (ML42100A)
MILWAUKEE, WISCONSIN

EDGE PROJECT NUMBER:
7465

JUNE 2012

STRUCTURAL ANALYSIS REPORT

Project Information: Schrager RT
2915 N. Sherman Blvd.
Milwaukee, WI

Client Project Number: ML42100A

Client: SureSite Consulting Group, LLC
Contact: Mark Williams, Project Manager
Phone: (312) 434-0106

Carrier: T-Mobile
8550 W Bryn Mawr
First Floor
Chicago, IL 60631

Consultant: Edge Consulting Engineers
624 Water Street
Prairie du Sac, Wisconsin 53578
Contact: David Lyshek, P.E.
Phone: (608) 644-1449

Edge Project Number: 7465

Date: June 2012

WISCONSIN
DAVID C.
LYSHEK
39472
PRAIRIE DU SAC,
WI
PROFESSIONAL ENGINEER

David Lyshek, P.E.
Project Engineer

6/12/2012
Date

TABLE OF CONTENTS

APPENDICES

SECTION 1
EXECUTIVE SUMMARY

Site Name:	Schrager RT
Site Location:	2915 N. Sherman Blvd. Milwaukee, Wisconsin
Structure Type:	Rooftop
Project Description:	T-Mobile Site Modernization

We have completed a structural analysis to address the T-Mobile site modernization goals. T-Mobile currently occupies the structure with (3) sectors of antennas. Each sector of antennas will be replaced by (3) Andrew TMBXX-6517-A2M antennas. Each sector of antennas will be accompanied by remote radio units (RRUs) and supported by a COVP. The site modernization will also include the addition of a site support cabinet (SSC) and related system modules for the RRUs at the radio cabinet end.

Our analysis was performed in accordance with the current Wisconsin Commercial Building Code (IBC 2009), and all of its referenced standards.

The existing antenna supports and equipment space were analyzed for proposed antenna loading and existing and proposed equipment loading.

The analysis shows that the equipment room and the building in question are structurally adequate to support the proposed change in loading. Likewise, the existing antenna mounts and proposed RRU + COVP mounts are structurally adequate to support the proposed loading.

Please refer to the report which follows this summary for further information. Feel free to contact us if you have any questions or concerns.

SECTION 2
INTRODUCTION

2.1 PROJECT OVERVIEW

This report summarizes the results of a structural analysis conducted by Edge Consulting Engineers (Edge) for SureSite who is managing a site modernization project for T-Mobile related to a rooftop site which they currently occupy.

2.2 PURPOSE OF REPORT

The purpose of this report is to assess the adequacy of the existing rooftop structure, equipment room, and antenna mounts to support the proposed antennas and equipment cabinet loading while considering appropriate loading criteria. This assessment was completed using background information provided by the client/local municipality and/or obtained in the field (where noted) and in conformance with current applicable codes, client directed protocols, and the judgment of the structural engineer.

2.3 SCOPE OF SERVICES

The scope of services for this project included structural analysis of the building and equipment area, and antenna supports in accordance with client supplied information.

This report summarizes the structural analysis results.

SECTION 3
ANALYSIS

3.1 BACKGROUND & SCOPE OF WORK

T-Mobile currently occupies the subject structure with telecommunications equipment. Site modernization through antenna swap-outs the addition of remote radio units (RRUs) and COVP and the installation of a site support cabinet (SSC) and system modules,

The proposed modernization shall occur on the existing T-Mobile equipment and antennas installed within the building loft and rooftop level.

The following resources were utilized in preparation of this analysis:

- T-Mobile Construction Drawings (10/12/2005) and T-Mobile Structural Analysis (10/12/2005).
- Existing rooftop layout of equipment and antennas per Edge site visit dated 5/31/2012
- Proposed antenna and equipment cabinet loading.
- T-Mobile Radio Frequency Data Sheet & SSC equipment specifications.

The structure was designed as a church with a second story balcony, loft, and elevated dome. The building appears to date back to 1922 and is currently used for antique storage and resale. The building primarily consists of masonry and reinforced concrete. The existing T-Mobile equipment room is on the second floor organ room loft. The antennas are installed on the vertical wall of the dome at the rooftop level. This configuration gives an antenna centerline height of approximately 60' above ground level.

