CITY OF CAMBRIDGE
MASSACHUSETTS
BOARD OF ZONING APPEAL
831 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02139
617 349-6100

BZA APPLICATION FORM

Plan No: BZA-017052-2018

GENERAL INFORMATION

The undersigned hereby petitions the Board of Zoning Appeal for the following:

Special Permit : √ **Variance :** _____ **Appeal :** _____

PETITIONER : AT&T - C/O Alex Murshteyn, Centerline Communications

PETITIONER'S ADDRESS : 750 West Center St., Suite #301 West Bridgewater, MA 02379

LOCATION OF PROPERTY : 840 Memorial Dr Cambridge, MA 02139

TYPE OF OCCUPANCY : Retail Office **ZONING DISTRICT :** Office 2 Zone/Overlay Districts MXR; MIT

REASON FOR PETITION :

Other: Wireless Communications

DESCRIPTION OF PETITIONER'S PROPOSAL :

AT&T proposes to add twelve (12) antennas on the building's rooftop. Antennas will be housed within six (6) faux flue pipe canisters designed and painted to match the existing pipes on the roof. AT&T's other rooftop equipment will be house within the proposed 8'x8' walk-in-cabinet on steel fram, along with the attached space for a generator. See latest plans attached.

SECTIONS OF ZONING ORDINANCE CITED :

Article 4.000 Section 4.32.G.1 (Telecommunication Facility).
Article 4.000 Section 4.40 (Footnote 49) (Telecommunication Facility).
Article 10.000 Section 10.40-10.46 (Special Permit).
Article 6409 Section Middle Class Tax Relief Act

Original Signature(s) : _____
(Petitioner(s) / Owner)

Alex Murshteyn
(Print Name)

Address : 750 W. Center St, Ste. 301
W. Bridgewater, MA 02379

Tel. No. : 508-821-0150

E-Mail Address : amurshteyn@elinellc.com

Date : 12/21/2018

BZA APPLICATION FORM - OWNERSHIP INFORMATION

To be completed by OWNER, signed before a notary and returned to The Secretary of the Board of Zoning Appeals.

I/We Rivertech Associates II, LLC
(OWNER)

Address: c/o The Abbey Group , 177 Huntington Avenue, 24th Floor, Boston, MA 02115

State that I/We own the property located at 18 Blackstone St,

which is the subject of this zoning application.

The record title of this property is in the name of Rivertech Associates II, LLC

*Pursuant to a deed of duly recorded in the date 12/29/1989, Middlesex South County Registry of Deeds at Book 01065, Page 74; or Middlesex Registry District of Land Court, Certificate No. _____

Book _____ Page _____.

SIGNATURE BY LAND OWNER OR AUTHORIZED TRUSTEE, OFFICER OR AGENT*

Written evidence of Agent's standing to represent petitioner may be requested.

Commonwealth of Massachusetts, County of Suffolk

The above-name Alan Goodman personally appeared before me, this 21ST of December 2018, and made oath that the above statement is true.

Notary

My commission expires November 14 2019 (Notary Seal).

AOIFE AUSTIN
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
MY COMMISSION EXPIRES NOVEMBER 14, 2019

- If ownership is not shown in recorded deed, e.g. if by court order, recent deed, or inheritance, please include documentation.

BZA APPLICATION FORM

SUPPORTING STATEMENT FOR A SPECIAL PERMIT

Please describe in complete detail how you meet each of the following criteria referring to the property and proposed changes or uses which are requested in your application. Attach sheets with additional information for special permits which have additional criteria, e.g.; fast food permits, comprehensive permits, etc., which must be met.

Granting the Special Permit requested for 18 Blackstone Street / 840 Memorial Dr. **(*location*) would not be a detriment to the public interest because:**

A) Requirements of the Ordinance can or will be met for the following reasons:

The proposed Wireless Communications Facility will comply with all applicable Special Permit criteria as stated in the ordinance and as shown in the application letter accompanying this form.

B) Traffic generated or patterns of access or egress would not cause congestion hazard, or substantial change in established neighborhood character for the following reasons:

The facility will be unmanned. Other than one or two visits per month for routine maintenance, it will not generate any traffic.

C) The continued operation of or the development of adjacent uses as permitted in the Zoning Ordinance would not be adversely affected by the nature of the proposed use for the following reasons:

The facility will not have any adverse affect on the continued operation or development of or development of adjacent uses. It will not create any nuisance or consume any public utilities that would diminish the availability of such utilities to adjacent properties. In fact, it will enhance adjacent uses by providing wireless communications services to the surrounding general public.

D) Nuisance or hazard would not be created to the detriment of the health, safety and/or welfare of the occupant of the proposed use or the citizens of the City for the following reasons:

The facility will not create any nuisance or hazard that would be detrimental to anyone's health, safety and/or welfare. It will not generate any glare, odors, particulate matter or other nuisance that might disturb neighbors' quiet enjoyment. AT&T will comply with applicable FCC regulations concerning radio frequency emissions. It will install, construct and operate the Facility in accordance with all applicable codes.

E) For other reasons, the proposed use would not impair the integrity of the district or adjoining district or otherwise derogate from the intent or purpose of this ordinance for the following reasons:

The facility will not impair the integrity of the O-2 or adjoining non-residential districts. It will not be incompatible with residential and non-residential uses in the area.

BZA APPLICATION FORM

DIMENSIONAL INFORMATION

APPLICANT: AT&T c/o Centerline Communications **PRESENT USE/OCCUPANCY:** _____

LOCATION: 750 West Center St, Suite 301, West Bridgewater, MA 02739 **ZONE:** _____

PHONE: 508-821-0159 **REQUESTED USE/OCCUPANCY:** Wireless Communications

		EXISTING CONDITIONS	*REQUESTED CONDITIONS*	*ORDINANCE REQUIREMENTS*[1]	
TOTAL GROSS FLOOR AREA:		N/A	N/A	N/A	(max.)
LOT AREA:		no change	no change	5,000 sf	(min.)
RATIO OF GROSS FLOOR AREA TO LOT AREA:[2]		N/A	N/A	N/A	(max.)
LOT AREA FOR EACH DWELLING UNIT:		N/A	N/A	N/A	(min.)
SIZE OF LOT:	WIDTH	200'	no change	no change	(min.)
	DEPTH	150'	no change	no change	
Setbacks in Feet:	FRONT	N/A	N/A	N/A	(min.)
	REAR	N/A	N/A	N/A	(min.)
	LEFT SIDE	N/A	N/A	N/A	(min.)
	RIGHT SIDE	N/A	N/A	N/A	(min.)
SIZE OF BLDG.:	HEIGHT	78'	78'	no extension	(max.)
	LENGTH	200'	no change	no change	
	WIDTH	150'	no change	no change	
RATIO OF USABLE OPEN SPACE TO LOT AREA:[3])		N/A	N/A	N/A	(min.)
NO. OF DWELLING UNITS:		N/A	N/A	N/A	(max.)
NO. OF PARKING SPACES:		N/A	N/A	N/A	(min./max)
NO. OF LOADING AREAS:		N/A	N/A	N/A	(min.)
DISTANCE TO NEAREST BLDG. ON SAME LOT:		N/A	N/A	N/A	(min.)

Describe where applicable, other occupancies on same lot, the size of adjacent buildings on same lot, and type of construction proposed, e.g.; wood frame, concrete, brick, steel, etc.

The lot consists of Riverside Technology Center's building and parking area. Two (2) wireless carriers currently existing on the roof along with three (3) generators, storage containers and additional equipment. AT&T proposes to install their equipment and antennas on the roof as described in the attached.

1. *SEE CAMBRIDGE ZONING ORDINANCE ARTICLE 5.000, SECTION 5.30 (DISTRICT OF DIMENSIONAL REGULATIONS).*
2. *TOTAL GROSS FLOOR AREA (INCLUDING BASEMENT 7'-0" IN HEIGHT AND ATTIC AREAS GREATER THAN 5') DIVIDED BY LOT AREA.*
3. *OPEN SPACE SHALL NOT INCLUDE PARKING AREAS, WALKWAYS OR DRIVEWAYS AND SHALL HAVE A MINIMUM DIMENSION OF 15'.*

EXHIBIT 7

Dewberry

Dewberry Engineers Inc.
280 Summer Street, 10th Floor
Boston, MA 02210

617.695.3400
617.695.3310 fax
www.dewberry.com

January 16, 2018

Centerline Communications
95 Ryan Drive, Suite 1
Raynham, MA 02767

Re: Site No.: MA2881
Site Name: Putnam Avenue
840 Memorial Drive
Cambridge, MA 02139

To Whom It May Concern:

AT&T Mobility/Centerline Communications has proposed to install the following equipment at the above referenced location:

- (2) Two custom 12'-0"x12'-0" steel ballast frames each supporting (4) antennas concealed within 48" dia. fiberglass canister and miscellaneous support equipment; (2) canisters per ballast frame, each canister concealing (2) antennas
- (1) One new steel equipment frame supporting:
  - (2) Two 48" dia. fiberglass canisters concealing (2) antennas each
  - (1) One telecommunications prefabricated 8'-0"x8'-0" Walk in Cabinet (WIC)
  - (1) One 15 KW DC Natural Gas generator
  - (1) One Transformer
  - (1) One Natural Gas Booster

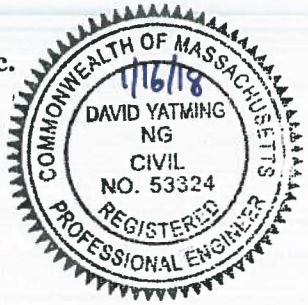
The proposed equipment is to be installed at various locations on the roof at the site reference above. The existing 5-story structure is constructed with a reinforced concrete deck spanning steel framing.

Dewberry Engineers Inc. (Dewberry) has performed an analysis of the existing structure and has determined the existing structural elements have sufficient capacity to support the proposed conditions if constructed in accordance with the latest Construction Drawings by Dewberry. The attached calculations include our design of the proposed installation and analysis of the existing structure.

Our analysis is based on the assumption that the existing building is in good condition and the original design and construction was performed in accordance with all applicable state and local building codes. If during construction any damage or deterioration is noticed, Dewberry is to be notified to assess any deviation from the assumed condition. Any alteration in equipment loading described above and on the associated plans will void any conclusions expressed herein and will require further analysis and design.

If you have any questions, please do not hesitate to call me at 617-531-0790.

Sincerely,
Dewberry Engineers Inc.



David Ng, P.E.
Structural Project Engineer

Dewberry Engineers
Structural Calculation Summary Sheet

Job No.:	50093723/50096257	**By:**	JJC	**Date:**	12/28/17
Job Name:	Putnam Ave	**Chkd:**	DYN	**Date:**	1/16/18

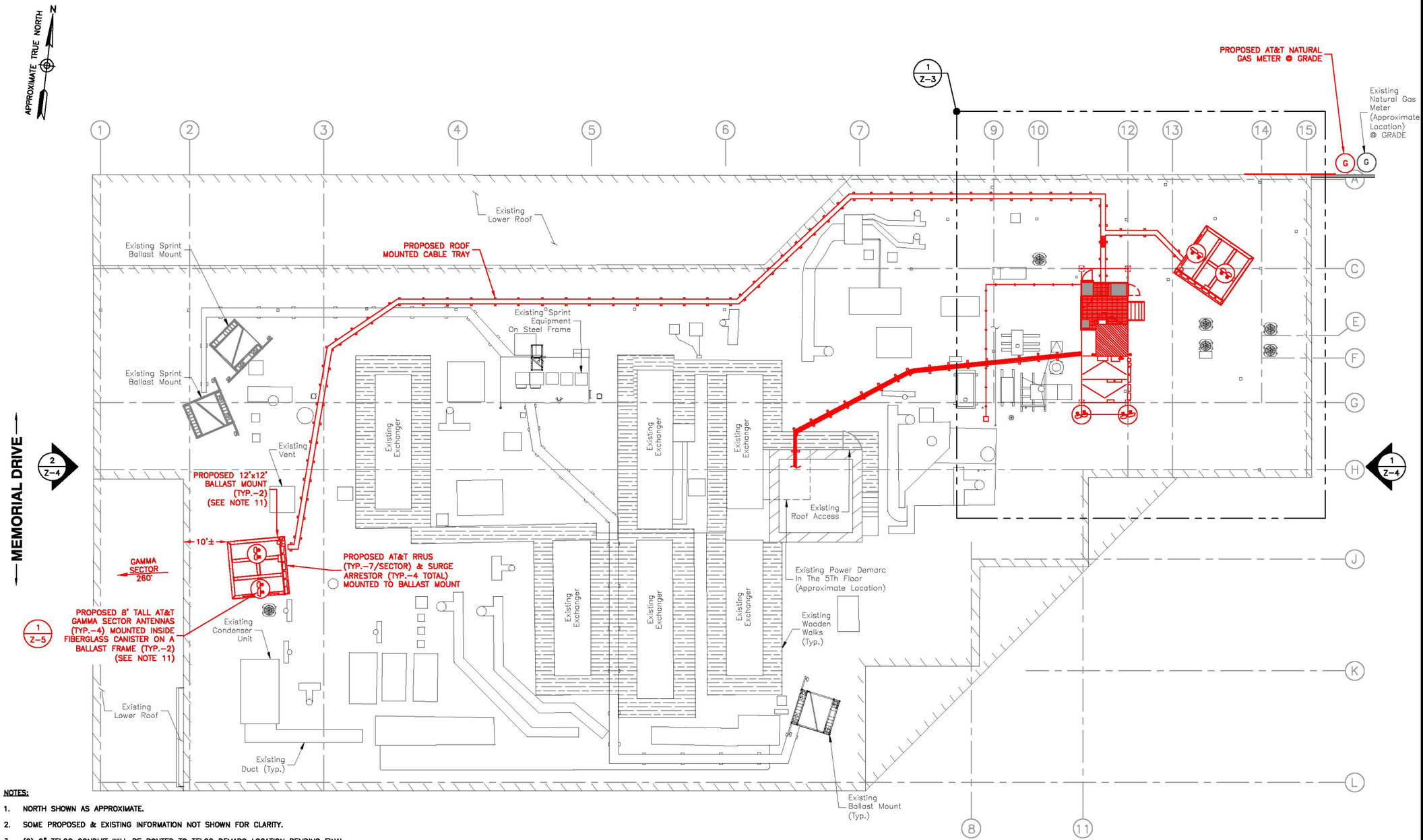
Location: 840 Memorial Drive, Cambridge, MA 02139
Client: AT&T

Site Inspection/Photos/Other Data provided by: Oscar Suarez

Brief Description:
1. Proposed addition of (12) new antennas to be concealed by (6) proposed 48" dia. false flues on an existing rooftop. (2) False flues to be mounted to each ballast frame, and (2) false flues to be mounted to the proposed platform.
2. Proposed addition of (2) 12ft x 12ft custom ballast frames.
3. Proposed addition of a new 28ft x 9.5ft steel equipment platform to support a walk-in-cabinet and various telecommunications equipment.
4. Proposed addition of (15) new RRH units to be mounted on proposed ballast frames and equipment platform. Analysis also includes addition of (6) future RRH units.
5. Existing structure is a 78 ft tall steel and concrete framed commercial building.
6. Information for analysis from multiple site visits and building plans by James E MacDonald Associates dated 10/16/1978.

Basic Criteria:
1. IBC 2009
2. MA State Building Code
3. ASCE 7-05
4. TIA-222-G-4
5. AISC 14th Ed.

Design/Analysis Summary:
1. Proposed antennas and RRH's to be installed on the proposed ballast mounts and proposed equipment platform.
2. Proposed ballast frames to bear directly on the existing rooftop. <u>All existing stone ballast under the ballast frame footprint is to be removed prior to installation.</u>
3. Proposed steel platform to post down in (4) locations to the existing concrete roof deck. (2) Locations over existing steel beams and (2) locations over existing steel columns.
4. Proposed equipment platform evaluated for a total equipment dead load of **<u>10,200 lbs</u>**.
5. The reconfiguration or addition of any new equipment not accounted for in this analysis will require further analysis and design.
6. The existing structural elements have sufficient capacity to support the proposed installation.
7. Design and analysis based on dead load, wind load with ice, design checks for normal bending and shear stresses.



NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. SOME PROPOSED & EXISTING INFORMATION NOT SHOWN FOR CLARITY.
3. (2) 2" TELCO CONDUIT WILL BE ROUTED TO TELCO DEMARC LOCATION PENDING FINAL DESIGN.
4. GROUND WILL BE TO STREET SIDE BASEMENT WATER MAIN.
5. SHELTER IS TO BE TIED INTO THE BUILDING ALARM SYSTEM AT THE CLOSEST POINT.
6. PROPOSED INSTALLATION INCLUDES A BACKUP 15KW DC NATURAL GAS GENERATOR LOCATED OUTSIDE THE PREFABRICATED WALK IN CABINET (WIC).
7. ZONING DRAWINGS BASED ON DRAWINGS BY DEWBERRY ENGINEERS INC. DATED 04/21/14 & EXISTING DRAWINGS PROVIDED BY THE BUILDING OWNER.
8. VERTICAL NATURAL GAS RUN INSIDE BUILDING PENDING FINAL DESIGN.
9. WALK IN CABINET, MODEL# DOOR & LAYOUT, WEIGHT PENDING FINAL DESIGN.
10. PROPOSED LOCATIONS ARE CONCEPTUAL AND FOR ZONING PURPOSES ONLY. NOT FOR CONSTRUCTION.
11. ANTENNA AND EQUIPMENT SHALL BE INSTALLED PER STRUCTURAL ANALYSIS BY DEWBERRY ENGINEERS INC. VO DATED 01/16/18.