3.2 ANALYSIS CRITERIA

This analysis was performed in accordance with the current Wisconsin Commercial Building Code (IBC 2009).

This analysis utilized the following Exposure Criteria and Occupancy Category.

Exposure Criteria: C
Occupancy Category: II
Wind speed: 90 mph

These criteria were selected based on the location and use of the building in question. Should the client have reason for selection of other criteria, they must contact the engineer.

Definitions of the different categories and criteria were taken from the ASCE 7-05 standard and are provided in Appendix A.

SECTION 4
RESULTS

4.1 ANTENNA MOUNTS

T-Mobile maintains (3) sectors of antennas on the rooftop of the structure. Each sector of antennas consists of (2) existing antennas. The existing antennas are proposed to be replaced with the (3) Andrew TMBXX-6517-A2M antennas. The additional antenna will be supported adjacent to the existing and secured and anchored to the building exterior to match the existing. The proposed mounts, like the existing, will be anchored through the brick façade and into the underlying concrete wall. A manufactured mount prescribed for such applications shall be used.

The antennas will also be supplemented by (1) COVP and (3) RRUs. Antennas and supplementary equipment shall be supported by the existing mounts. The RRUs + COVP are designed to be supported on a custom fabricated frame to be located adjacent to each of the sectors behind the parapet wall. The weight of the frame and supported equipment was determined to adequately anchor its self in place. The resultant superimposed roof load (16.3 psf) was calculated. Surplus roof capacity between 20 to 30 psf is anticipated, which is well above the anticipated loads at each of these locations. Therefore, the mounts and ballast as prescribed <u>are adequate</u>. See Appendix B for supporting calculations to this analysis.

4.2 EQUIPMENT SPACE AND ROOFTOP STRUCTURE

The proposed Site Support Cabinet (SSC) and system modules are to be located in a section of the mechanical room penthouse prescribed for T-Mobile's use. The summary of T-Mobile loading conditions with respect to the existing conditions, original T-Mobile design, and as proposed under site modernization is as follows:

Equipment Type & Location	Existing Conditions	Original Design	Proposed Conditions
BTS	(1) BTS (1200 lbs)	(2) BTS (2400 lbs)	(1) BTS (1200 lbs)
Battery Backup Unit	(0)	(0)	(0)
Flexi	Flexi (300 lbs)	(0)	(0) Wall mount
Site Support Cabinet & System Modules	(0)	(0)	(1) SSC & (4) System Modules (1400 lbs)
TOTAL	1500 Lbs	2400 lbs	2600 lbs

Equipment items such as coax, jumper cables, power panels, junction boxes, and other ancillary support equipment not deemed significant to the structural analysis were excluded from the summary table above.

The existing and proposed equipment shall be located in a second floor loft room. The equipment area is adjacent to an exterior wall and shall sit on the reinforced concrete floor. The previous field inspection revealed that the floor of the loft consists of a reinforced concrete slab and beam structure. The slab was determined to be 5" thick. The original architectural plans identified this area as the Choir Organ room. The total weight of the proposed equipment configuration is approximately 2,600 lbs. T-Mobile leases an area of 120 square feet (sqft) within this room. The resultant uniform load over T-Mobile's designated area is approximately 21.7 psf. Based on this, the proposed equipment is considered to be within the reinforced concrete floor's loading capacity. Therefore, the existing equipment room floor and building superstructure are adequate.

4.3 RECOMMENDATIONS

Based on the results of this analysis, it is our professional opinion that the existing antenna mounts, equipment space, and rooftop structure are adequate as analyzed under the proposed change in loading.

If the proposed loading is altered from that analyzed, this report shall be deemed obsolete and further analysis will be required.

SECTION 5
LIMITATIONS AND RESTRICTIONS

1. This report was prepared in accordance with generally accepted structural engineering practices common to the industry and makes no other warranties, either expressed or implied, as to the professional advice provided under the terms of the agreement between Engineer and Client. This report has not been prepared for uses or parties other than those specifically named, or for uses or applications other than those enumerated herein. The report may contain insufficient or inaccurate information for other purposes, applications, and/or other uses.
2. This report is intended for the use of the client, and cannot be utilized or relied upon by other parties without the written consent of Edge Consulting Engineers.
3. Edge consulting Engineers is not responsible for any, and all, modifications completed prior to, or hereafter, which Edge Consulting Engineers was not, or will not, be directly involved.
4. The conclusions and recommendations contained within this report are based upon the supplied and attained information as described within the report. If it is known, or becomes known, that any item(s) are in conflict with what is described within this document, this report should be considered void and Edge Consulting Engineers should be contacted immediately.
5. Edge Consulting Engineers disclaims all liability for any information, conclusion, or recommendation that is not expressly stated or represented within this report.
6. Edge Consulting Engineers shall not be liable for any incidental, consequential, indirect, special or punitive damages arising out of any claim associated with the use of this report.
7. The scope of worked performed for this analysis is limited to the items in which we were furnished complete and accurate information.
8. This analysis was performed under the assumption that all structural elements are in like new condition, free from rust and other deterioration. It is also assumed that everything was properly installed per construction documents. Edge Consulting Engineers cannot account for, nor be held responsible, if elements are deteriorated, damaged, and/or missing.
9. This analysis was performed based upon the antenna and equipment loading and placement as described within this report. Any alterations to the described loading or placement will require re-analysis, and the findings contained in this report are not valid.
10. The loading utilized for this analysis is based on information provided by the client, and readily available manufacturer/vendor information (antenna and mount projected areas, weight and shape factors). However, if the described loading criteria and design assumptions within this report are not accurate, are altered, or changed in any form, this analysis shall be considered void and an additional analysis must be performed.
11. It is the responsibility of the client and the building owner to thoroughly review the existing and proposed loading, and bring any discrepancy to the attention of Edge Consulting Engineers.
12. This analysis does not evaluate manufacturer specifications for equipment anchorage or attachment. This includes the specification for the system modules to the top of the SSC which is a design undertaking between the SSC manufacturer and T-Mobile.

APPENDIX A

ASCE 7-05 DEFINITIONS

ANALYSIS CRITERIA DEFINITIONS

Exposure Criteria:

Exposure B

Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Use of this exposure shall be limited to those areas for which terrain representative of Exposure B surrounds the structure in all directions for a distance of at least 2,630 ft. or ten times the height of the structure, whichever is greater.

Exposure C

Open terrain with scattered obstructions having heights generally less than 30 ft. This category includes flat, open country, grasslands and shorelines in hurricane prone regions.

Exposure D

Flat, unobstructed shorelines exposed to wind flowing over open water (excluding shorelines in hurricane prone regions) for a distance of at least 1 mile. Shorelines in Exposure D include inland waterways, lakes and non-hurricane coastal areas. Exposure D extends inland a distance of 660 ft. or ten times the height of the structure, whichever is greater. Smooth mud flats, salt flats and other similar terrain shall be considered as Exposure D.

Occupancy Categories:

Category I

Buildings and other structures that represent a low hazard to human life in the event of failure, including, but not limited to:

- Agricultural facilities
- Certain temporary facilities
- Minor storage facilities

Category II

All buildings and other structures except those listed in Occupancy Categories I, III, and IV

Category III

Buildings and other structures that represent a substantial hazard to human life I the event of failure, including, but not limited to:

- Buildings and other structures where more than 300 people congregate in one area
- Buildings and other structures with daycare facilities with a capacity greater than 150
- Buildings and other structures with elementary school or secondary school facilities with a capacity greater than 250
- Buildings and other structures with a capacity greater than 500 for colleges or adult education facilities
- Health care facilities with a capacity of 50 or more resident patients, but not having surgery or emergency treatment facilities
- Jails and detention facilities

Buildings and other structures, not included in Occupancy Category IV, with potential to cause a substantial economic impact and/or mass disruption of day-to-day civilian life in the event of failure, including, but not limited to:

- Power generating stations [a]
- Water treatment facilities
- Sewage treatment facilities
- Telecommunication centers

Buildings and other structures not included in Occupancy Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released.

Buildings and other structures containing toxic or explosive substances shall be eligible for classification as Occupancy Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the toxic or explosive substances does not pose a threat to the public.