ROOF PLAN 1

SCALE: 3/64"=1' FOR 11"x17"
3/32"=1' FOR 22"x34"

0' 8' 16' 24'

LEGEND

Existing Wooden Walks

Column Grid Lines

at&t Mobility

550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS
95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS		
1	01/16/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry®
Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
PHONE: 617.695.3400
FAX: 617.695.3310

DRAWN BY:	JG
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50093723
JOB NUMBER:	50096257

SITE ADDRESS

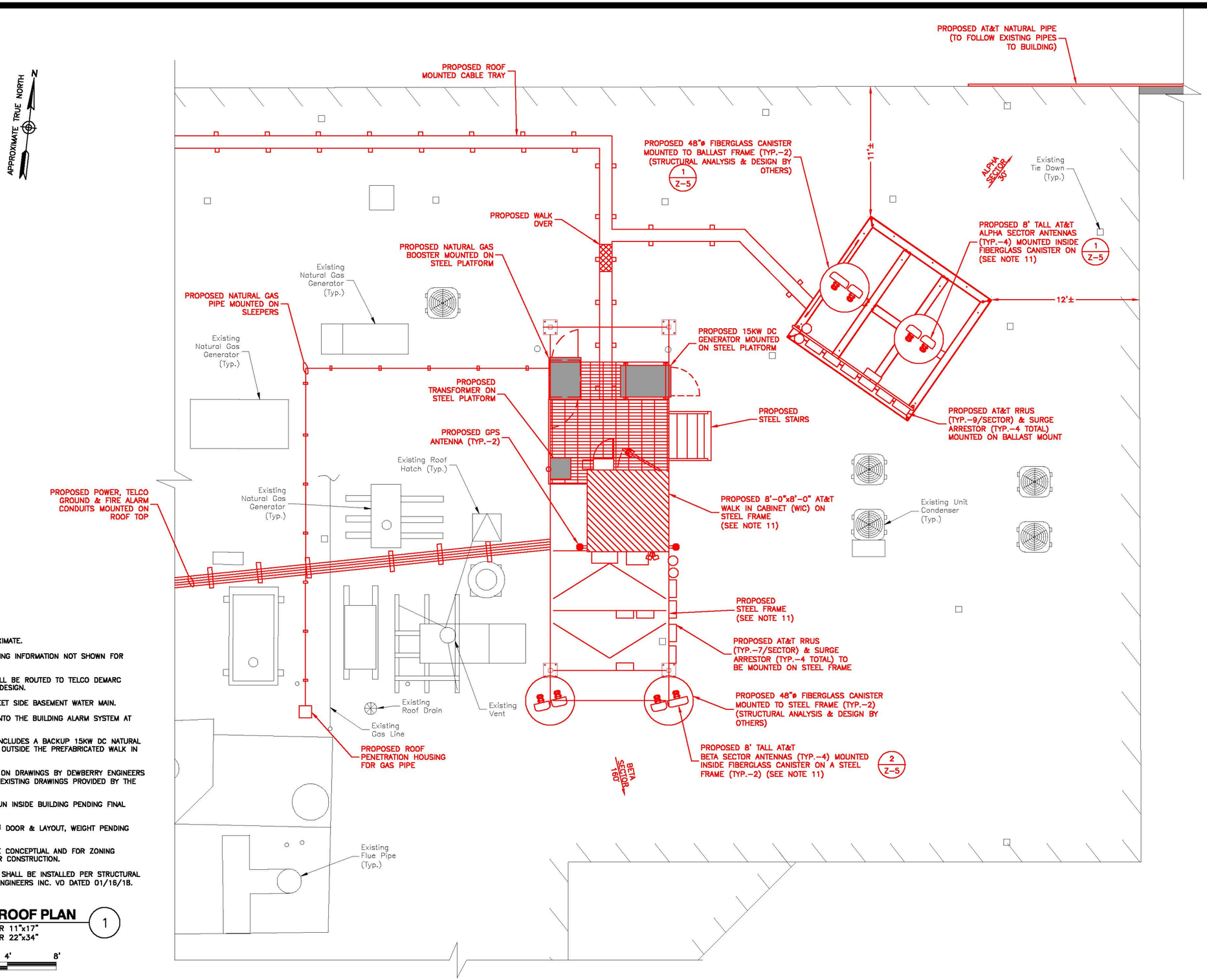
840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

ROOF PLAN

SHEET NUMBER

Z-2



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DETAILED ROOF PLAN 1

SCALE: 1/8"=1' FOR 11"x17"
1/4"=1' FOR 22"x34"

0' 2' 4' 8'

at&t Mobility
550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS
95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS		
1	01/16/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry®
Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
PHONE: 617.695.3400
FAX: 617.695.3310

DRAWN BY:	JG
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50093723
JOB NUMBER:	50096257

SITE ADDRESS

840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

DETAILED ROOF PLAN

SHEET NUMBER

Z-3

NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. SOME PROPOSED & EXISTING INFORMATION NOT SHOWN FOR CLARITY.
3. (2) 2" TELCO CONDUIT WILL BE ROUTED TO TELCO DEMARC LOCATION PENDING FINAL DESIGN.
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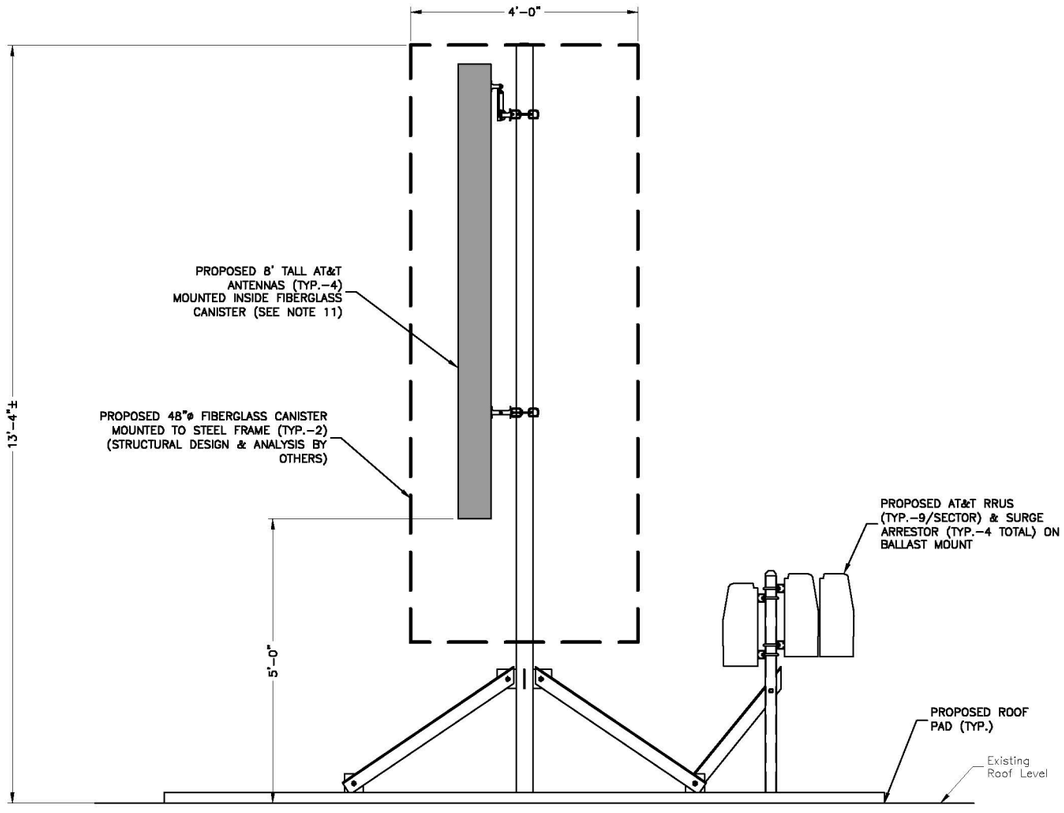
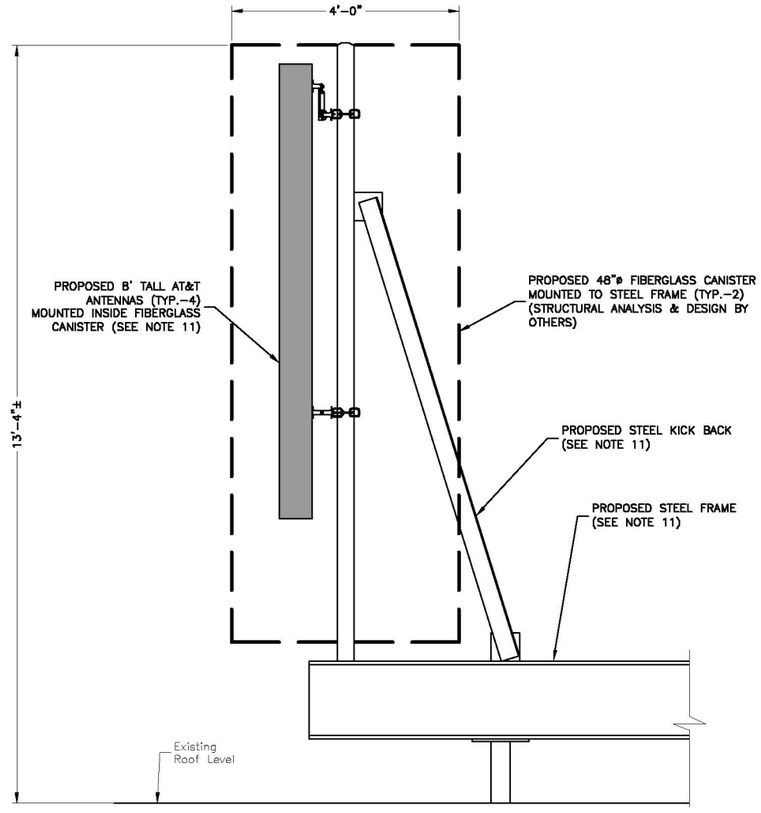


ALPHA & GAMMA SECTORS ANTENNA DETAIL 1

SCALE: 3/8"=1' FOR 11"x17"
3/4"=1' FOR 22"x34"

0' 1' 2' 3'



BETA SECTOR ANTENNA DETAIL 2

SCALE: 3/8"=1' FOR 11"x17"
3/4"=1' FOR 22"x34"

0' 1' 2' 3'

at&t Mobility
550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS
95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS		
1	01/16/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry®
Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
PHONE: 617.695.3400
FAX: 617.695.3310

DRAWN BY:	JG
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50093723
JOB NUMBER:	50096257

SITE ADDRESS

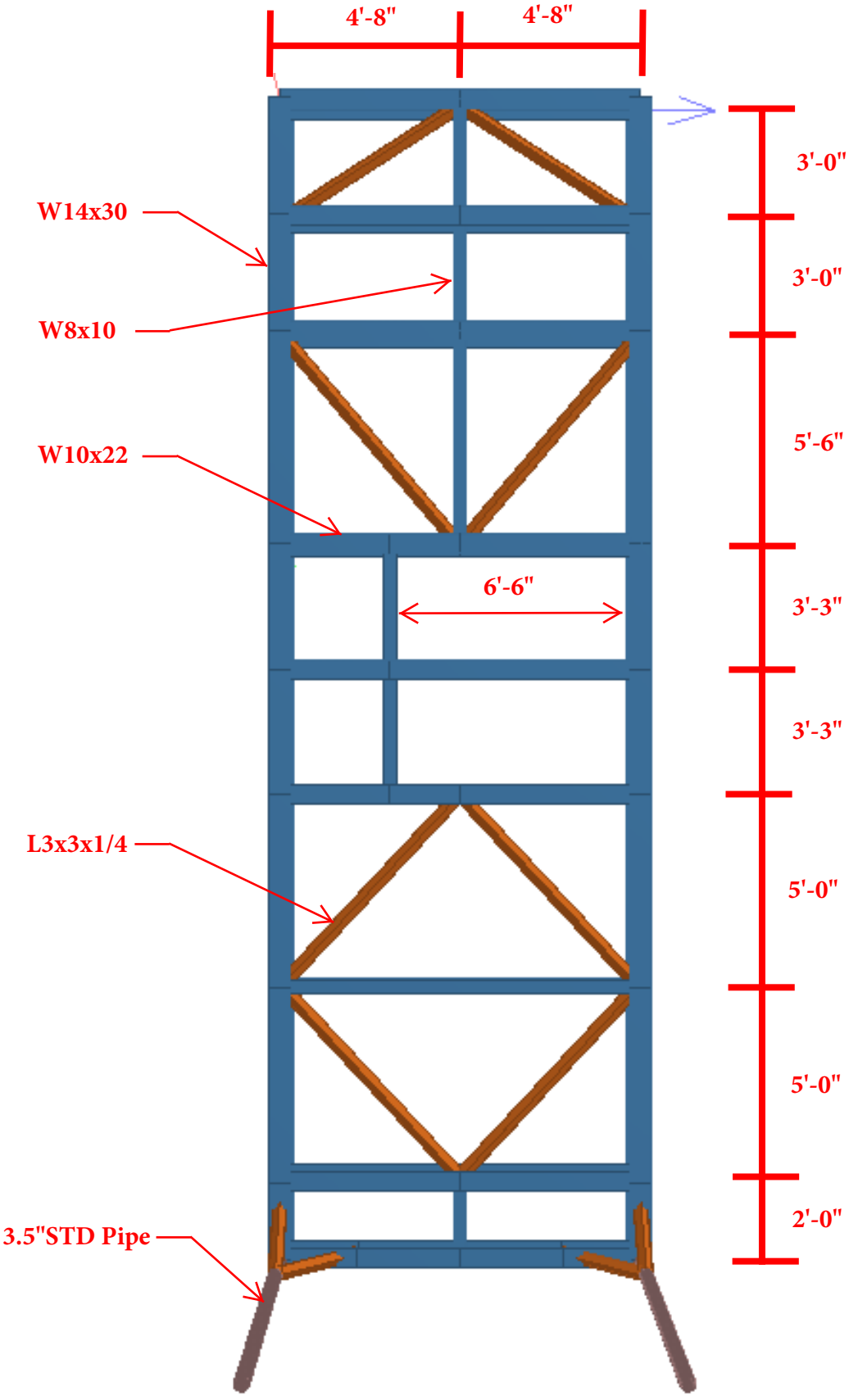
840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

CONCEPTUAL
ANTENNA DETAILS

SHEET NUMBER

Z-5


4'-8"
4'-8"
3'-0"
3'-0"
5'-6"
3'-3"
3'-3"
5'-0"
5'-0"
2'-0"
6'-6"
W14x30
W8x10
W10x22
L3x3x1/4
3.5"STD Pipe

Dewberry®

Job Number	50096257
Made by:	JJC
Date:	12/28/17
Checked by:	DYN
Date:	1/16/18

Putnam Ave - Wind load

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Wind Loading per TIA/222-G Standard

General Information from TIA-222-G-1-2007

Item	Value	Description	Reference
V_{max} =	105.00	Cambridge, MA	*780 CMR - MA Amendments to the IBC*
V_i =	40.00	Suffolk County, MA (with ice)	*Annex B*
K_d =	0.95	Wind Direction Probability Factor	*Table 2-2*
I =	1.00	Importance Factor	*Table 2-3*
z = h =	86.00	ft. (A.G.L.)	*Max. Center of Mount*
Exp. Cat.	B	Exposure Category	*Sect. 2.6.5.1*
z_g =	1200.00	Exposure Category Coeff.	*Table 2-4*
a =	7.00	Exposure Category Coeff.	*Table 2-4*
$K_{z\,(min)}$ =	0.70	Exposure Category Coeff.	*Table 2-4*
K_e =	0.90	Exposure Category Coeff.	*Table 2-4*
K_t =	N/A	Topo. Cat. Coeff.	*Table 2-5, "N/A" if Topo. Cat. = 1*
K_z =	0.95	$= 2.01(z/z_g)^{(2/a)}$	*Sect. 2.6.5.2*
Topo. Cat.	1.00	Topographic Category (1-5)	*Sect. 2.6.6.2*
e =	2.72	Natural Logarithmic base	
f =	N/A	Height Attenuation Factor	*Table 2-5, "N/A" if Topo. Cat. = 1*
H =	N/A	ft. Height of crest above surrounding terrain	
K_h =	N/A	$e^{((f*z)/H)}$	*Sect. 2.6.6.4*
K_{zt} =	1.00	$= [1+((K_e*K_t)/K_h)]^2$	*Sect. 2.6.6.4*
G_h =	0.85	Gust Effect Factor	*Sect. 6.5.8.1, ASCE 7-05*
t_i =	1.00	Design Ice Thickness	*Annex B*

Dewberry

Job Number	50096257
Made by:	JJC
Date:	12/28/17
Checked by:	DYN
Date:	1/16/18

Putnam Ave - Wind Load (cont'd)

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Wind Loading per TIA/222-G Standard (cont'd)

Design Wind Forces:

Section 2.6.9.6

$q_z = 0.00256(K_z)(K_{zt})(K_d)(V^2)(I)$

where:

K_z = 0.95 K_d = 0.90 V_{max} = 105.00 mph

K_{zt} = 1.00 I = 1.00 V_i = 40.00 mph

q_z = 24.04 psf *(velocity pressure without ice)*

Section 2.6.9.2

$F_a = q_z * G_h * (EPA)_a$ *(see calculation table on next page)*

F = Horiz. wind force on the appurtenance in the direction of the wind

q_z = Velocity pressure from Section 2.6.9.6

$(EPA)_a$ = effective projected area of the appurtenance

-Wind load on Equipment:

$(EPA)_a = (EPA)_n$ *(Conservative)* $= \sum(C_a A_a)_n$ *(Front)*

$(EPA)_a = (EPA)_t$ *(Conservative)* $= \sum(C_a A_a)_t$ *(Side)*

Wind Loading per TIA/222-G Standard (cont'd)

Element Definition:

	Description	Dimensions (in.)			Weight
		W	D	H	(lb)
(1) Proposed	RRUS-32	12.10	7.00	27.20	53
(2) Proposed	RRUS-11	17.00	7.20	19.70	50.6
(1) Proposed	4426 B66	13.20	5.80	15.00	48.4
(2) Proposed	4478 B5	13.00	7.40	15.00	60
(1) Proposed	4415 B25	13.20	5.40	15.00	46

Members	Dimensions (ft.)			$A_a)_n$ (Normal)	$A_a)_t$ (Side)	Aspect Ratio	Aspect Ratio	C_a (front)	C_a (side)
	Width *(Normal)*	Depth *(Tangent)*	Height *(or span)*	*(sf)*	*(sf)*	*(front)*	*(side)*	*Table 2-8*	*Table 2-8*
RRUS-32	1.01	0.58	2.27	2.29	1.32	2.25	3.91	1.20	1.26
RRUS-11	1.42	0.60	1.64	2.33	0.98	1.15	2.73	1.20	1.21
4426 B66	1.10	0.48	1.25	1.38	0.60	1.14	2.60	1.20	1.20
4478 B5	1.08	0.62	1.25	1.35	0.78	1.16	2.02	1.20	1.20
4415 B25	1.10	0.45	1.25	1.38	0.56	1.14	2.78	1.20	1.21

Wind Loading without Ice:

Calculation of Design Forces	Weight (lb)	$F_{(a)n}$ (lb) *(Normal)*	$F_{(a)t}$ (lb) *(Tangent)*	Length/ Number of Supports	Gravity Load Per Support (lb)	$F_{(a)n}$ Per Support (lb) or (plf)	$F_{(a)t}$ Per Support (lb) or (plf)
Members							
RRUS-32	53.00	**56.22**	**33.97**	1.00	53.00	**56.22**	**33.97**
RRUS-11	50.60	**57.10**	**24.34**	1.00	50.60	**57.10**	**24.34**
4426 B66	48.40	**33.72**	**14.77**	1.00	48.40	**33.72**	**14.77**
4478 B5	60.00	**33.10**	**19.00**	1.00	60.00	**33.10**	**19.00**
4415 B25	46.00	**33.72**	**13.93**	1.00	46.00	**33.72**	**13.93**

Dewberry

Job Number	50096257
Made by:	JJC
Date:	12/28/17
Checked by:	DYN
Date:	1/16/18

Putnam Ave - Design Loads

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Wind Load per ASCE 7-05

Design Criteria

Height, z =	86.00 ft	*(CL of Shelter/False Flue)*
Risk Category =	II	*(Table 1-1, ASCE 7-05)*
Basic Wind Speed, V =	105 mph	*(780 CMR - MA Amendments to the IBC)*
K_d =	0.95	*(Table 6-4, ASCE 7-05)*
Exposure Category =	B	*(Sect. 6.5.6.3, ASCE 7-05)*
K_{zt} =	1	*(Sect. 6.5.7.2, ASCE 7-05)*
G =	0.85	*(Sect. 6.5.8.1, ASCE 7-05)*
K_z =	0.95	*(Table 6-3, ASCE 7-05)*
I =	1.00	*(Table 6-1, ASCE 7-05)*

Velocity Pressure

$q_h = 0.00256*K_z*K_{zt}*K_d*V^2I$ *(Eqn. 6-15, ASCE 7-05)*

$= 25.38$ lb/ft²

Design Wind Force

- Proposed structures considered an extension of building, designed per Sect. 6.5.12.2.1.

False Flue

$Pw = q_zG*A*Cf$ *ASCE 7-05 Ch. 6.5.15*

H=	10.5 ft	*Height*
D=	4 ft	*Diameter*
Cf=	0.6	*ASCE 7-05 Figure 6-21*
A=	42 sf	*H * D*

Pw= 543.6 lb

Shelter

$Pw = q_zG*A*Cf$ *ASCE 7-05 Ch. 6.5.15*

H=	9.3 ft	*Height*
W=	6.7 ft	*Width*
Cf=	1.3	*ASCE 7-05 Figure 6-21*
A=	62 sf	*H * W*

Pw= 1745.0 lb

Dead Load

- Assume 15 psf on all walkways for steel grating

Platform Equipment

(1x) AT&T WIC Shelter=	7200 lb	(1x) 15KW Generator =	1500 lb
(1x) Transformer =	1000 lb	(1x) Natural Gas Booster =	500 lb

Roof Dead Load

5.5" Composite Conc Deck =	39 psf
Misc, say =	5 psf
Stone Ballast, say =	15 psf
Roofing, say =	5 psf
Total =	**64 psf**

Snow Load/Live Load

- Use max. of 30 psf design live load, design snow load, or min. design snow load.
- In accordance with Chapter 7 of ASCE 7-05

$p_f = 0.7C_eC_tI_sp_g$

$= 25.20$

Use = 30 psf

where:

C_e =	0.9	p_g =	40 psf	*(780 CMR)*
C_t =	1	$p_{f\,min}$ =	30 psf	*(780 CMR)*
I_s =	1			

Dewberry

Job Number	50096257
Made by:	JJC
Date:	12/28/17
Checked by:	DYN
Date:	1/16/18

Putnam Ave - Ballast Calculation

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Dead Load of Antenna Mount

Item	Quantity	Dimensions (ft.)			Weight		Total Weight (lb)	
		L	W	H				
HPA65R-BU8A	2	-	-	-	57.30	lb. ea.	114.60	
OPA65R-BU8B	1	-	-	-	69.00	lb. ea.	69.00	
EPBQ-654L8H8-L2	1	-	-	-	86.00	lb. ea.	86.00	
RRUS-32	1	-	-	-	53.00	lb. ea.	53.00	*
RRUS-11	2	-	-	-	50.60	lb. ea.	101.20	*
4426 B66	1	-	-	-	48.40	lb. ea.	48.40	*
4478 B5	2	-	-	-	60.00	lb. ea.	120.00	*
4415 B25	1	-	-	-	46.00	lb. ea.	46.00	*
48"OD False Flue	2	4.00	4.00	10.00	3.00	psf	753.60	
3.5" OD Pipe	2	13.00	-	-	7.58	lb/ft	197.08	
2.375" OD Pipe	2	4.00	-	-	3.66	lb/ft	29.28	
C10x15.3	2	12.00	-	-	15.30	lb/ft	367.20	
	4	10.33	-	-	15.30	lb/ft	632.20	
	3	2.88	-	-	15.30	lb/ft	132.19	
L3x3x1/4	6	3.00	-	-	4.90	lb/ft	88.20	
	2	12.00	-	-	4.90	lb/ft	117.60	
	3	2.00	-	-	4.90	lb/ft	29.40	
Misc. hardware	1	-	-	-	100.00	lb. ea.	100.00	

* Not included in Overturning Calculation

Σ Total Weight = 3085 lbs

P_{DL} = 3.08 kips

Required Ballast for Antenna Mount

Overturning Moment, M_{OT}

$P_{w,Flue}$ = 1.09 kips *(False Flue Wind Loads)*

$P_{w,RRH} = \Sigma F_{(a)n}$ = 0.25 kips *(RRH Wind Loads)*

x_{Flue} = 8.00 ft *(Center of antenna to base of mount)*

x_{RRH} = 3.00 ft *(Center of RRH to base of mount)*

$M_{OT} = (P_{w,Flue} * x_{Flue}) + (P_{w,RRH} * x_{RRH})$

M_{OT} = 9.44 kip-ft

Resisting Moment, M_R

P_{DL} = 2.71 kips *(Total Dead Load - RRH Loading at overturning point)*

y = 6 ft *(0.5 * Base Width)*

$M_R = P_{DL} * y$

M_R = 16.27 kip-ft

Factor of Safety Check

$F.S. = M_R/M_{OT}$

F.S. = 1.72 > 1.5

PASS, (No Add'l Ballast Req'd)

Removed Stone Ballst = 15 psf

Proposed additional load = 22.4 - 15 = **7.4 psf**

Total Dead Load (psf) for Exist. Roof Check

Total Dead Load (psf) = 3084.95 lb / (12' x 12') **21.4 psf**

Roof O.K.

Job Information

	Engineer	Checked	Approved
Name:	JJC	DYN	
Date:	12/28/17	1/16/18	

Project ID	
Project Name	

Structure Type	SPACE FRAME

Number of Nodes	38	Highest Node	49
Number of Elements	63	Highest Beam	82

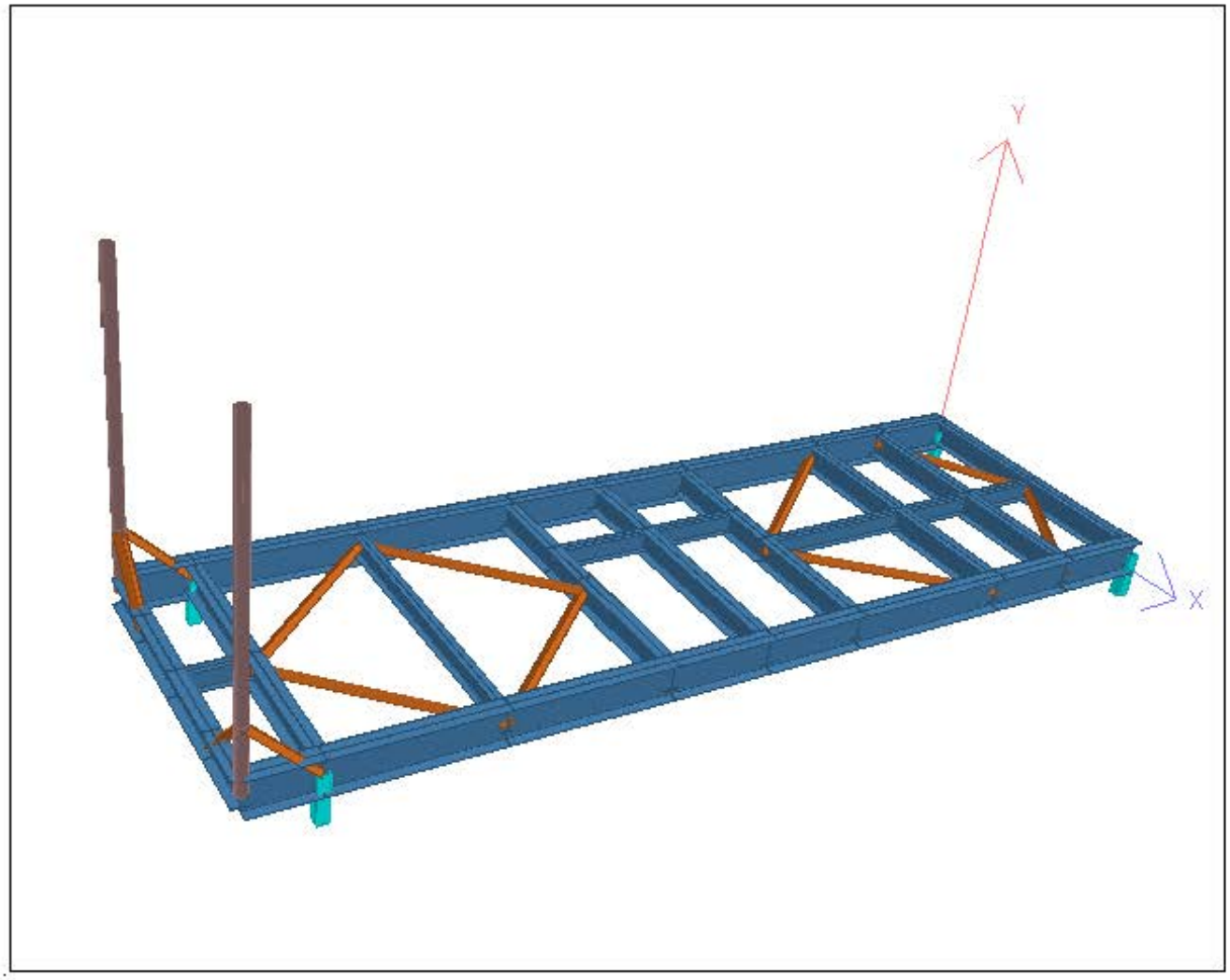
Number of Basic Load Cases	4
Number of Combination Load Cases	9

Included in this printout are data for:

All	The Whole Structure

Included in this printout are results for load cases:

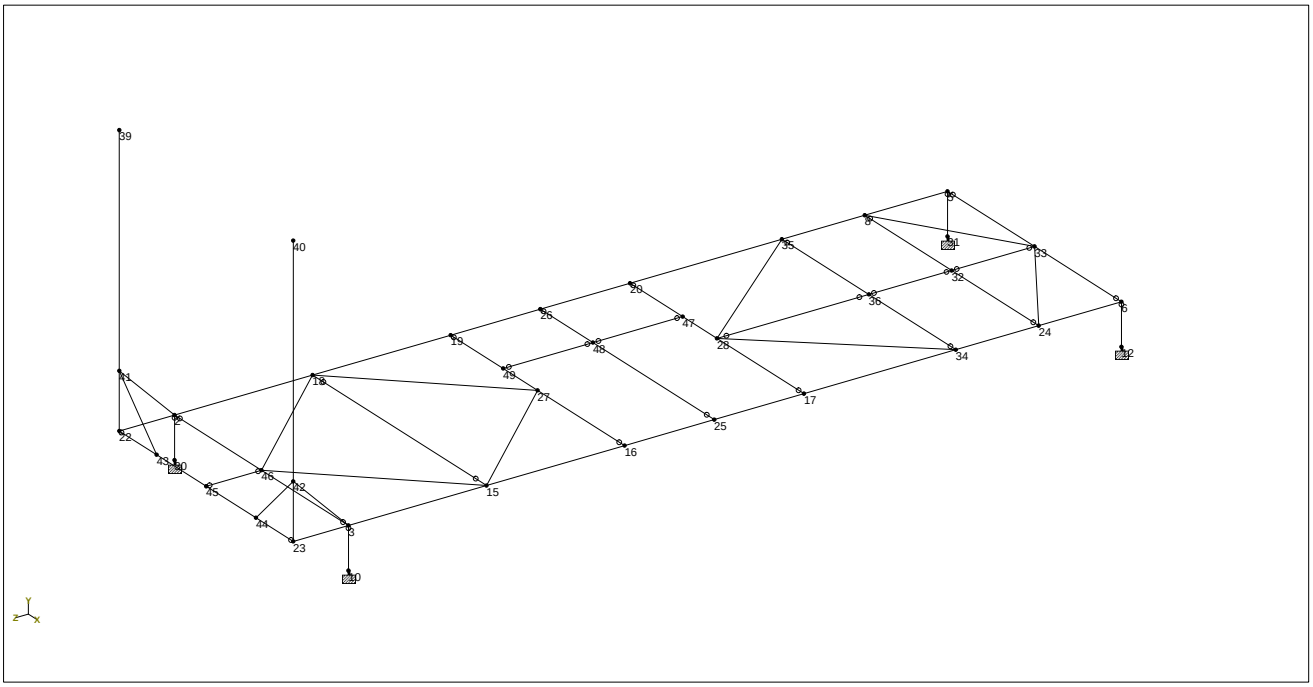
Type	L/C	Name
Primary	1	DEAD
Primary	2	LIVE
Primary	3	WIND Z
Primary	4	WIND X
Combination	5	DEAD + LIVE
Combination	6	DEAD + WIND Z
Combination	7	DEAD + WIND X
Combination	8	DEAD + WIND -Z
Combination	9	DEAD + WIND -X
Combination	10	D + 0.75L + 0.75WLZ
Combination	11	D + 0.75L + 0.75WLX
Combination	12	D + 0.75L + (-) 0.75WLZ
Combination	13	D + 0.75L + (-) 0.75WLX



3D Rendered View

Nodes

Node	X (ft)	Y (ft)	Z (ft)
2	0.000	0.500	28.000
3	9.330	0.500	28.000
5	0.000	0.500	0.000
6	9.330	0.500	0.000
8	0.000	0.500	3.000
10	9.330	-1.000	28.000
12	9.330	-1.000	0.000
15	9.330	0.500	23.000
16	9.330	0.500	18.000
17	9.330	0.500	11.500
18	0.000	0.500	23.000
19	0.000	0.500	18.000
20	0.000	0.500	11.500
22	-0.003	0.500	30.000
23	9.330	0.500	30.000
24	9.330	0.500	3.000
25	9.330	0.500	14.750
26	0.000	0.500	14.750
27	4.665	0.500	18.000
28	4.665	0.500	11.500
30	0.000	-1.000	28.000
31	0.000	-1.000	0.000
32	4.665	0.500	3.000
33	4.665	0.500	0.000
34	9.330	0.500	6.000
35	0.000	0.500	6.000
36	4.665	0.500	6.000
39	-0.003	10.500	30.000
40	9.330	10.500	30.000
41	-0.003	2.500	30.000
42	9.330	2.500	30.000
43	1.997	0.500	30.000
44	7.327	0.500	30.000
45	4.662	0.500	30.000
46	4.662	0.500	28.000
47	2.820	0.500	11.500
48	2.820	0.500	14.750
49	2.820	0.500	18.000



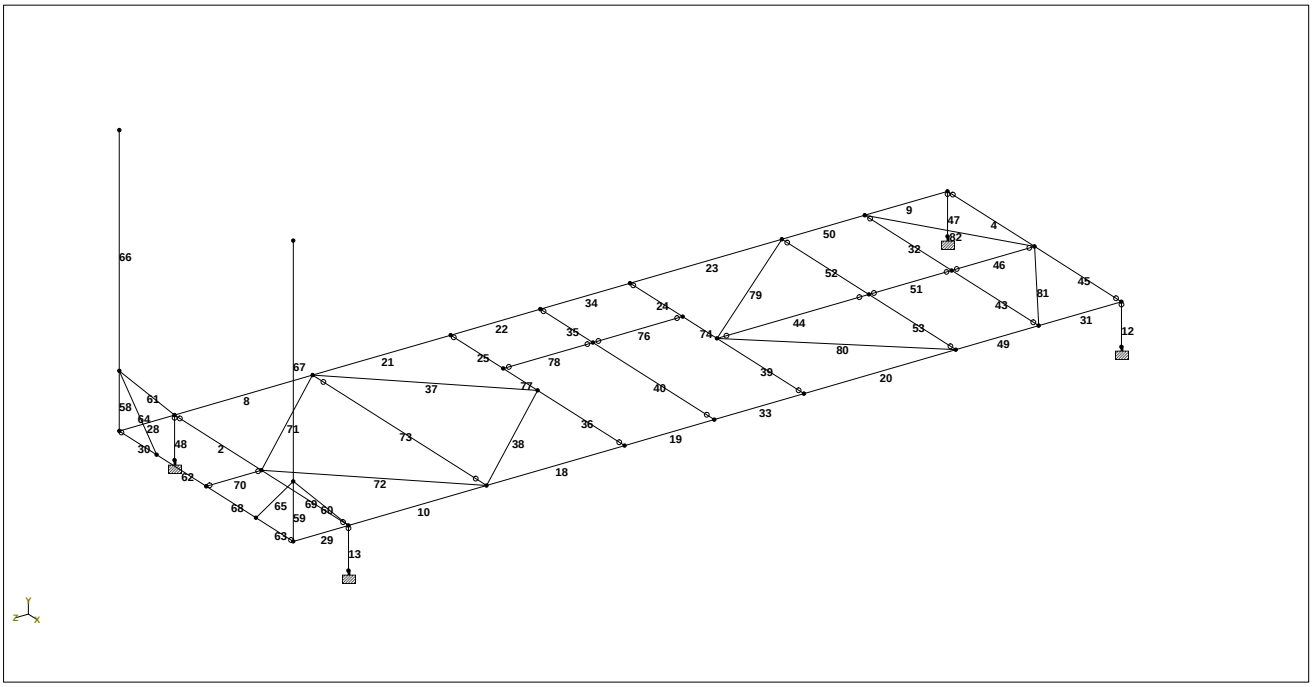
Nodes

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
2	2	46	4.662	2	0
4	5	33	4.665	2	0
8	2	18	5.000	1	0
9	8	5	3.000	1	0
10	3	15	5.000	1	0
12	12	6	1.500	3	0
13	10	3	1.500	3	0
18	15	16	5.000	1	0
19	16	25	3.250	1	0
20	17	34	5.500	1	0
21	18	19	5.000	1	0
22	19	26	3.250	1	0
23	20	35	5.500	1	0
24	20	47	2.820	2	0
25	19	49	2.820	2	0
28	2	22	2.000	1	0
29	3	23	2.000	1	0
30	22	43	2.000	2	0
31	24	6	3.000	1	0
32	8	32	4.665	2	0
33	25	17	3.250	1	0
34	26	20	3.250	1	0

Beams Cont...

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
35	26	48	2.820	2	0
36	27	16	4.665	2	0
37	18	27	6.838	5	0
38	15	27	6.838	5	0
39	28	17	4.665	2	0
40	25	48	6.510	2	0
43	32	24	4.665	2	0
44	28	36	5.500	4	0
45	33	6	4.665	2	0
46	32	33	3.000	4	0
47	31	5	1.500	3	0
48	30	2	1.500	3	0
49	34	24	3.000	1	0
50	35	8	3.000	1	0
51	36	32	3.000	4	0
52	35	36	4.665	2	0
53	36	34	4.665	2	0
58	22	41	2.000	6	0
59	23	42	2.000	6	0
60	42	3	2.828	5	0
61	41	2	2.828	5	0
62	43	45	2.665	2	0
63	44	23	2.003	2	0
64	41	43	2.828	5	0
65	42	44	2.831	5	0
66	41	39	8.000	6	0
67	42	40	8.000	6	0
68	45	44	2.665	2	0
69	46	3	4.668	2	0
70	45	46	2.000	4	0
71	46	18	6.836	5	0
72	46	15	6.840	5	0
73	18	15	9.330	4	0
74	47	28	1.845	2	0
76	47	48	3.250	4	0
77	49	27	1.845	2	0
78	48	49	3.250	4	0
79	28	35	7.212	5	0
80	28	34	7.212	5	0
81	24	33	5.546	5	0
82	33	8	5.546	5	0



Beams

Section Properties

Prop	Section	Area (in^2)	I_{yy} (in^4)	I_{zz} (in^4)	J (in^4)	Material
1	W14X30	8.850	19.600	291.000	0.344	STEEL
2	W10X22	6.490	11.400	118.000	0.224	STEEL
3	HSST4X4X0.375	4.780	10.300	10.300	16.985	STEEL
4	W8X10	2.960	2.090	30.800	0.035	STEEL
5	L30304	1.440	1.982	0.506	0.031	STEEL
6	PIPS35	2.500	4.520	4.520	9.043	STEEL

Materials

Mat	Name	E (kip/in^2)	ν	Density (lb/in^3)	α (/°F)
1	STEEL	29E+3	0.300	0.283	6E -6
2	STAINLESSSTEEL	28E+3	0.300	0.283	10E -6
3	ALUMINUM	10E+3	0.330	0.098	13E -6
4	CONCRETE	3.15E+3	0.170	0.087	5E -6

Supports

Node	X (kip/in)	Y (kip/in)	Z (kip/in)	rX (kip-ft/deg)	rY (kip-ft/deg)	rZ (kip-ft/deg)
10	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
12	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
30	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
31	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

Releases

Beam ends not shown in this table are fixed in all directions.