Category IV

Buildings and other structures designated as essential facilities, including, but not limited to:

- Hospitals and other health care facilities having surgery or emergency treatment facilities
- Fire, rescue, ambulance, and police stations and emergency vehicle garages
- Designated earthquake, hurricane, or other emergency shelters
- Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response
- Power generating stations and other public utility facilities required in an emergency
- Ancillary structures (including, but not limited to, communication towers, fuel storage tanks, cooling towers, electrical substation structures, fire water storage tanks or other structures housing or supporting water, or other fire suppression material or equipment) required for operation of Occupancy Category IV structures during an emergency
- Aviation control towers, air traffic control centers, and emergency aircraft hangars
- Water storage facilities and pump structures required to maintain water pressure for fire suppression
- Buildings and other structures having critical national defense functions

Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous chemicals, or hazardous waste) containing highly toxic substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction.

Buildings and other structures containing highly toxic substances shall be eligible for classification as Occupancy Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the highly toxic substances does not pose a threat to the public. This reduced classification shall not be permitted if the buildings or other structures also funcition as essential facilities.

[a] Cogeneration power plants that do not supply power on the national grid shall be designated Occupancy Category II.

APPENDIX B

STRUCTURAL CALCULATIONS

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Prairie du Sac, WI 53578
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262.364.3000 fax

Structural Calculations

Wind Load Calculations

Client:	**T-Mobile**	**Site Name:**	**Schrager RT**	**Client Site #:**	**ML42100A**	**Edge Site #:**	**7465**
Calculated By:	**DCL**	**Date:**	**6/12/12**	**Checked By:**		**Date:**	

Factors & Formulas

Exposure	C		(ASCE 7-05, p. 288-290)	Note: C considered a conservative default
Importance	1		(ASCE 7-05, Table 6-1, p. 77)	Note: See the Occupancy Categories along with Table 6-1, both given below
Base Wind Speed	90	mph	(ASCE 7-05, Figure 6-1, p. 32-33)	
K_z	1.09		(ASCE 7-05, Table 6-3, p. 79)	Note: See Table 6-3 given below
K_{zt}	1		(ASCE 7-05, Section 6.5.7.1, p. 26)	
K_d	0.85		(ASCE 7-05, Table 6-4, p. 80)	Note: K_d 0.85 for all rooftops

$$q_z = 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I$$

q_z = 19.21 psf (ASCE 7-05, Eq. 6-15, p. 27)

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Structural Calculations

RRU/COVP Mount Frame Calculations

Client: T-Mobile	**Site Name:** Schrager RT	**Client Site #:** ML42100A	**Edge Site #:** 7465
Calculated By: DCL	**Date:** 6/12/12	**Checked By:**	**Date:**

Variables

Variable	Item				Variable	Value	
A	Total Flat Surface Area of All Units				A =	2.69	ft^2
q_z	Wind Pressure (Based on Elevation)				q_z =	19.21	psf
H	CL of Units Above Roof				H =	2.5	ft. above roof
d	Depth of Mount Frame				d =	4	ft
		Number of COVP	1	(50 lbs / 0.92 ft^2 each)			
		Number of RRU	2	(55 lbs / 0.57 ft^2 each)			
		Number of Frig RRU	1	(57 lbs / 0.63 ft^2 each)			
W_s	Self-Weight of All Units				W_s =	217	lbs
W	Weight of Ballast Required						

Calculations

Formula for determining weight of required ballast:

$$W = \frac{1.5 \cdot A \cdot q_z \cdot H}{\frac{d}{2}} - W_s$$

W = -120 lbs of ballast

Concrete Blocks Required = 0 blocks required for ballast

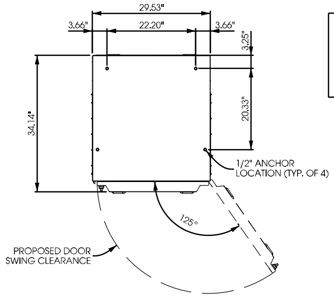
Note: A nominal 4x8x16 solid concrete block weighs 20-30 lb. Verify weight w/ supplier. Calculations above assume a 25 lb nominal weight.
Note: Additional ballast will be needed if more units are added.