Beam	Node	x	y	z	rx	ry	rz
2	2	Fixed	Fixed	Fixed	Fixed	Pin	Pin
4	5	Fixed	Fixed	Fixed	Fixed	Pin	Pin
12	6	Fixed	Fixed	Fixed	Fixed	Pin	Pin
13	3	Fixed	Fixed	Fixed	Fixed	Pin	Pin
24	20	Fixed	Fixed	Fixed	Fixed	Pin	Pin
25	19	Fixed	Fixed	Fixed	Fixed	Pin	Pin
30	22	Fixed	Fixed	Fixed	Fixed	Pin	Pin
32	8	Fixed	Fixed	Fixed	Fixed	Pin	Pin
35	26	Fixed	Fixed	Fixed	Fixed	Pin	Pin
36	16	Fixed	Fixed	Fixed	Fixed	Pin	Pin
39	17	Fixed	Fixed	Fixed	Fixed	Pin	Pin
40	25	Fixed	Fixed	Fixed	Fixed	Pin	Pin
43	24	Fixed	Fixed	Fixed	Fixed	Pin	Pin
44	28	Fixed	Fixed	Fixed	Fixed	Pin	Pin
44	36	Fixed	Fixed	Fixed	Fixed	Pin	Pin
45	6	Fixed	Fixed	Fixed	Fixed	Pin	Pin
46	32	Fixed	Fixed	Fixed	Fixed	Pin	Pin
46	33	Fixed	Fixed	Fixed	Fixed	Pin	Pin
47	5	Fixed	Fixed	Fixed	Fixed	Pin	Pin
48	2	Fixed	Fixed	Fixed	Fixed	Pin	Pin
51	36	Fixed	Fixed	Fixed	Fixed	Pin	Pin
51	32	Fixed	Fixed	Fixed	Fixed	Pin	Pin
52	35	Fixed	Fixed	Fixed	Fixed	Pin	Pin
53	34	Fixed	Fixed	Fixed	Fixed	Pin	Pin
63	23	Fixed	Fixed	Fixed	Fixed	Pin	Pin
69	3	Fixed	Fixed	Fixed	Fixed	Pin	Pin
70	45	Fixed	Fixed	Fixed	Fixed	Pin	Pin
70	46	Fixed	Fixed	Fixed	Fixed	Pin	Pin
73	18	Fixed	Fixed	Fixed	Fixed	Pin	Pin
73	15	Fixed	Fixed	Fixed	Fixed	Pin	Pin
76	47	Fixed	Fixed	Fixed	Fixed	Pin	Pin
76	48	Fixed	Fixed	Fixed	Fixed	Pin	Pin
78	48	Fixed	Fixed	Fixed	Fixed	Pin	Pin
78	49	Fixed	Fixed	Fixed	Fixed	Pin	Pin

Primary Load Cases

Number	Name	Type
1	DEAD	Dead
2	LIVE	Live
3	WIND Z	Wind
4	WIND X	Wind

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
5	DEAD + LIVE	1	DEAD	1.00
		2	LIVE	1.00
6	DEAD + WIND Z	1	DEAD	1.00
		3	WIND Z	1.00
7	DEAD + WIND X	1	DEAD	1.00
		4	WIND X	1.00
8	DEAD + WIND -Z	1	DEAD	1.00
		3	WIND Z	-1.00
9	DEAD + WIND -X	1	DEAD	1.00
		4	WIND X	-1.00
10	D + 0.75L + 0.75WLZ	1	DEAD	1.00
		2	LIVE	0.75
		3	WIND Z	0.75
11	D + 0.75L + 0.75WLX	1	DEAD	1.00
		2	LIVE	0.75
		4	WIND X	0.75
12	D + 0.75L + (-) 0.75WLZ	1	DEAD	1.00
		2	LIVE	0.75
		3	WIND Z	-0.75
13	D + 0.75L + (-) 0.75WLX	1	DEAD	1.00
		2	LIVE	0.75
		4	WIND X	-0.75

1 DEAD : Beam Loads

Beam	Type		Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
24	CON	kip	GY	-0.750	-	-	-	-
32	CON	kip	GY	-0.250	1.500	-	-	-
43	CON	kip	GY	-0.750	-	-	-	-
52	CON	kip	GY	-0.250	1.500	-	-	-
53	CON	kip	GY	-0.750	-	-	-	-

1 DEAD : Selfweight

Direction	Factor	Assigned Geometry
Y	-1.000	ALL

3 WIND Z : Node Loads

Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
16	-	-0.606	0.436	-	-	-
17	-	0.606	0.436	-	-	-
47	-	0.606	0.436	-	-	-
49	-	-0.606	0.436	-	-	-

3 WIND Z : Beam Loads

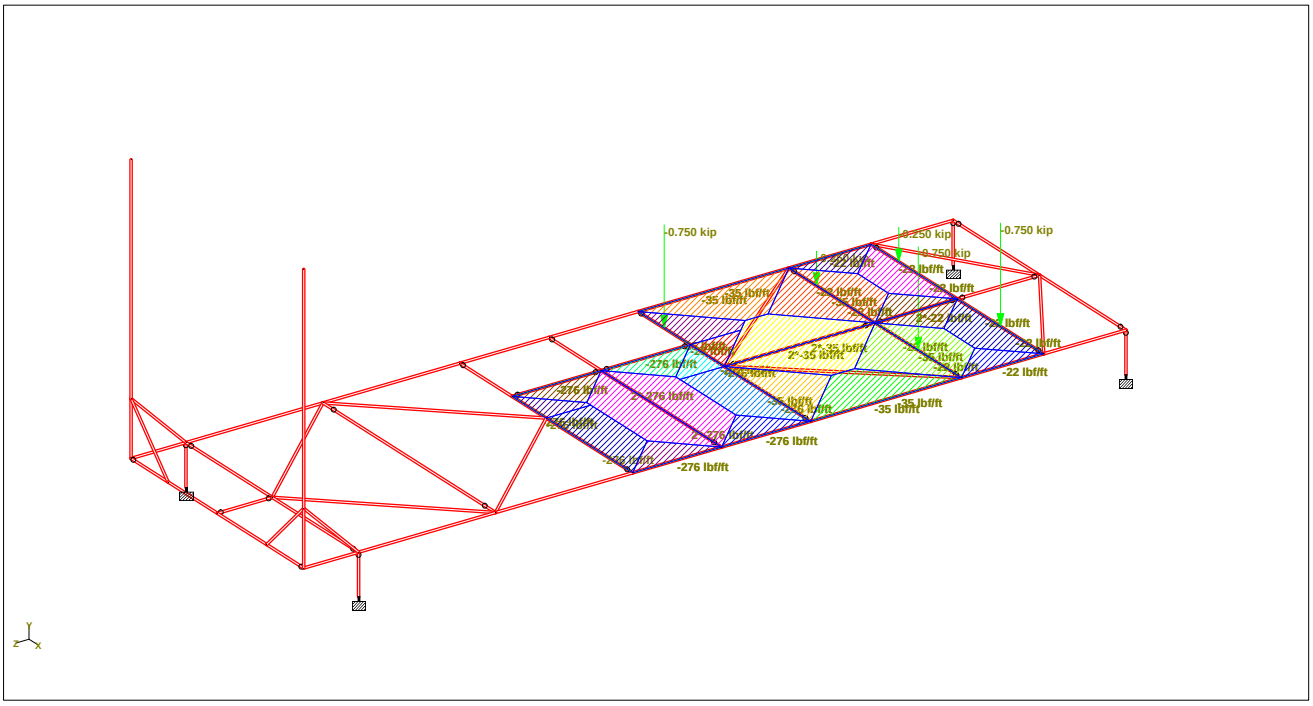
Beam	Type		Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
66	CON	kip	GZ	0.544	-	-	-	-
67	CON	kip	GZ	0.544	-	-	-	-

4 WIND X : Node Loads

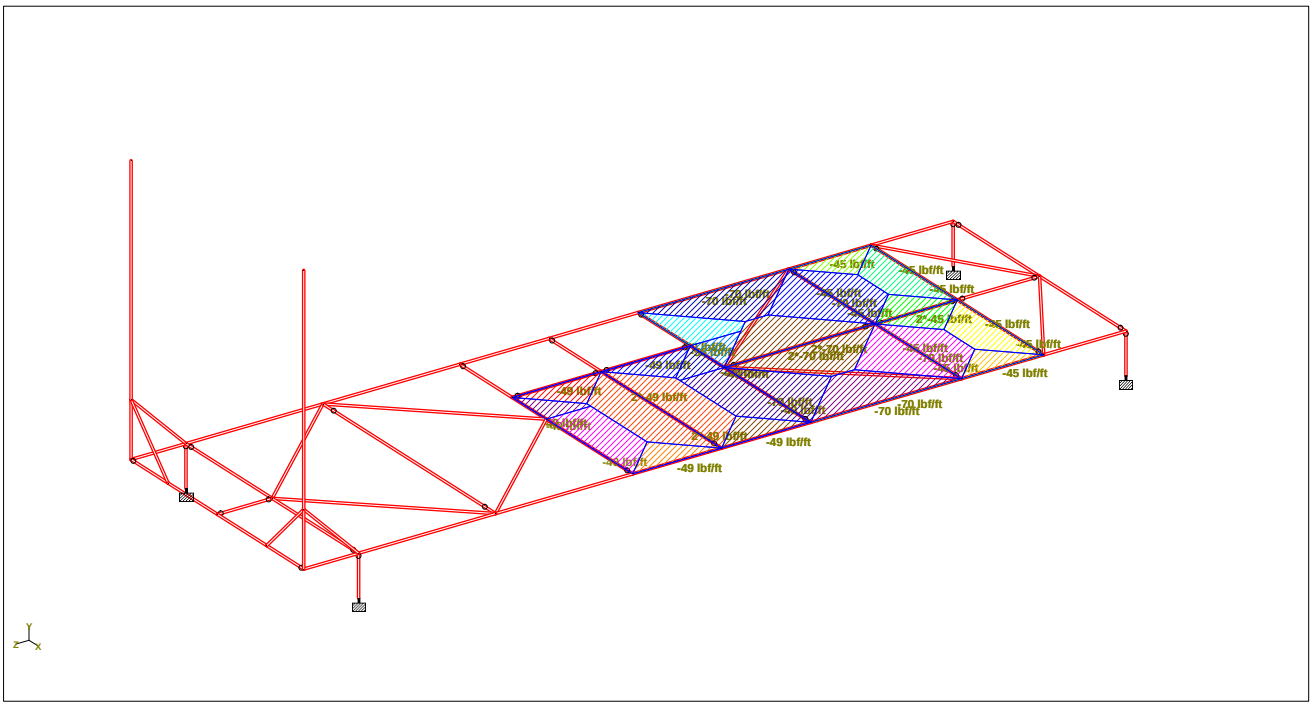
Node	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
16	0.436	-0.606	-	-	-	-
17	0.436	-0.606	-	-	-	-
47	0.436	0.606	-	-	-	-
49	0.436	0.606	-	-	-	-

4 WIND X : Beam Loads

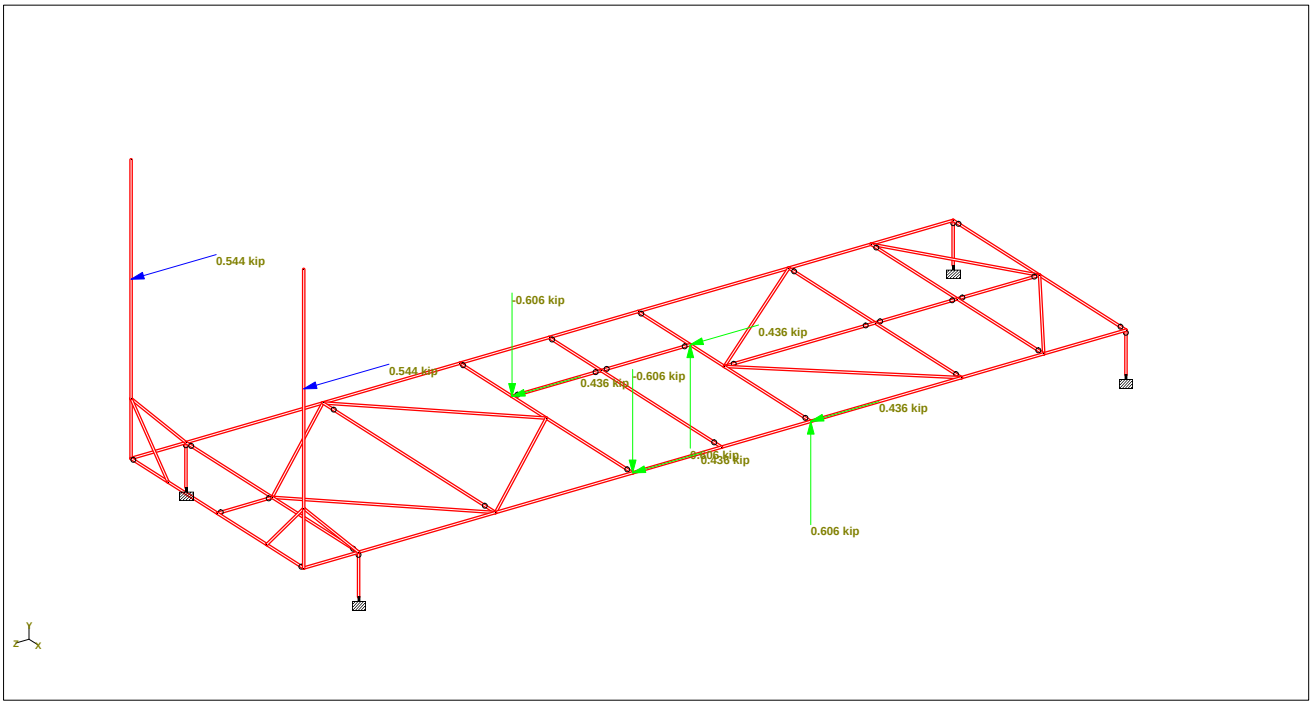
Beam	Type		Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
66	CON	kip	GX	0.544	-	-	-	-
67	CON	kip	GX	0.544	-	-	-	-



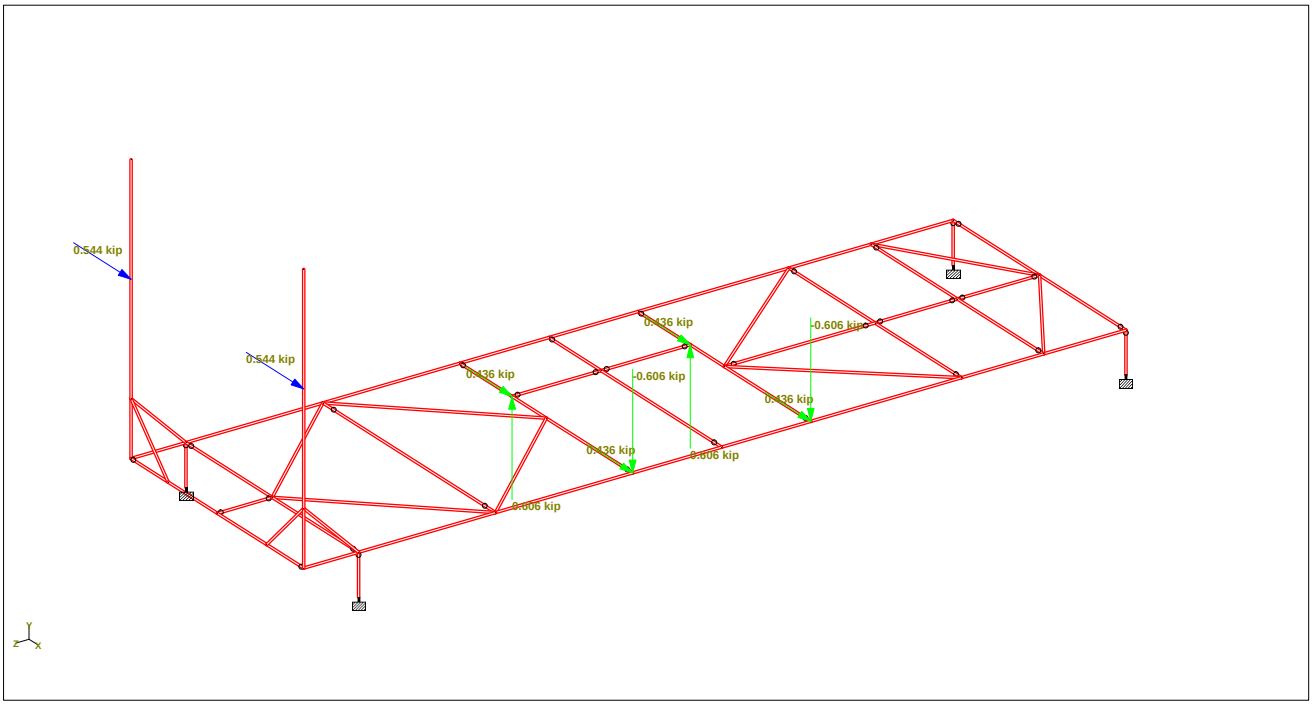
Dead Load (15 psf Dist. Load)



Live Load (30 psf)


0.544 kip
-0.606 kip
0.436 kip
0.544 kip
0.436 kip
-0.606 kip
0.436 kip
0.436 kip
0.606 kip

Wind Z


0.544 kip
0.544 kip
0.436 kip
-0.606 kip
0.436 kip
0.436 kip
0.436 kip
-0.606 kip
0.606 kip
0.606 kip

Wind X

Node Displacement Summary

Conservatively using full WL

	Node	L/C	X (in)	Y (in)	Z (in)	Resultant (in)	rX (rad)	rY (rad)	rZ (rad)
Max X	39	4:WIND X	**0.571**	-0.009	0.047	0.573	0.000	0.001	-0.007
Min X	40	9:DEAD + WIN	**-0.614**	0.122	-0.615	0.878	-0.005	-0.001	0.007
Max Y	42	12:D + 0.75L +	-0.010	**0.165**	-0.173	0.239	-0.008	0.000	0.000
Min Y	25	11:D + 0.75L +	0.012	**-0.782**	-0.000	0.782	-0.001	-0.000	0.001
Max Z	39	3:WIND Z	-0.004	-0.014	**0.615**	0.616	0.007	-0.000	0.000
Min Z	40	8:DEAD + WIN	-0.045	0.145	**-1.274**	1.283	-0.012	0.000	0.000
Max rX	6	11:D + 0.75L +	0.002	-0.001	-0.000	0.002	**0.007**	-0.000	0.001
Min rX	40	8:DEAD + WIN	-0.045	0.145	-1.274	1.283	**-0.012**	0.000	0.000
Max rY	22	7:DEAD + WIN	0.019	0.085	-0.000	0.088	-0.004	**0.001**	0.001
Min rY	22	9:DEAD + WIN	-0.019	0.105	0.000	0.107	-0.004	**-0.001**	-0.000
Max rZ	40	9:DEAD + WIN	-0.614	0.122	-0.615	0.878	-0.005	-0.001	**0.007**
Min rZ	39	4:WIND X	0.571	-0.009	0.047	0.573	0.000	0.001	**-0.007**
Max Rst	40	8:DEAD + WIN	-0.045	0.145	-1.274	**1.283**	-0.012	0.000	0.000

Allow. Displacement = 10.5ft x 12in/ft x 0.015 = 1.8" > 1.28" ------>> Displacement O.K.

Reactions

		Horizontal	Vertical	Horizontal	Moment			
Node	L/C	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)	
10	1:DEAD	0.000	4.036	0.000	0.000	0.000	-0.000	Column Line G-12
	2:LIVE	-0.000	0.743	0.000	0.000	-0.000	0.000	
	3:WIND Z	0.015	0.300	-0.816	-1.224	0.006	-0.023	
	4:WIND X	-1.020	1.195	-0.009	-0.014	-0.261	1.529	
	5:DEAD + LIVE	0.000	4.780	0.000	0.000	0.000	-0.000	
	6:DEAD + WIN	0.015	4.336	-0.816	-1.224	0.006	-0.023	
	7:DEAD + WIN	-1.020	5.231	-0.009	-0.014	-0.261	1.529	
	8:DEAD + WIN	-0.015	3.736	0.816	1.224	-0.006	0.023	
	9:DEAD + WIN	1.020	2.841	0.009	0.014	0.261	-1.529	
	10:D + 0.75L +	0.012	4.819	-0.612	-0.918	0.004	-0.017	
	11:D + 0.75L +	-0.765	5.490	-0.007	-0.010	-0.196	1.147	
	12:D + 0.75L +	-0.012	4.369	0.612	0.918	-0.004	0.017	
	13:D + 0.75L +	0.765	3.697	0.007	0.010	0.196	-1.147	
12	1:DEAD	-0.000	4.710	-0.000	-0.000	0.000	0.000	Column Line C-12
	2:LIVE	0.000	1.273	-0.000	-0.000	0.000	-0.000	
	3:WIND Z	-0.016	-0.300	-0.767	-1.150	0.007	0.024	
	4:WIND X	-0.396	0.350	0.093	0.139	0.018	0.595	
	5:DEAD + LIVE	-0.000	5.983	-0.000	-0.000	0.000	0.000	
	6:DEAD + WIN	-0.016	4.411	-0.767	-1.150	0.007	0.024	
	7:DEAD + WIN	-0.396	5.061	0.093	0.139	0.018	0.595	
	8:DEAD + WIN	0.016	5.010	0.767	1.150	-0.007	-0.024	
	9:DEAD + WIN	0.396	4.360	-0.093	-0.139	-0.018	-0.595	
	10:D + 0.75L +	-0.012	5.440	-0.575	-0.863	0.005	0.018	
	11:D + 0.75L +	-0.297	5.928	0.069	0.104	0.013	0.446	
	12:D + 0.75L +	0.012	5.890	0.575	0.863	-0.005	-0.018	

Reactions Cont...

		Horizontal	Vertical	Horizontal	Moment		
Node	L/C	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
	13:D + 0.75L +	0.297	5.402	-0.069	-0.104	-0.013	-0.446
30	1:DEAD	-0.000	3.054	0.000	0.000	-0.000	0.000
	2:LIVE	0.000	0.541	0.000	0.000	0.000	-0.000
	3:WIND Z	0.016	0.215	-0.647	-0.971	0.004	-0.024
	4:WIND X	-1.020	-1.195	0.009	0.013	-0.261	1.530
	5:DEAD + LIVE	-0.000	3.595	0.000	0.000	-0.000	0.000
	6:DEAD + WIN	0.016	3.268	-0.647	-0.971	0.004	-0.024
	7:DEAD + WIN	-1.020	1.859	0.009	0.013	-0.261	1.530
	8:DEAD + WIN	-0.016	2.839	0.647	0.971	-0.004	0.024
	9:DEAD + WIN	1.020	4.249	-0.009	-0.013	0.261	-1.530
	10:D + 0.75L +	0.012	3.621	-0.486	-0.728	0.003	-0.018
	11:D + 0.75L +	-0.765	2.563	0.007	0.010	-0.195	1.147
	12:D + 0.75L +	-0.012	3.299	0.486	0.728	-0.003	0.018
	13:D + 0.75L +	0.765	4.356	-0.007	-0.010	0.195	-1.147
31	1:DEAD	-0.000	3.657	-0.000	-0.000	-0.000	0.000
	2:LIVE	-0.000	1.091	-0.000	-0.000	-0.000	0.000
	3:WIND Z	-0.016	-0.215	-0.602	-0.903	0.009	0.023
	4:WIND X	-0.396	-0.350	-0.092	-0.138	0.018	0.595
	5:DEAD + LIVE	-0.000	4.748	-0.000	-0.000	-0.000	0.000
	6:DEAD + WIN	-0.016	3.442	-0.602	-0.903	0.009	0.023
	7:DEAD + WIN	-0.396	3.307	-0.092	-0.138	0.018	0.595
	8:DEAD + WIN	0.016	3.872	0.602	0.903	-0.009	-0.023
	9:DEAD + WIN	0.396	4.007	0.092	0.138	-0.018	-0.595
	10:D + 0.75L +	-0.012	4.315	-0.451	-0.677	0.007	0.017
	11:D + 0.75L +	-0.297	4.213	-0.069	-0.104	0.013	0.446
	12:D + 0.75L +	0.012	4.637	0.451	0.677	-0.007	-0.017
	13:D + 0.75L +	0.297	4.738	0.069	0.104	-0.013	-0.446

Beam Line G: 9'-6" from Col.

Beam Line C: 9'-6" from Col.

Utilization Ratio

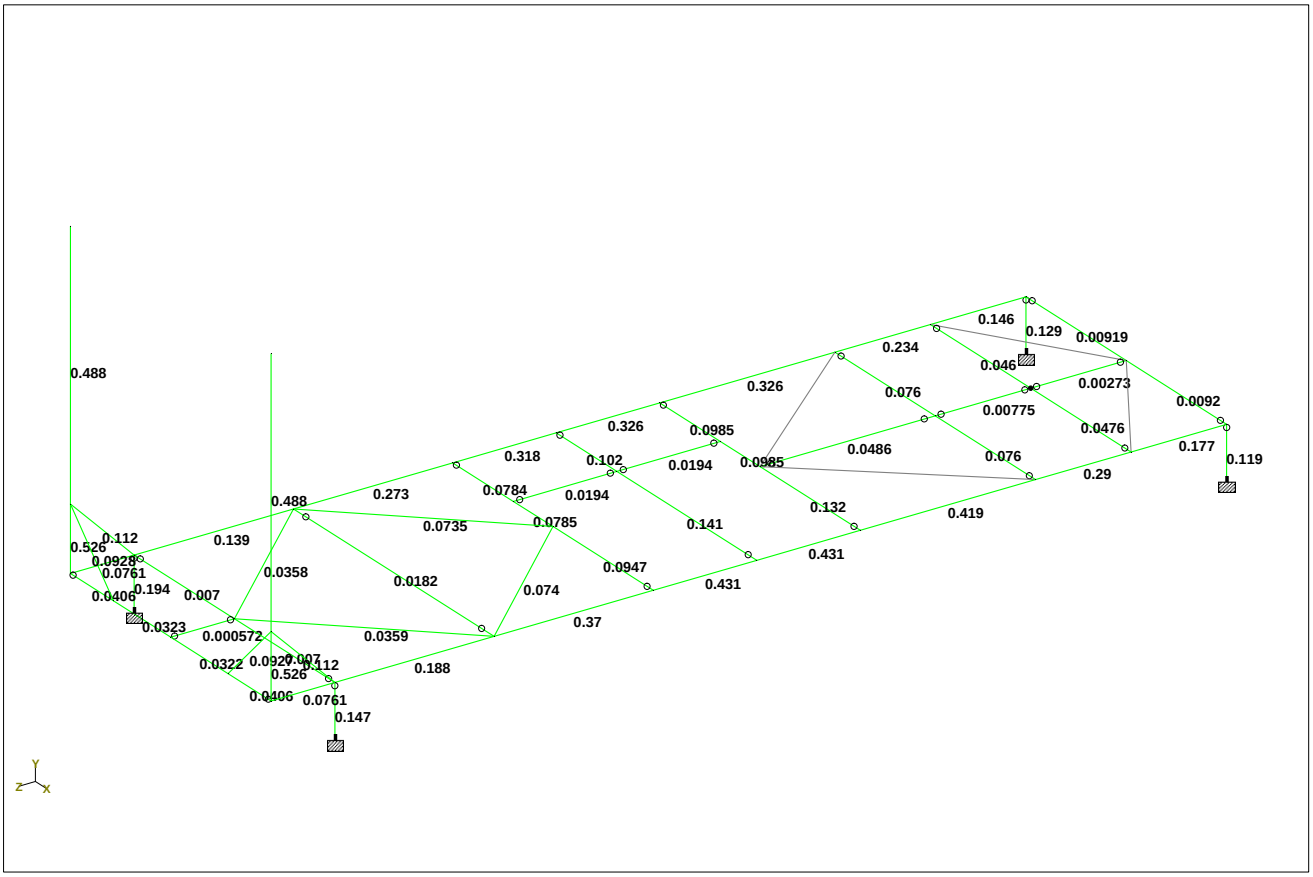
Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (in^2)	Iz (in^4)	Iy (in^4)	Ix (in^4)
2	W10X22	W10X22	0.007	1.000	0.007	AISC- H1-3	9	6.490	118.000	11.400	0.239
4	W10X22	W10X22	0.009	1.000	0.009	AISC- H1-3	9	6.490	118.000	11.400	0.239
8	W14X30	W14X30	0.139	1.000	0.139	AISC- H1-3	13	8.850	291.000	19.600	0.380
9	W14X30	W14X30	0.146	1.000	0.146	AISC- H1-3	13	8.850	291.000	19.600	0.380
10	W14X30	W14X30	0.188	1.000	0.188	AISC- H1-3	11	8.850	291.000	19.600	0.380
12	HSST4X4X0	HSST4X4X0	0.119	1.000	0.119	AISC- H1-3	8	4.780	10.300	10.300	17.500
13	HSST4X4X0	HSST4X4X0	0.147	1.000	0.147	AISC- H1-3	7	4.780	10.300	10.300	17.500
18	W14X30	W14X30	0.370	1.000	0.370	AISC- H2-1	11	8.850	291.000	19.600	0.380
19	W14X30	W14X30	0.431	1.000	0.431	AISC- H2-1	11	8.850	291.000	19.600	0.380
20	W14X30	W14X30	0.419	1.000	0.419	AISC- H2-1	11	8.850	291.000	19.600	0.380
21	W14X30	W14X30	0.273	1.000	0.273	AISC- H2-1	13	8.850	291.000	19.600	0.380

Utilization Ratio Cont...

Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (in^2)	Iz (in^4)	Iy (in^4)	Ix (in^4)
22	W14X30	W14X30	0.318	1.000	0.318	AISC- H2-1	13	8.850	291.000	19.600	0.380
23	W14X30	W14X30	0.326	1.000	0.326	AISC- H2-1	13	8.850	291.000	19.600	0.380
24	W10X22	W10X22	0.098	1.000	0.098	AISC- H2-1	8	6.490	118.000	11.400	0.239
25	W10X22	W10X22	0.078	1.000	0.078	AISC- H2-1	6	6.490	118.000	11.400	0.239
28	W14X30	W14X30	0.076	1.000	0.076	AISC- H2-1	9	8.850	291.000	19.600	0.380
29	W14X30	W14X30	0.076	1.000	0.076	AISC- H2-1	7	8.850	291.000	19.600	0.380
30	W10X22	W10X22	0.041	1.000	0.041	AISC- H2-1	7	6.490	118.000	11.400	0.239
31	W14X30	W14X30	0.177	1.000	0.177	AISC- H1-3	11	8.850	291.000	19.600	0.380
32	W10X22	W10X22	0.046	1.000	0.046	AISC- H1-3	5	6.490	118.000	11.400	0.239
33	W14X30	W14X30	0.431	1.000	0.431	AISC- H2-1	11	8.850	291.000	19.600	0.380
34	W14X30	W14X30	0.326	1.000	0.326	AISC- H2-1	13	8.850	291.000	19.600	0.380
35	W10X22	W10X22	0.102	1.000	0.102	AISC- H1-3	10	6.490	118.000	11.400	0.239
36	W10X22	W10X22	0.095	1.000	0.095	AISC- H1-3	6	6.490	118.000	11.400	0.239
37	L30304	L30304	0.073	1.000	0.073	AISC- H1-3	9	1.440	0.493	1.996	0.030
38	L30304	L30304	0.074	1.000	0.074	AISC- H1-3	4	1.440	0.493	1.996	0.030
39	W10X22	W10X22	0.132	1.000	0.132	AISC- H1-3	12	6.490	118.000	11.400	0.239
40	W10X22	W10X22	0.141	1.000	0.141	AISC- H1-3	10	6.490	118.000	11.400	0.239
43	W10X22	W10X22	0.048	1.000	0.048	AISC- H1-3	5	6.490	118.000	11.400	0.239
44	W8X10	W8X10	0.049	1.000	0.049	AISC- H1-3	5	2.960	30.800	2.090	0.043
45	W10X22	W10X22	0.009	1.000	0.009	AISC- H1-3	7	6.490	118.000	11.400	0.239
46	W8X10	W8X10	0.003	1.000	0.003	AISC- H1-3	8	2.960	30.800	2.090	0.043
47	HSST4X4X0	HSST4X4X0	0.129	1.000	0.129	AISC- H1-3	8	4.780	10.300	10.300	17.500
48	HSST4X4X0	HSST4X4X0	0.194	1.000	0.194	AISC- H1-3	9	4.780	10.300	10.300	17.500
49	W14X30	W14X30	0.290	1.000	0.290	AISC- H2-1	11	8.850	291.000	19.600	0.380
50	W14X30	W14X30	0.234	1.000	0.234	AISC- H2-1	13	8.850	291.000	19.600	0.380
51	W8X10	W8X10	0.008	1.000	0.008	AISC- H1-3	12	2.960	30.800	2.090	0.043
52	W10X22	W10X22	0.076	1.000	0.076	AISC- H1-3	5	6.490	118.000	11.400	0.239
53	W10X22	W10X22	0.076	1.000	0.076	AISC- H1-3	5	6.490	118.000	11.400	0.239
58	PIPS35	PIPS35	0.526	1.000	0.526	AISC- H1-3	6	2.500	4.520	4.520	9.040
59	PIPS35	PIPS35	0.526	1.000	0.526	AISC- H1-3	6	2.500	4.520	4.520	9.040
60	L30304	L30304	0.112	1.000	0.112	AISC- H1-3	8	1.440	0.493	1.996	0.030
61	L30304	L30304	0.112	1.000	0.112	AISC- H1-3	8	1.440	0.493	1.996	0.030
62	W10X22	W10X22	0.032	1.000	0.032	AISC- H2-1	7	6.490	118.000	11.400	0.239
63	W10X22	W10X22	0.041	1.000	0.041	AISC- H2-1	9	6.490	118.000	11.400	0.239
64	L30304	L30304	0.093	1.000	0.093	AISC- H1-3	7	1.440	0.493	1.996	0.030
65	L30304	L30304	0.093	1.000	0.093	AISC- H1-3	9	1.440	0.493	1.996	0.030
66	PIPS35	PIPS35	0.488	1.000	0.488	AISC- H1-3	6	2.500	4.520	4.520	9.040
67	PIPS35	PIPS35	0.488	1.000	0.488	AISC- H1-3	6	2.500	4.520	4.520	9.040
68	W10X22	W10X22	0.032	1.000	0.032	AISC- H1-3	9	6.490	118.000	11.400	0.239
69	W10X22	W10X22	0.007	1.000	0.007	AISC- H1-3	7	6.490	118.000	11.400	0.239
70	W8X10	W8X10	0.001	1.000	0.001	SHEAR -Y	1	2.960	30.800	2.090	0.043
71	L30304	L30304	0.036	1.000	0.036	AISC- H1-3	4	1.440	0.493	1.996	0.030
72	L30304	L30304	0.036	1.000	0.036	AISC- H1-3	9	1.440	0.493	1.996	0.030
73	W8X10	W8X10	0.018	1.000	0.018	AISC- H1-3	8	2.960	30.800	2.090	0.043
74	W10X22	W10X22	0.098	1.000	0.098	AISC- H2-1	8	6.490	118.000	11.400	0.239

Utilization Ratio Cont...

Beam	Analysis Property	Design Property	Actual Ratio	Allowable Ratio	Ratio (Act./Allow.)	Clause	L/C	Ax (in^2)	Iz (in^4)	Iy (in^4)	Ix (in^4)
76	W8X10	W8X10	0.019	1.000	0.019	AISC- H1-3	5	2.960	30.800	2.090	0.043
77	W10X22	W10X22	0.078	1.000	0.078	AISC- H2-1	6	6.490	118.000	11.400	0.239
78	W8X10	W8X10	0.019	1.000	0.019	AISC- H1-3	5	2.960	30.800	2.090	0.043
79	L30304	N/A						1.440	0.493	1.996	0.030
80	L30304	N/A						1.440	0.493	1.996	0.030
81	L30304	N/A						1.440	0.493	1.996	0.030
82	L30304	N/A						1.440	0.493	1.996	0.030



Unity Check

Failed Members

There is no data of this type.

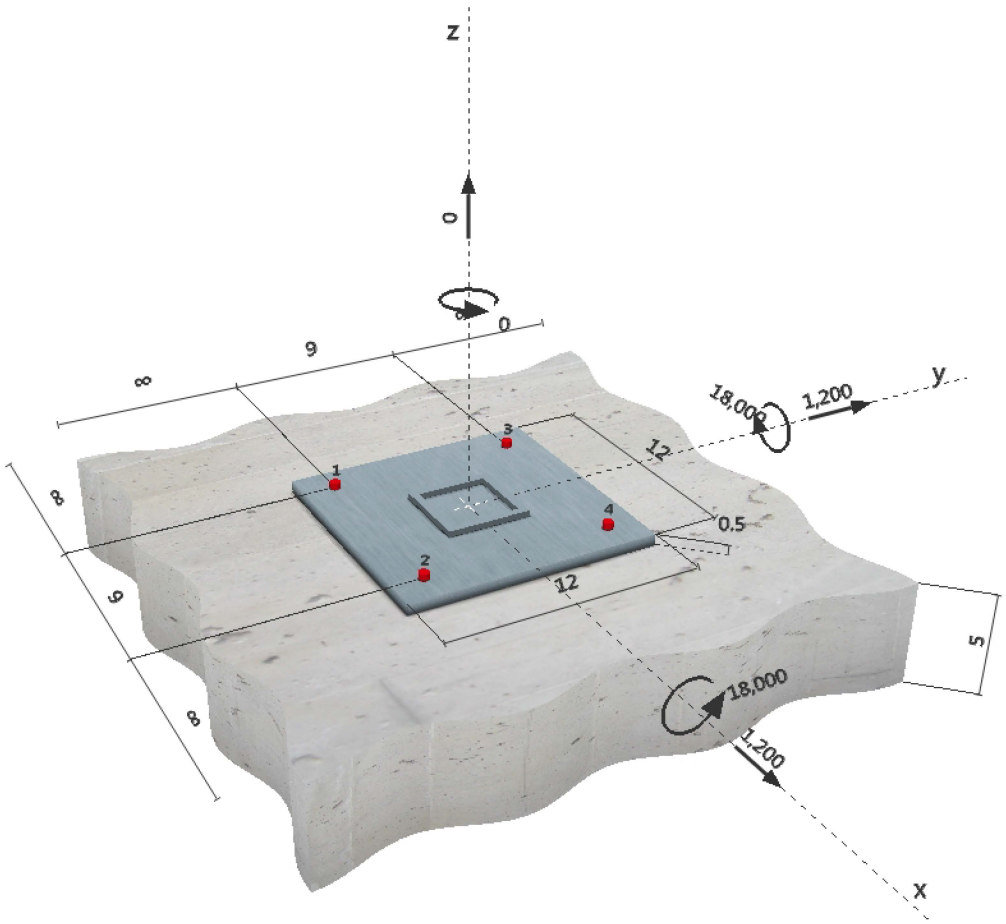
Company:		Page:	1
Specifier:		Project:	Putnam Ave
Address:		Sub-Project I Pos. No.:	
Phone I Fax:	|	Date:	1/16/2018
E-Mail:			

Specifier's comments:

1 Input data

Anchor type and diameter:	**HIT-HY 200 + HAS-E 1/2**
Effective embedment depth:	$h_{ef,opti}$ = 2.750 in. ($h_{ef,limit}$ = 3.750 in.)
Material:	5.8
Evaluation Service Report:	ESR-3187
Issued I Valid:	11/1/2016 | 3/1/2018
Proof:	Design method ACI 318-08 / Chem
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate:	l_x x l_y x t = 12.000 in. x 12.000 in. x 0.500 in.; (Recommended plate thickness: not calculated
Profile:	Square HSS (AISC); (L x W x T) = 4.000 in. x 4.000 in. x 0.375 in.
Base material:	cracked concrete, 3000, f_c' = 3000 psi; h = 5.000 in., Temp. short/long: 32/32 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	no

Geometry [in.] & Loading [lb, in.lb]



Company:
Specifier:
Address:
Phone I Fax: |
E-Mail:

2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	**Proof**	**Load**	**Capacity**	**β_N / β_V [%]**	**Status**
Tension	Concrete Breakout Strength	2543	5485	47 / -	OK
Shear	Steel Strength	424	3705	- / 12	OK

Loading	**β_N**	**β_V**	**ζ**	**Utilization $\beta_{N,V}$ [%]**	**Status**
Combined tension and shear loads	0.464	0.115	5/3	31	OK

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!