Approximate Weight of Empty RRU/COVP Frame = 175 lbs
Foot Print of Frame = 24 ft^2
Total Ballast Weight = 0 lbs
Total Superimposed Area Load = 16.333 psf

OK less than 20 PSF

APPENDIX C

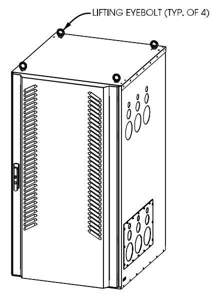
EQUIPMENT SPECIFICATIONS & CUT SHEETS



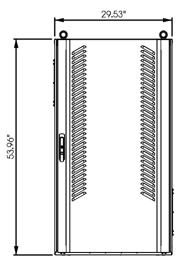
PLAN VIEW

ESOA200-CCU01 (MEDIUM-SS):

CLASS:	MEDIUM SSC CABINET
MANUFACTUER:	DELTA ELECTRONICS, INC.
SIZE:	1370.5 H x 750.0 W x 867 D (MM) 53.96" H x 39.53" W x 34.16" D
WEIGHT:	1200 LBS (APPROX.)



ISOMETRIC VIEW



ELEVATION VIEW

SYSTEM MODULE NOTE:

AS SPECIFIED BY T-MOBILE SYSTEM MODULES SHALL BE SECURED TO THE TOP OF THE SSC. ATTACHMENT OF SYSTEM MODULES TO BE IN ACCORDANCE WITH T-MOBILE/SSC MNFG. SPECIFICATIONS.

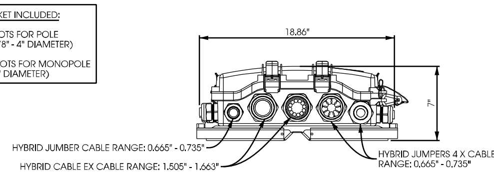
SITE SUPPORT CABINET DETAILS

SCALE: NTS

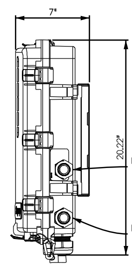
MOUNTING BRACKET INCLUDED:

UTILIZE INNER SLOTS FOR POLE MOUNTING (1-3/8" - 4" DIAMETER)

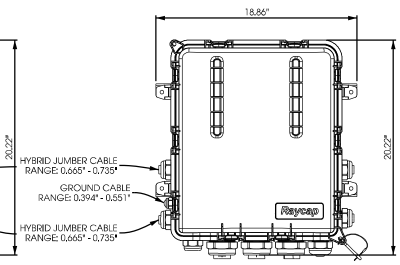
UTILIZE OUTER SLOTS FOR MONOPOLE MOUNTING (> 4" DIAMETER)



BOTTOM VIEW



SIDE VIEW



FRONT VIEW

COVP JUMPER LENGTH NOT TO EXCEED 15'.

COVP DETAILS

SCALE: NTS RNSDC-7771-PF-48

REMOTE RADIO HEAD WEIGHTS:

FXFB (FLEXI 3-SECTOR RF MODULE 1900): 55 LBS (25 KG)

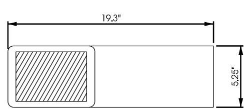
FRIA (FLEXI 3-SECTOR RF MODULE 1.7/2.1): 55 LBS (25 KG) (GROUND MOUNTED)

SYSTEM MODULE WEIGHTS:

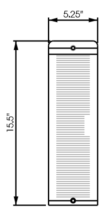
ESMB (FLEXI MULTIRADIO BTS SYSTEM MODULE): 33 LBS (15 KG)

FSME (FLEXI MULTIRADIO BTS SYSTEM MODULE): 50.6 LBS (23 KG)

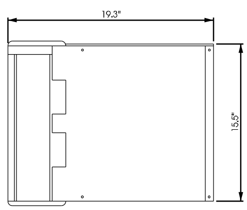
FSMF (FLEXI MULTIRADIO BTS SYSTEM MODULE): 33 LBS (15 KG)



TOP VIEW



SIDE VIEW



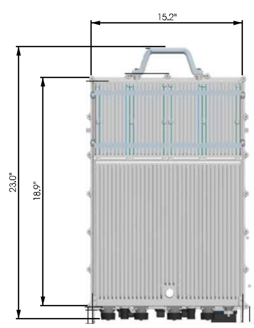
FRONT VIEW

RRU AND SYSTEM MODULE DETAILS

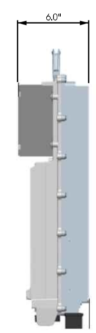
SCALE: NTS

FRIG REMOTE RADIO HEAD SPECIFICATIONS:

WIDTH:	15.2" (387 MM)
HEIGHT:	18.9" (480 MM)
DEPTH:	6.0" (151.85 MM)
WEIGHT:	57 LBS (26 KG)



FRONT VIEW



SIDE VIEW

FRIG RRU DETAIL [LTE]

SCALE: NTS

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SHEET TITLE:

STANDARD EQUIPMENT

T-MOBILE SITE MODERNIZATION

PLOT DATE: 6/9/2012	ISSUE DATE: 2012	SHEET NUMBER:
PROJECT #: 0000	DRAWN BY: AMF	T1.0
FILE NAME: Equipment.dgn		

I:\Telecommunications\Sure-Site\2012-MilwLTE\STR\Equipment.dgn

TMBXX-6517-R2M

DualPol®, Quad Panel Antenna

DualPol®
Teletilt®

- Patented cross dipole and feed system
- Rugged, reliable design with excellent PIM suppression
- Includes factory installed AISG 2.0 RET actuator
- Fully compatible with Andrew Teletilt® remote control antenna system

ELECTRICAL

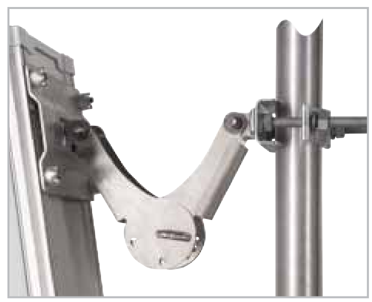
Frequency Range (MHz):	1710–2155
Characteristic Impedance (Ohms):	50
Azimuth BW (Deg):	65 ± 6
Elevation BW (Deg):	4.8 ± 0.8
Gain (dBi) :	18.7 ± 0.8
Polarization:	±45°
Front-to-Back Ratio (dB)	**0° 2° 4° 6°**
Copol, 180° ± 30°:	>25 >25 >25 >24
Total Power, 180° ± 30°:	>24 >24 >24 >23
Upper Sidelobe (dB)	**0° 2° 4° 6°**
Main Beam to +20°:	>17 >17 >16 >14
VSWR / Return Loss (dB):	1.35:1 / 16.5
Port-to-Port Isolation (dB):	>30
Electrical Tilt Range (Deg)*:	0–6
Electrical Downtilt Accuracy (Deg):	± 0.9
Cross-pol (dB)	**0° 2° 4° 6°**
3 dB Beamwidth:	>13 >13 >12 >12
Intermodulation Products (dBc)	
3rd Order, 2 x 20 Watts:	155
Max. Input Power (Watts):	250
Lightning Protection:	DC Ground

PERFORMANCE TRACKING

Gain Variation (dB) (between UL and DL frequency pair):	1.0
Electrical Tilt Accuracy (Deg) (between UL and DL frequency pair within 0.5°):	<0.5
Azimuth HPBW (Deg) (between UL and DL frequency pair):	9

MECHANICAL

Net Weight (kg / lbs):	20.2 / 44.4
Dimensions–LxWxD: (with actuator)	2135 x 305 x 166 mm 84.0 x 12 x 6.5 inch
Length without actuator	1903 mm / 74.9 inch
Max. Wind Area (m² / ft²):	0.28 / 3.0
Max. Wind Load (N / lbf):	747.2 / 168
Max. Wind Speed (km/h / mph):	241 / 150
Hardware Material:	Hot Dip Galvanized
Connector Type:	7-16 DIN, Female (4)
Color:	Off White
Standard Mounting Hardware:	TM600899A-2



***Specifications may vary when using 0° or 1° electrical tilt.**

Andrew Wireless Solutions
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U.K.: 0800 250055
Other Europe:+44 592 782 612

www.commscope.com
Visit our Web site at www.commscope.com or contact your local Andrew Wireless Solutions representative for more information.

TMBXX-6517-R2M

Information correct at date of issue but may be subject to change without notice.