4 Remarks; Your Cooperation Duties

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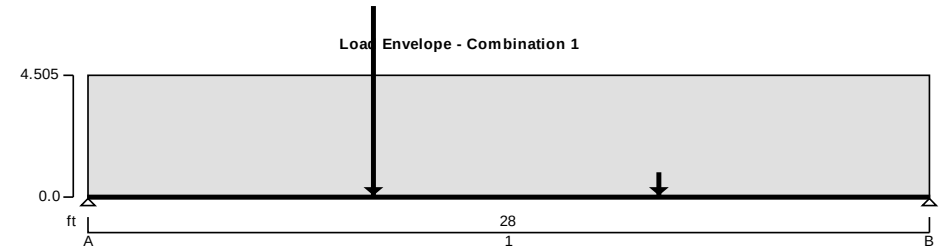
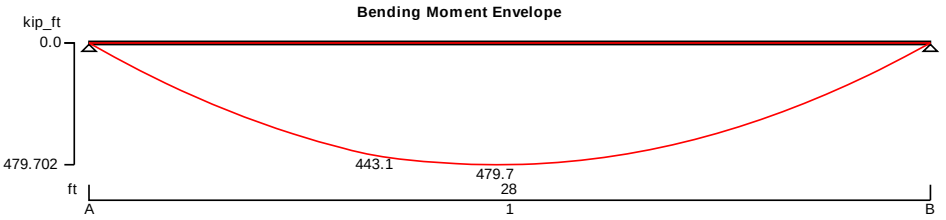
Tekla Tedds Dewberry	Project: Putnam Ave				Job Ref.: 50096257	
	Section: W24x84 - Beam Line C				Sheet no./rev.: 1	
	Calc. by: JJC	Date: 1/16/2018	Chk'd by:	Date:	App'd by:	Date:

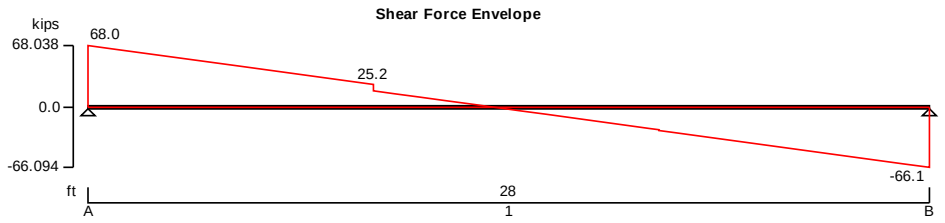
STEEL BEAM ANALYSIS & DESIGN (AISC360-10)

In accordance with AISC360 14th Edition published 2010 using the LRFD method

Tedds calculation version 3.0.12







Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading Beam Tributary Width = 23.33'

Beam loads	Dead self weight of beam × 1
40 psf x 23.33'	Live - Roof live full UDL 0.933 kips/ft
64 psf x 23.33'	Roof Dead - Dead full UDL 1.493 kips/ft
30 psf x 23.33'	Snow - Snow full UDL 0.7 kips/ft
STAAD Node 31	Frame Point Load DL - Dead point load 3.657 kips at 114.00 in
STAAD Node 31	Frame Point Load LL - Live point load 1.1 kips at 114.00 in
(40 plf x 14') + (22plf x 9.33')	Beam DL - Dead point load 0.765 kips at 114.00 in

Tekla Tedds Dewberry	Project: Putnam Ave				Job Ref.: 50096257	
	Section: W24x84 - Beam Line C				Sheet no./rev.: 2	
	Calc. by: JJC	Date: 1/16/2018	Chk'd by	Date	App'd by	Date

(40 plf x 14') + (22plf x 9.33') Beam DL - Dead point load 0.765 kips at 228.00 in

Load combinations Very conservative load case. Beam still passes

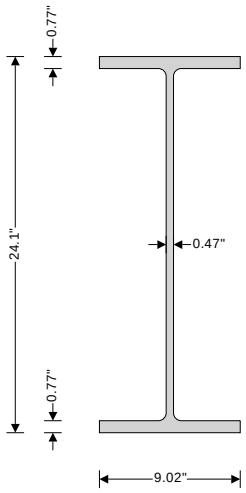
Load combination 1	Support A	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60
	Span 1	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60
	Support B	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60

Analysis results

Maximum moment	M_{max} = **479.7** kips_ft	M_{min} = **0** kips_ft
Maximum moment span 1 segment 1	$M_{s1\_seg1\_max}$ = **438.8** kips_ft	$M_{s1\_seg1\_min}$ = **0** kips_ft
Maximum moment span 1 segment 2	$M_{s1\_seg2\_max}$ = **479.7** kips_ft	$M_{s1\_seg2\_min}$ = **0** kips_ft
Maximum moment span 1 segment 3	$M_{s1\_seg3\_max}$ = **420.3** kips_ft	$M_{s1\_seg3\_min}$ = **0** kips_ft
Maximum shear	V_{max} = **68** kips	V_{min} = **-66.1** kips
Maximum shear span 1 segment 1	$V_{s1\_seg1\_max}$ = **68** kips	$V_{s1\_seg1\_min}$ = **0** kips
Maximum shear span 1 segment 2	$V_{s1\_seg2\_max}$ = **26** kips	$V_{s1\_seg2\_min}$ = **-23.1** kips
Maximum shear span 1 segment 3	$V_{s1\_seg3\_max}$ = **0** kips	$V_{s1\_seg3\_min}$ = **-66.1** kips
Deflection segment 4	δ_{max} = **0.7** in	δ_{min} = **0** in
Maximum reaction at support A	R_{A_max} = **68** kips	R_{A_min} = **68** kips
Unfactored dead load reaction at support A	R_{A_Dead} = **25.2** kips	
Unfactored live load reaction at support A	R_{A_Live} = **0.7** kips	
Unfactored roof live load reaction at support A	$R_{A\_Roof\ live}$ = **13.1** kips	
Unfactored snow load reaction at support A	R_{A_Snow} = **9.8** kips	
Maximum reaction at support B	R_{B_max} = **66.1** kips	R_{B_min} = **66.1** kips
Unfactored dead load reaction at support B	R_{B_Dead} = **24.1** kips	
Unfactored live load reaction at support B	R_{B_Live} = **0.4** kips	
Unfactored roof live load reaction at support B	$R_{B\_Roof\ live}$ = **13.1** kips	
Unfactored snow load reaction at support B	R_{B_Snow} = **9.8** kips	

Section details

Section type	**W 24x84 (AISC 14th Edn (v14.1))**
ASTM steel designation	**A36**
Steel yield stress	F_y = **36** ksi
Steel tensile stress	F_u = **58** ksi
Modulus of elasticity	E = **29000** ksi



Resistance factors

Resistance factor for tensile yielding	ϕ_{ty} = **0.90**
Resistance factor for tensile rupture	ϕ_{tr} = **0.75**
Resistance factor for compression	ϕ_c = **0.90**
Resistance factor for flexure	ϕ_b = **0.90**
Resistance factor for shear	ϕ_v = **1.00**

Lateral bracing

Span 1 has lateral bracing at supports plus third points

Classification of sections for local buckling - Section B4.1

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio	$b_f / (2 \times t_f)$ = **5.86**	
Limiting ratio for compact section	$\lambda_{pff} = 0.38 \times \sqrt{[E / F_y]}$ = **10.79**	
Limiting ratio for non-compact section	$\lambda_{rff} = 1.0 \times \sqrt{[E / F_y]}$ = **28.38**	Compact

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio	$(d - 2 \times k) / t_w$ = **45.87**	
Limiting ratio for compact section	$\lambda_{pwf} = 3.76 \times \sqrt{[E / F_y]}$ = **106.72**	
Limiting ratio for non-compact section	$\lambda_{rwf} = 5.70 \times \sqrt{[E / F_y]}$ = **161.78**	Compact

Section is compact in flexure

Design of members for shear - Chapter G

Required shear strength	$V_r = \max(\text{abs}(V_{max}), \text{abs}(V_{min}))$ = **68.038** kips
Web area	$A_w = d \times t_w$ = **11.327** in^2
Web plate buckling coefficient	k_v = **5**
Web shear coefficient - eq G2-2	C_v = **1.000**
Nominal shear strength - eq G2-1	$V_n = 0.6 \times F_y \times A_w \times C_v$ = **244.663** kips
Design shear strength	$V_c = \phi_v \times V_n$ = **244.663** kips

PASS - Design shear strength exceeds required shear strength

Design of members for flexure in the major axis at span 1 segment 2 - Chapter F

Required flexural strength	$M_r = \max(\text{abs}(M_{s1\_seg2\_max}), \text{abs}(M_{s1\_seg2\_min}))$ = **479.702** kips_ft

Yielding - Section F2.1

Nominal flexural strength for yielding - eq F2-1 $M_{nyld} = M_p = F_y \times Z_x =$ **672** kips_ft

Lateral-torsional buckling - Section F2.2

Unbraced length $L_b = L_{s1\_seg2} =$ **112** in

Limiting unbraced length for yielding - eq F2-5 $L_p = 1.76 \times r_y \times \sqrt{[E / F_y]} =$ **97.408** in

Distance between flange centroids $h_o = d - t_f =$ **23.33** in

$c =$ **1**

$r_{ts} = \sqrt{[\sqrt{(I_y \times C_w) / S_x]}} =$ **2.368** in

Limiting unbraced length for inelastic LTB - eq F2-6

$$L_r = 1.95 \times r_{ts} \times E / (0.7 \times F_y) \times \sqrt{[(J \times c / (S_x \times h_o)) + \sqrt{((J \times c / (S_x \times h_o))^2 + 6.76 \times (0.7 \times F_y / E)^2)}]} = \mathbf{301.047} \text{ in}$$

Cross-section mono-symmetry parameter $R_m =$ **1.000**

Moment at quarter point of segment $M_A =$ **471.853** kips_ft

Moment at center-line of segment $M_B =$ **479.212** kips_ft

Moment at three quarter point of segment $M_C =$ **462.042** kips_ft

Maximum moment in segment $M_{abs} =$ **479.702** kips_ft

Lateral torsional buckling modification factor - eq F1-1 $C_b = 12.5 \times M_{abs} / [2.5 \times M_{abs} + 3 \times M_A + 4 \times M_B + 3 \times M_C] =$ **1.013**

Nominal flexural strength for lateral torsional buckling - eq F2-2 $M_{nltb} = C_b \times [M_p - (M_p - 0.7 \times F_y \times S_x) \times (L_b - L_p) / (L_r - L_p)] =$ **662.006** kips_ft

Nominal flexural strength $M_n = \min(M_{nyld}, M_{nltb}) =$ **662.006** kips_ft

Design flexural strength $M_c = \phi_b \times M_n =$ **595.806** kips_ft

PASS - Design flexural strength exceeds required flexural strength

Design of members for vertical deflection

Consider deflection due to dead, live, roof live and snow loads

Limiting deflection $\delta_{lim} = L_{s1} / 360 =$ **0.933** in

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) =$ **0.708** in

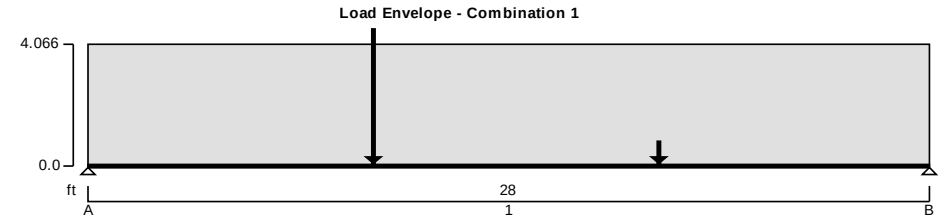
PASS - Maximum deflection does not exceed deflection limit

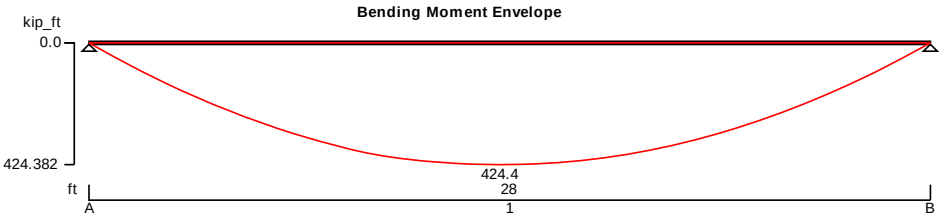
Tekla Tedds Dewberry	Project: Putnam Ave				Job Ref.: 50096257	
	Section: W24x64 - Beam Line G				Sheet no./rev.: 1	
	Calc. by: JJC	Date: 1/16/2018	Chk'd by	Date	App'd by	Date

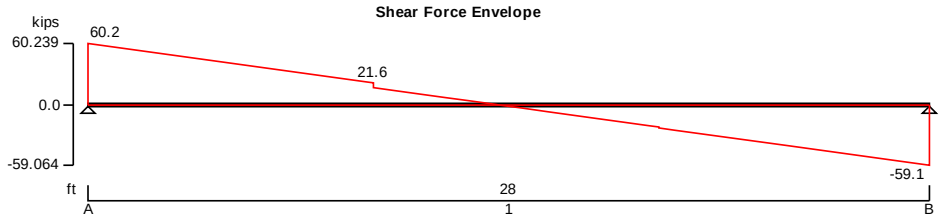
STEEL BEAM ANALYSIS & DESIGN (AISC360-10)

In accordance with AISC360 14th Edition published 2010 using the LRFD method

Tedds calculation version 3.0.12







Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading Beam Tributary Width = 21'

Beam loads	Dead self weight of beam × 1
40 psf x 21'	Live - Roof live full UDL 0.84 kips/ft
64 psf x 21'	Roof Dead - Dead full UDL 1.344 kips/ft
30 psf x 21'	Snow - Snow full UDL 0.63 kips/ft
STAAD Node 31	Frame Point Load - Dead point load 3.054 kips at 114.00 in
STAAD Node 31	Frame Point Load - Live point load 0.054 kips at 114.00 in
(40 plf x 14') + (22plf x 7')	Beam DL - Dead point load 0.714 kips at 114.00 in
(40 plf x 14') + (22plf x 7')	Beam DL - Dead point load 0.714 kips at 228.00 in

Load combinations

Very conservative load case. Beam still passes

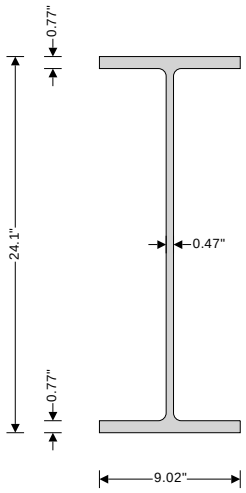
Load combination 1	Support A	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60
	Span 1	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60
	Support B	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60

Analysis results

Maximum moment	M_{max} = **424.4** kips_ft	M_{min} = **0** kips_ft
Maximum moment span 1 segment 1	$M_{s1\_seg1\_max}$ = **385.2** kips_ft	$M_{s1\_seg1\_min}$ = **0** kips_ft
Maximum moment span 1 segment 2	$M_{s1\_seg2\_max}$ = **424.4** kips_ft	$M_{s1\_seg2\_min}$ = **0** kips_ft
Maximum moment span 1 segment 3	$M_{s1\_seg3\_max}$ = **373.9** kips_ft	$M_{s1\_seg3\_min}$ = **0** kips_ft
Maximum shear	V_{max} = **60.2** kips	V_{min} = **-59.1** kips
Maximum shear span 1 segment 1	$V_{s1\_seg1\_max}$ = **60.2** kips	$V_{s1\_seg1\_min}$ = **0** kips
Maximum shear span 1 segment 2	$V_{s1\_seg2\_max}$ = **22.3** kips	$V_{s1\_seg2\_min}$ = **-20.3** kips
Maximum shear span 1 segment 3	$V_{s1\_seg3\_max}$ = **0** kips	$V_{s1\_seg3\_min}$ = **-59.1** kips
Deflection segment 4	δ_{max} = **0.6** in	δ_{min} = **0** in
Maximum reaction at support A	R_{A_max} = **60.2** kips	R_{A_min} = **60.2** kips
Unfactored dead load reaction at support A	R_{A_Dead} = **22.7** kips	
Unfactored live load reaction at support A	R_{A_Live} = **0** kips	
Unfactored roof live load reaction at support A	$R_{A\_Roof\ live}$ = **11.8** kips	
Unfactored snow load reaction at support A	R_{A_Snow} = **8.8** kips	
Maximum reaction at support B	R_{B_max} = **59.1** kips	R_{B_min} = **59.1** kips
Unfactored dead load reaction at support B	R_{B_Dead} = **21.8** kips	
Unfactored live load reaction at support B	R_{B_Live} = **0** kips	
Unfactored roof live load reaction at support B	$R_{B\_Roof\ live}$ = **11.8** kips	
Unfactored snow load reaction at support B	R_{B_Snow} = **8.8** kips	

Section details

Section type	**W 24x84 (AISC 14th Edn (v14.1))**
ASTM steel designation	**A36**
Steel yield stress	F_y = **36** ksi
Steel tensile stress	F_u = **58** ksi
Modulus of elasticity	E = **29000** ksi



Resistance factors

Resistance factor for tensile yielding	ϕ_{ty} = **0.90**
Resistance factor for tensile rupture	ϕ_{tr} = **0.75**
Resistance factor for compression	ϕ_c = **0.90**
Resistance factor for flexure	ϕ_b = **0.90**
Resistance factor for shear	ϕ_v = **1.00**

Lateral bracing

Span 1 has lateral bracing at supports plus third points

Classification of sections for local buckling - Section B4.1

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio	$b_f / (2 \times t_f)$ = **5.86**	
Limiting ratio for compact section	$\lambda_{pff} = 0.38 \times \sqrt{[E / F_y]}$ = **10.79**	
Limiting ratio for non-compact section	$\lambda_{rff} = 1.0 \times \sqrt{[E / F_y]}$ = **28.38**	Compact

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio	$(d - 2 \times k) / t_w$ = **45.87**	
Limiting ratio for compact section	$\lambda_{pwf} = 3.76 \times \sqrt{[E / F_y]}$ = **106.72**	
Limiting ratio for non-compact section	$\lambda_{rwf} = 5.70 \times \sqrt{[E / F_y]}$ = **161.78**	Compact

Section is compact in flexure

Design of members for shear - Chapter G

Required shear strength	$V_r = \max(\text{abs}(V_{max}), \text{abs}(V_{min}))$ = **60.239** kips
Web area	$A_w = d \times t_w$ = **11.327** in^2
Web plate buckling coefficient	k_v = **5**
Web shear coefficient - eq G2-2	C_v = **1.000**
Nominal shear strength - eq G2-1	$V_n = 0.6 \times F_y \times A_w \times C_v$ = **244.663** kips
Design shear strength	$V_c = \phi_v \times V_n$ = **244.663** kips

PASS - Design shear strength exceeds required shear strength

Design of members for flexure in the major axis at span 1 segment 2 - Chapter F

Required flexural strength	$M_r = \max(\text{abs}(M_{s1\_seg2\_max}), \text{abs}(M_{s1\_seg2\_min}))$ = **424.382** kips_ft

Yielding - Section F2.1

Nominal flexural strength for yielding - eq F2-1 $M_{nyld} = M_p = F_y \times Z_x =$ **672** kips_ft

Lateral-torsional buckling - Section F2.2

Unbraced length $L_b = L_{s1\_seg2} =$ **112** in

Limiting unbraced length for yielding - eq F2-5 $L_p = 1.76 \times r_y \times \sqrt{[E / F_y]} =$ **97.408** in

Distance between flange centroids $h_o = d - t_f =$ **23.33** in

$c =$ **1**

$r_{ts} = \sqrt{[\sqrt{(I_y \times C_w) / S_x]}} =$ **2.368** in

Limiting unbraced length for inelastic LTB - eq F2-6

$$L_r = 1.95 \times r_{ts} \times E / (0.7 \times F_y) \times \sqrt{[(J \times c / (S_x \times h_o)) + \sqrt{((J \times c / (S_x \times h_o))^2 + 6.76 \times (0.7 \times F_y / E)^2)}]} = \mathbf{301.047} \text{ in}$$

Cross-section mono-symmetry parameter $R_m =$ **1.000**

Moment at quarter point of segment $M_A =$ **416.116** kips_ft

Moment at center-line of segment $M_B =$ **424.178** kips_ft

Moment at three quarter point of segment $M_C =$ **410.105** kips_ft

Maximum moment in segment $M_{abs} =$ **424.382** kips_ft

Lateral torsional buckling modification factor - eq F1-1 $C_b = 12.5 \times M_{abs} / [2.5 \times M_{abs} + 3 \times M_A + 4 \times M_B + 3 \times M_C] =$ **1.013**

Nominal flexural strength for lateral torsional buckling - eq F2-2 $M_{nltb} = C_b \times [M_p - (M_p - 0.7 \times F_y \times S_x) \times (L_b - L_p) / (L_r - L_p)] =$ **661.881** kips_ft

Nominal flexural strength $M_n = \min(M_{nyld}, M_{nltb}) =$ **661.881** kips_ft

Design flexural strength $M_c = \phi_b \times M_n =$ **595.693** kips_ft

PASS - Design flexural strength exceeds required flexural strength

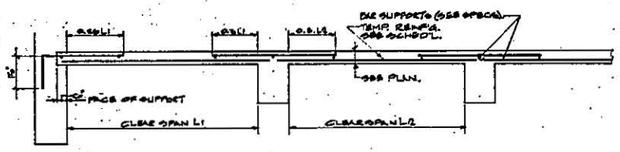
Design of members for vertical deflection

Consider deflection due to dead, live, roof live and snow loads

Limiting deflection $\delta_{lim} = L_{s1} / 360 =$ **0.933** in

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) =$ **0.628** in

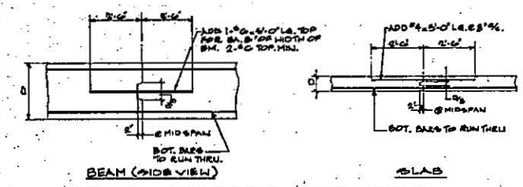
PASS - Maximum deflection does not exceed deflection limit



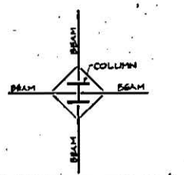
ONE-WAY SLAB

TEMPERATURE REINFG.	
5" & 6" SLAB	#4 @ 18"
7" SLAB	#4 @ 15"
8" & 9" SLAB	#4 @ 12"

BOT. LAYER TOP OF SLAB, TOP LAYER BOT. OF SLAB.

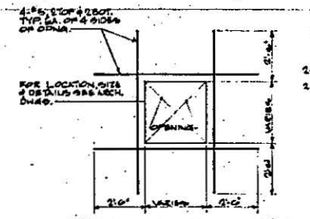


TYPICAL CONSTRUCTION JOINT DETAILS

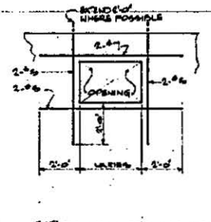


L 4"x3½"x⅜" - TYPICAL FOR DECK SUPPORT AT ALL INTERIOR AND EXTERIOR COLUMNS - FIELD WELD. WHERE BEAM DOES NOT CONNECT TO COLUMN, FIELD WELD ANGLE TO COLUMN.

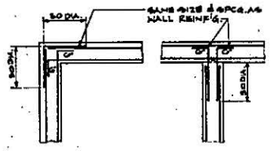
TYPICAL DECK SUPPORT



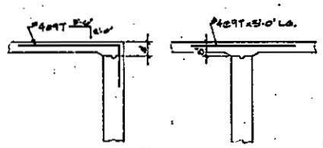
TYPICAL SLAB OPENING DETAIL



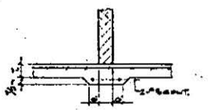
TYPICAL WALL OPENING DETAIL



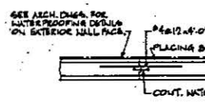
TYPICAL CORNER REINFG.



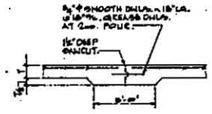
SLAB ON WALL @ ENTRANCES



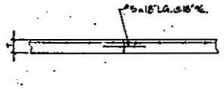
NON-BEARING WALL ON SLAB ON GRADE



VERTICAL WALL JOINT

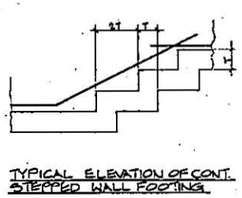


EXPOSED SLAB ON GRADE CONSTR. JT. DET.

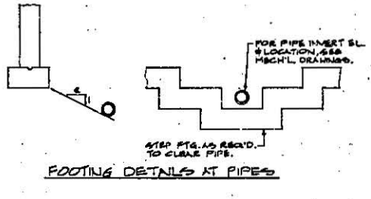


SLAB ON GRADE CONSTR. JOINT WHERE SLAB RECEIVES FLOOR FINISH

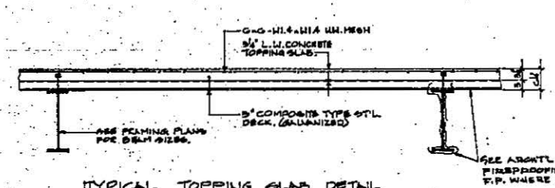
NOTE: SLAB TO BE CHAMFERED (1" DEEP) IN PANELS NOT EXCEEDING 1000 SQ. FT. FILL ALL JTS.



TYPICAL ELEVATION OF CONT. STEPPED WALL FOOTING

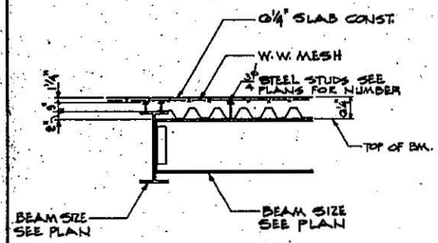


FOOTING DETAILS AT PIPES



TYPICAL TOPPING SLAB DETAIL

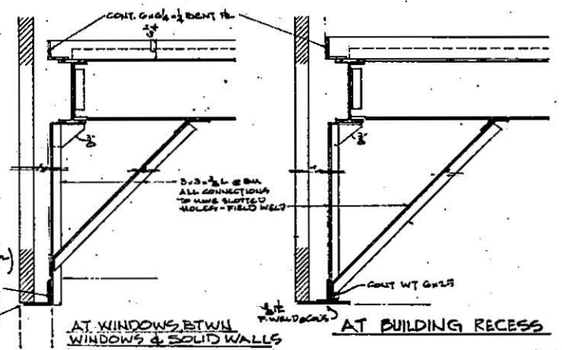
AT EXPOSED SLABS - SAW CUT ½"DEEP & FILL W/SEALER @ CONT. LINES



TYPICAL BEAM TO GIRDER CONN. DETAIL

SCALE: ¾"=1'-0"

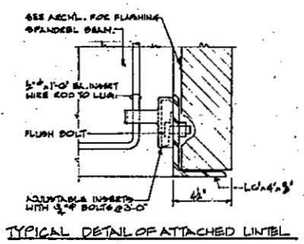
NOTE: BEAMS & GIRDERS NOT NOTED AS TO NUMBER OF #THDS SHALL HAVE ¾" STUDS @ 12" O.C. FULL LENGTH. (NOT ROOF).



TYPICAL BRICK SUPPORT DETAILS

SCALE: ¾"=1'-0" (ARCH'L. EXPOSED MISC SPEC SHALL APPLY)

NOTE: BRICK SUPPORTS SHOWN ARE CONTINUOUS SUPPORTS COMPLETELY AROUND BUILDING PERIMETER AT BASE, FLOOR & LINTEL LOCS.



TYPICAL DETAIL OF ATTACHED LINTEL

GENERAL

1. The Contractor shall verify all dimensions and conditions at the site and report any discrepancy to the Architect before proceeding with the work.
2. The Contractor shall submit shop drawings to the Architect and receive his approval before fabrication of the material, for Spans.
3. All work shall conform to the Commonwealth of Massachusetts State Building Code.
4. All work shall be by specialized, fencing and concrete supervisor selected by and approved by the Commonwealth of Massachusetts Construction Materials Safety Board. All work shall require adherence to the requirements of ASTM designation E-329, entitled "Recommended Practice For Inspection and Testing Agencies for Concrete and Steel Used in Construction".
5. Design live loads:

Roof	40#/sq. ft.
Office	100#/sq. ft.
Light Storage, Assembly	
Mechanical Areas	125#/sq. ft.
Public Areas	100#/sq. ft.
Parking	75#/sq. ft.

6. All questions, details, notes, methods or materials shown and/or noted on any plan, section, or elevation shall apply to all other similar locations unless otherwise noted.
7. Structural drawings shall be used in conjunction with Architectural, Heating and Ventilating, Plumbing, Electrical and Mechanical drawings and specifications and these drawings shall be referred to for size and location of openings, vents, pipes, inserts, hangers, etc.

FOUNDATION

1. Footings shall bear on firm undisturbed soil having a minimum bearing capacity of 2.5 tons per square foot. It is assumed that this soil is attained at the elevations noted on plan. The Contractor shall lower footings as necessary.
2. All granular fill material under slabs shall be placed to 95% density.
3. All footing excavations to be finished by hand and inspected and approved by the Soils Engineer before any concrete is placed.
4. Backfill shall be placed to equal elevations on both sides of foundation walls, where backfill is on one side only work shall be shored or have permanent adjacent construction in place before backfilling.
5. All work shall be protected against frost heaving.
6. All work shall be in the dry and no concrete is to be placed in water.
7. The sides of all beams, walls, footings, etc. shall be formed and concrete shall not be placed against earth cuts.

CONCRETE

1. Concrete shall have an ultimate compressive strength as follows:
   a.) Footings, Foundation Walls, Slabs on grade and all other concrete not otherwise noted _____ 3,000 #/sq. in. at 28 days
   b.) Structural slabs including entire Balcony Level framing and concrete columns _____ 4,000 #/sq. in. at 28 days
   c.) Concrete placed on steel floor deck shall be lightweight and have a weight of 110 pounds per cubic foot (air entrained) _____ 3,000 #/sq. in. at 28 days
2. All concrete work shall be controlled and under full time supervision of testing engineer for all mixing, transporting and placing operations.
3. Concrete exposed to the weather shall be air entrained.
4. Reinforcing steel shall conform to ASTM specification for Steel Bars For Concrete Reinforcement, Grade 60 (A615). All reinforcing shall be fabricated. Shop drawings to indicate all bar supports.
5. Steel reinforcement for fabrication shall comply with the requirements of The Manual of Standard Practice For Detailing Reinforced Concrete Structures, as adopted by The American Concrete Institute. Slab reinforcing shall be supported on chairs, bolsters and #9 rods on individual or continuous high chairs. Provide galvanized bar supports where slab suffix touches exposed. Lap temperature steel and support bars 36 diameter. (12 in. minimum)
6. Concrete cover:
   a.) Grade Beams, Walls — Bottom 3", Sides, interior, exposed 1½" Side against earth or exposed to weather 2".
   b.) Concrete Beams ——— Top, Sides; Bottom 1½" to stirrups.
   c.) Slabs and Structural Slabs — Top 3/4", Bottom 1"
   d.) Concrete Columns —— 1½ - Typical from tie.
7. Construction joint locations shall be approved by the Architect. See details for additional reinforcing.
8. Temperature steel shall be provided in accordance with ACI Code.
9. Pipes and conduits embedded in concrete shall not be larger in outside diameter than one third the thickness of the slab, wall or beam in which they are embedded, nor shall they be placed closer than three diameters on center and shall not be so located as to unduly impair the strength of the concrete.
10. Unless otherwise noted, provide at all four sides of an opening, 2-#5 top and bottom bars and 1-#6 each face in walls. Extend bars 2'-0" beyond opening or hook. Provide #4 at 12 c/c 4'-0" lg. ——— ——— at supports parallel to main reinforcing.
11. Unless otherwise noted and/or shown beams, girders, brackets, column capitals, and haunches shall be considered as part of the floor system and shall be placed simultaneously therewith.
12. No splices or bends in reinforcement shall be made except as noted and/or shown on the drawings unless authorized by the Architect.
13. Where two or more layers of reinforcing occur at the bottom and/or top of beams, separate the layers with #9 bars spaced not more than 4'-0" o.c.
14. All 3#5 stirrup support bars where less top steel is not continuous.
15. Slabs placed on ground shall be 6 inches thick unless otherwise noted and reinforced with 6x6 - 6/6 wire mesh.
16. Provide #4 at 12"o.c. at top over all framing members in first floor slab which are parallel to span direction of slab. Length of bars each side of framing member to equal 1/6 width of wider slab.
17. <—> Indicates direction of main reinforcing.
18. Construction joints shall be layed and shall be approximately 60'-0" apart, centers in either direction. See Typical details.
19. Provide 4 inch minimum concrete pads under all floor mounted mechanical and/or electrical equipment where indicated or specified under the applicable sections.
20. Provide pockets in foundation walls at top of walls as required for all wall bearing beams.

STRUCTURAL STEEL - HIGH STRENGTH BOLT - HIGH NUT TYPE

1. Structural steel shall conform to the requirements of The American Institute of Steel Construction, Material ASTM-A36 and high strength steel ASTM-A572 grade 50 as noted on plans.
2. Welding shall comply with the requirements of the latest edition of the welding specification.
3. Shop connections welded or high strength bolted. Field connections high strength bolted unless noted, to be welded. Bolts 3/4" round high strength with one washer, unless noted.
4. Provide temporary bracing to hold steel in place during erection.
5. All steel shall receive one shop coating of red inhibitive paint, except steel encased in concrete, and top flange of beams to receive rust preventers, see Specification.
6. Metal roof deck shall be in accordance with the recommendations of The Steel Deck Institute Specifications. Provide recessed sump plates at drains. Include welding schedule on shop drawings.
7. Unless noted, provide A.B.'s 1" dia. x 1'-6" + 3" hook anchor bolts for all columns.
8. Steel angle lintels in pairs shall be plug welded or bolted together at 2'-0" o/c. Provide 6" bearing each end unless noted.
9. Provide steel angle lintels over all interior and exterior openings in masonry walls, as follows: one angle for each 4" of wall thickness, unless noted.

   L - 4 x 3 1/2 x 1/4 for spans 3'-0" to 5'-0"
   L - 5 x 3 1/2 x 1/4 for spans 5'-0" to 7'-0"
   L - 6 x 3 1/2 x 3/8 for spans 7'-0" to 9'-0"

   Refer to schedule this drawing for additional requirements. All exterior angles, plates, etc. exposed to the weather, to be galvanized. Lintels shall be provided for all ductwork, etc. See mechanical drawings.
10. Bolts for wood nailers shall be ½" dia. at 9'10" dia. below at 2'-6" centers, unless noted.
11. Beams, columns, lintels, etc. encased in exterior masonry shall receive a troweled on coating of mastic 1/8" in thickness.
12. Beam to beam connections shall be standard A36 double angle connections.
13. Steel deck units to receive concrete shall be galvanized, A525, G60 (ASTM). Include welding schedule on shop drawings. Furnish all required floor closures.
14. Mesh reinforcing for beams encased in concrete shall be 6 x 4 - #10x#10.
15. Provide 6" thick planes and or 3½ x 3½ x ½ angles for support of unformed edges of roof and floor deck. Field weld, furnished by Structural Steel Fabricator.
16. At all openings in roof deck and roof deck locations provide angle frame as follows: 3 x 3 x ½" for openings up to 2'-0". 6 x 4 x ½" for openings over 2'-0". All angles turned down.
17. Provide 6" thick reinforcing plates on each side of beam where column occurs over or under beam.
18. Refer to Architectural drawings and specifications for approval on fireproofing for steel beams, girders, hangers, bracing, columns in hung ceiling spaces and underside of deck areas where required
19. Where beam, girders, columns, etc. are note for nominal depth or size and without weight the minimum weight in the series shall be provided.
20. Members with holes noted - plotted for adjustment shall be field welded.
21. Shear connectors shall be 3/4" diameter weld flared shear connector studs, automatically - field welded through metal deck as shown on the drawings. Material ASTM-A108, min. yield 60,000 p.s.i.

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ORION BUILDING

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Cambridge Massachusetts 02138

Job Number
Drawn By
Date 10/16/78
Revisions

SECTIONS, DETAILS & NOTES

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COLUMN SCHEDULE

STORY \ COL. No.	A-1	A-2	A-3, A-4, A-5, A-6	A-7	A-9	A-10	A-13	A-15	C-1	C-2	C-3 C-6	C-4 C-5
MAIN ROOF EL. VARIES												
5TH FLOOR EL. 92'-8"				W8x24	W12x53	W8x31	W8x24	W8x35	W12x58	W12x58	W12x106	W12x58
4TH FLOOR EL. 79'-8"												
3RD FLOOR EL. 67'-0"				W12x50	W12x65	W10x49	W12x45	W12x80	W12x72	W12x79	W12x120	W12x92
2ND FLOOR EL. 54'-4"												
1ST FLOOR EL. 40'-8"	W8x28	W8x24	W8x24	W12x58	W12x72	W10x45	W12x53	W12x87	W12x79	W12x92	W12x120	W12x99
ENTRY LEVEL EL. 29'-4"												
LOWER LEVEL EL. 18'-0"	W8x24	W8x28	W10x28	W12x65	W12x79				W12x79	W12x99	W12x161	W12x106
BASE PL SIZE	1½x12x10	1¼x16x14	1¼x16x17	2¼x30x2'-6	2½x30x2'-6	1x11x17	1¾x22x10	1¾x22x10	1½x30x2'-6	2¼x36x3'-0	1¾x30x30	[illegible]x36x3'-0
ANCHOR BOLTS	SEE	TYPICAL	DETAILS									

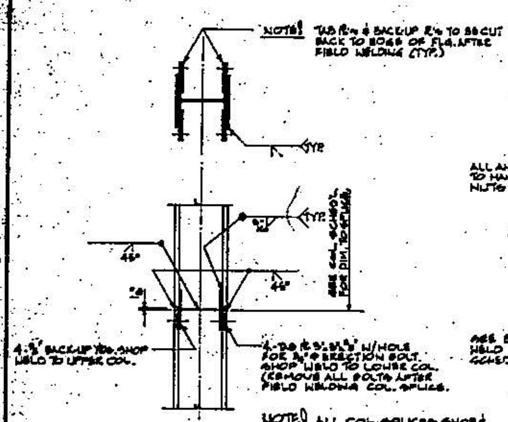
STORY \ COL. No.	C-7 C-9 C-12	E-14	F-16	G-1	G-2	G-3, G-4, G-5, G-6, I-3, I-4, I-5, I-6	H-1	H-2	H-6	H-7	H-8	H-11
MAIN ROOF EL. VARIES												
5TH FLOOR EL. 92'-8"	W12x65	W8x24	W8x24	W12x58	W12x65	W12x72	W8x24	W8x24	W12x45	W8x24		W12x40
4TH FLOOR EL. 79'-8"												
3RD FLOOR EL. 67'-0"	W12x93	W8x31	W8x31	W12x85	W12x99	W12x106	W8x31	W8x31	W12x65	W12x45	W12x40	W12x50
2ND FLOOR EL. 54'-4"												
1ST FLOOR EL. 40'-8"	W12x99	W8x36	W12x40	W12x85	W12x106	W12x120	W12x40	W8x31	W12x65	W12x53	W12x50	W12x58
ENTRY LEVEL EL. 29'-4"												
LOWER LEVEL EL. 18'-0"	W12x120			W12x92	W12x130	W12x133	W12x40	W8x31	W12x65	W12x65	W12x58	W12x65
BASE PL SIZE	[illegible]x36x3'-0	1½x20x16	1x18x10	2¼x36x3'-0	1¾x30x30	3x40x3'-4	1x17x17	1⅜x20x16	2x20x24	2x20x24	2x26x2'-1	2½x30x2'-6
ANCHOR BOLTS												

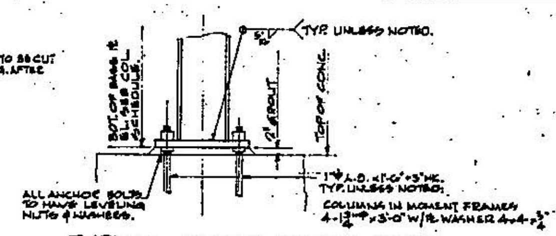
STORY \ COL. No.	H-13	H-14	H-16	I-1	J-2	J-7	J-8	J-11	K-1	K-2	K-3 K-4 K-5	K-6
MAIN ROOF EL. VARIES												
5TH FLOOR EL. 92'-8"	W12x40		W8x24		W8x31	W12x40	W8x31	W8x24		W12x58	W12x136	W12x99
4TH FLOOR EL. 79'-8"												
3RD FLOOR EL. 67'-0"	W12x53	W12x40	W12x45		W12x50	W12x65	W12x53	W12x58		W12x106	W12x79	W12x136
2ND FLOOR EL. 54'-4"												
1ST FLOOR EL. 40'-8"	W12x58	W12x58	W12x53		W12x58	W12x72	W12x65	W12x53		W12x120	W12x79	W12x133
ENTRY LEVEL EL. 29'-4"												
LOWER LEVEL EL. 18'-0"	W12x65	W12x58	W12x58	W8x17	W12x65	W12x58	W12x65	W12x65	W8x24	W12x133	W12x106	W12x161
BASE PL SIZE	2½x30x2'-6	1¾x26x33	2x26x21	¾x12x10	2¼x28x34	2¼x30x26	2¼x28x24	2¼x28x26	1x12x10	2x36x30	2¼x40x34	3x40x34
ANCHOR BOLTS												

STORY \ COL. No.	K-7	K-8	K-11 K-13 K-14 I-13 I-16	L-1	L-2	L-3 L-4 L-5 L-6	L-7	B-14 D-14	G-7 G-9 F-12
MAIN ROOF EL. VARIES									
5TH FLOOR EL. 92'-8"	W12x65	W12x24			W8x24	W8x24	W8x24		W12x65
4TH FLOOR EL. 79'-8"									
3RD FLOOR EL. 67'-0"	W12x65	W12x45			W12x40	W12x40	W12x45		W12x92
2ND FLOOR EL. 54'-4"									
1ST FLOOR EL. 40'-8"	W12x65	W12x50			W12x45	W12x45	W12x45		W12x92
ENTRY LEVEL EL. 29'-4"								W8x20	
LOWER LEVEL EL. 18'-0"	W12x79	W12x58	W8x40	W8x17	W12x53	W12x50	W12x50		W12x99
BASE PL SIZE	2x30x26	2x25x21	1½x18x16	¾x12x10	1¾x24x20	2x24x20	1¼x24x20	½x12x10	3x36x50
ANCHOR BOLTS									

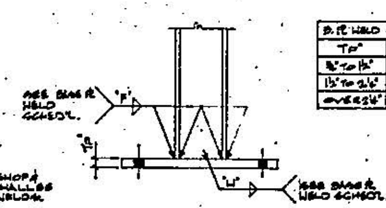
2'-10" TYP. SPLICE
1'-10"
BOT. PL.

COLUMNS - A36 STEEL
COLUMNS - A50 STEEL





TYPICAL ANCHOR SETTING DETAIL.

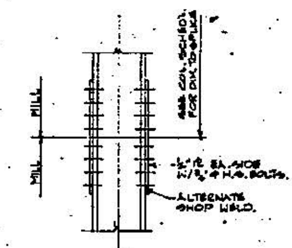


B.PL WELD SCHED'L.		
TP"	"F"	"W"
⅜" to 1½"	5/16"	¼"
1½" to 2¼"	⅜"	5/16"
over 2¼"	½"	⅜"

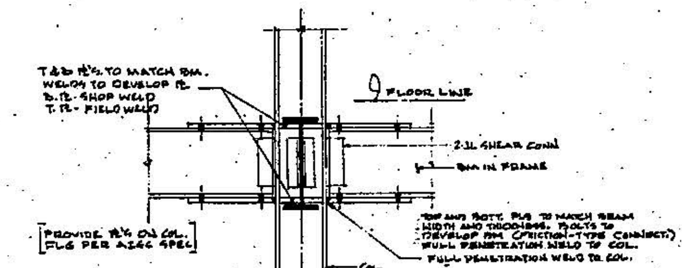
MOMENT RESISTANT COLUMN SPLICE & BASE PL DETAILS

TYPICAL DETAILS FOR ALL COLUMN SPLICES & BASE PL's. ON COLUMNS SUPPORTING MOMENT CONNECTED BEAMS. SEE PLANS FOR LOCATION.

ALL WELDS FULL PENETRATION.



TYPICAL COLUMN SPLICE DETAIL
FOR COLUMNS NOT IN MOMENT FRAMES.



TYPICAL BEAM TO COL. CONNECTION
FOR MOMENT FRAMES
(EXTERIOR BM TO COL & ROOF DETS SIMILAR)
NOT TO SCALE

NOTE - AT Ⓐ & Ⓛ LINES (EXCLUSIVE OF MOMENT FRAMES) PROVIDE ½" L @ TOP & BOTT OF BM @ COL - BOLT W/ 2-¾"Φ H.S.

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Revisions

COLUMN SCHEDULE & TYPICAL DETAILS
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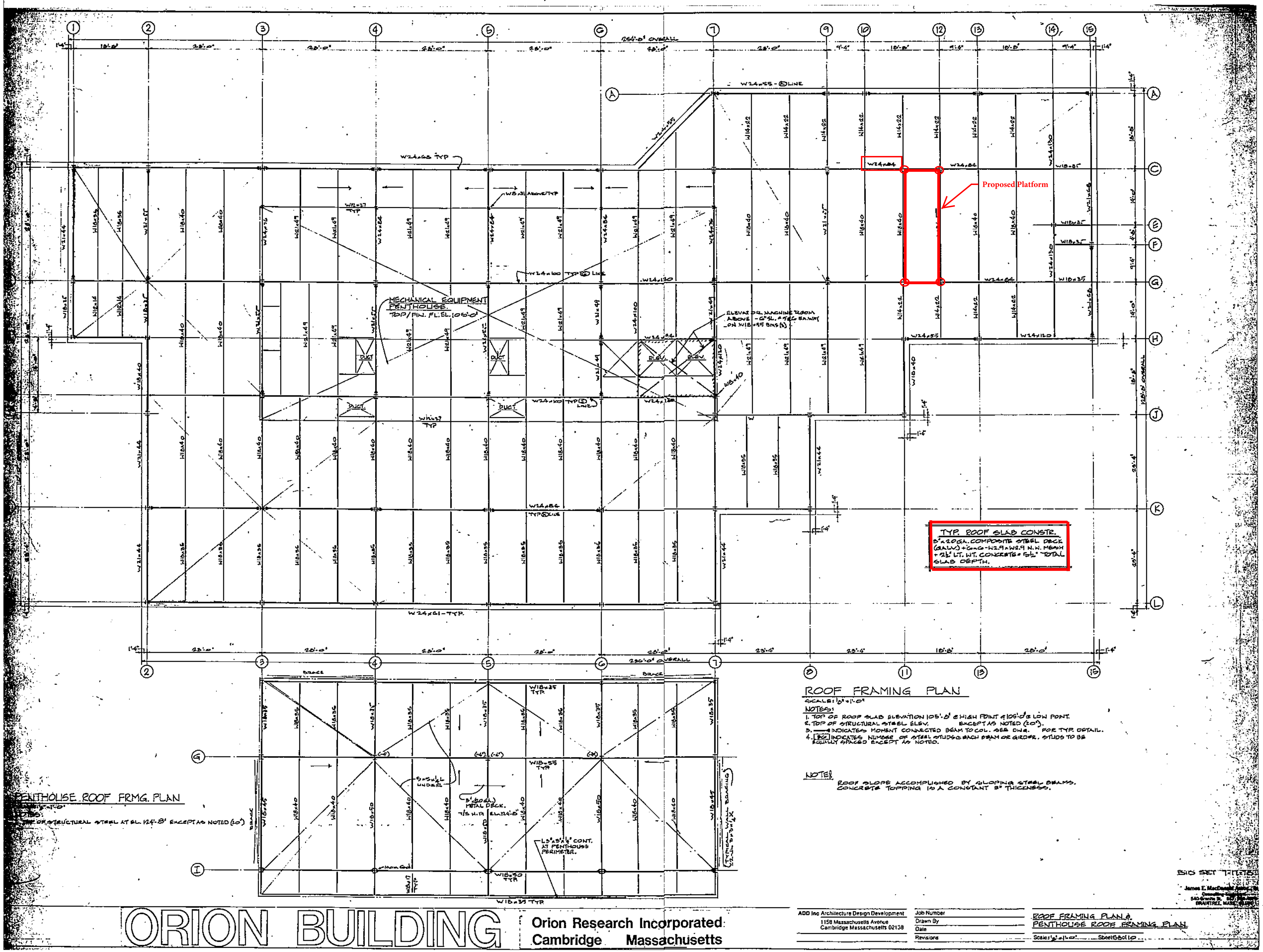

Proposed Platform
MECHANICAL EQUIPMENT PENTHOUSE.
TOP/FIN. FL. EL. 105'-0"
ELEVATOR MACHINE ROOM ABOVE
TYP. ROOF SLAB CONSTR.
3"x20GA. COMPOSITE STEEL DECK (GALV.) + 6x6-W2.9xW2.9 N.W. MESH + 2½" LT. WT. CONCRETE = 5½" TOTAL SLAB DEPTH.
ROOF FRAMING PLAN
NOTES:
1. TOP OF ROOF SLAB ELEVATION 105'-8" @ HIGH POINT & 105'-0" @ LOW POINT.
2. TOP OF STRUCTURAL STEEL ELEV. EXCEPT AS NOTED (20').
3. INDICATES MOMENT CONNECTED BEAM TO COL. SEE DWG. FOR TYP. DETAIL.
4. INDICATES NUMBER OF STEEL STUDS EACH BEAM OR GIRDER. STUDS TO BE EQUALLY SPACED EXCEPT AS NOTED.
NOTE:
ROOF SLOPE ACCOMPLISHED BY SLOPING STEEL BEAMS. CONCRETE TOPPING IS A CONSTANT 3" THICKNESS.
PENTHOUSE ROOF FRMG. PLAN
L5"x3"x¼" CONT. AT PENTHOUSE PERIMETER.
3" (20GA.) METAL DECK.
TYPICAL WALL BRACING
BID SET
ORION BUILDING
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1158 Massachusetts Avenue
Cambridge Massachusetts 02138
Job Number
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Revisions
ROOF FRAMING PLAN & PENTHOUSE ROOF FRAMING PLAN
James E. MacDonald
BRAINTREE, MASS.

EXHIBIT 8

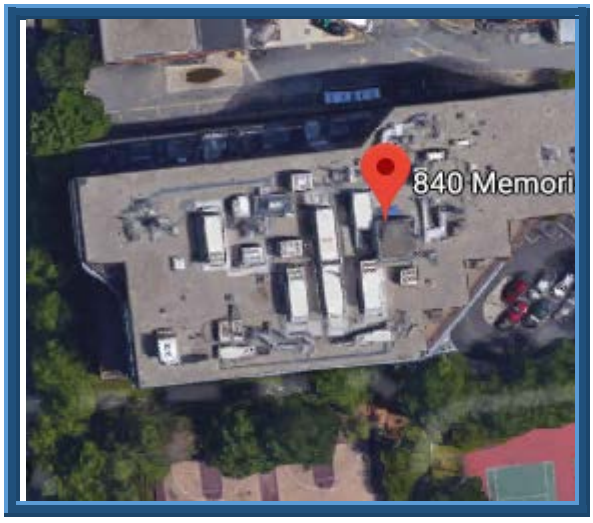
Radio Frequency Safety Survey Report Prediction (RFSSRP)

AT&T Wireless Rooftop Facility

Site ID: MA2881
Site Name: Cambridge Memorial Drive
Address: 840 Memorial Drive,
Cambridge, MA 02139
Latitude: 42.363086
Longitude: -71.115408
USID: 134433
FA: 10546807

Prepared for:
AT&T Mobility, LLC
550 Cochituate Road, Suite 13
Framingham, MA 01701

Centerline PN: 950010-060



Additional Site Information:

CDs:MA2881_Cambridge Putnam Ave_ZDs_REV1_01-24-18
RFDS:NEW-ENGLAND_BOSTON_MA2881_2019-New-Site_New_ra9161_2101A0727C_10546807_134433_05-11-2017_Preliminary-In-Progress_v2.00

Report Information:

Report Writer: Michelle Stone
Date: April 17, 2018

Report Reviewer: Ryan McManus

Statement of Compliance

AT&T will be compliant with FCC Regulations upon installation of recommended mitigation measures.

TABLE OF CONTENTS

1.0 GENERAL SUMMARY

Centerline Communications, LLC ("Centerline") has been contracted to provide a Radio Frequency (RF) Analysis for the following AT&T Mobility wireless rooftop facility to determine whether the facility is in compliance with federal standards and regulations regarding RF emissions. This analysis includes theoretical emissions calculations, for all equipment for AT&T Mobility and any other wireless carriers on site.

1.1 SITE SUMMARY

Analysis Site Data	
Site ID:	MA2881
Site USID:	134433
Site FA#:	10546807
Site Name:	Cambridge Memorial Drive
Site Address:	840 Memorial Drive, Cambridge MA 2139
Site Latitude:	42.363086 N
Site Longitude:	-71.115408 W
Facility Type:	Rooftop
Compliance Summary	
Compliance Status:	Compliant Upon Mitigation Installation
Maximum Modeled MPE% on Walking Surface AT&T (General Public Limit):	653.40 %
Maximum Modeled MPE% at Ground Level AT&T (General Public Limit):	2.00 %
Maximum Modeled MPE% on Walking Surface Composite (General Public Limit):	653.40 %
Maximum Modeled MPE% at Ground Level Composite (General Public Limit):	2.00 %
Site Survey Data	
Is Access Locked or Controlled? :	Uncontrolled*
Lock or Control Measures if Present:	N/A
Parapet Height:	Unknown

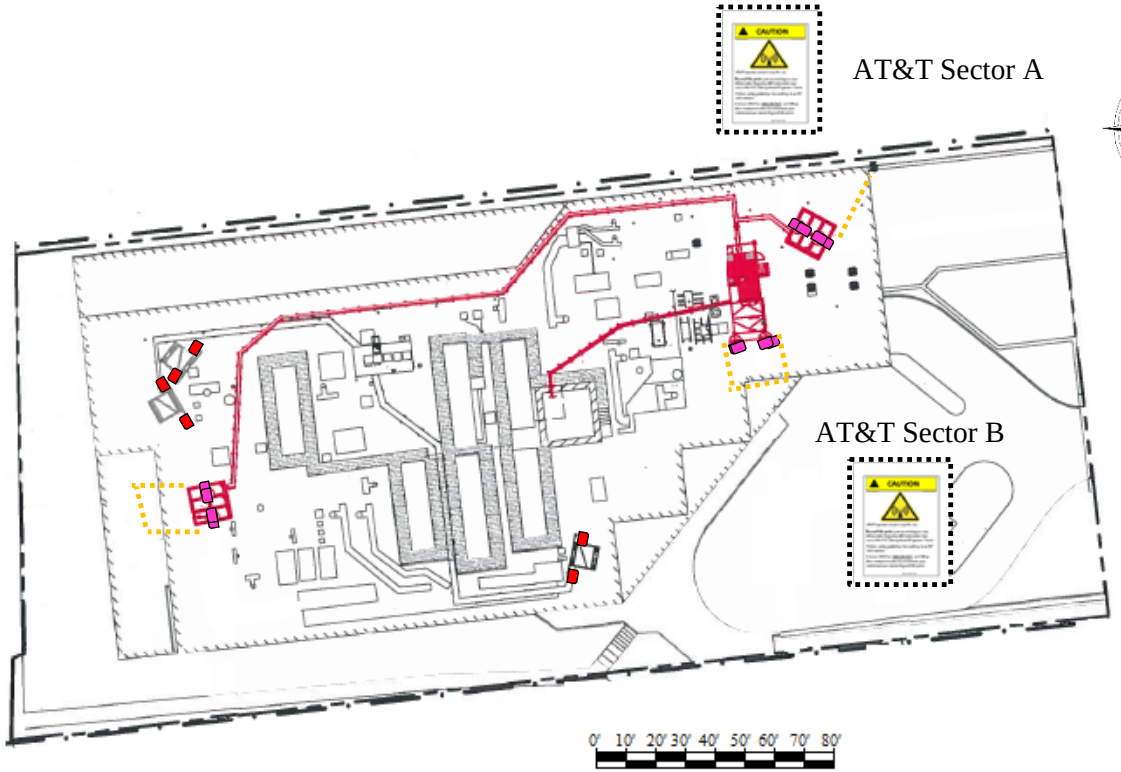
In addition to the AT&T antennas and radio equipment there are antennas and radio equipment for Sprint which have been included in this analysis as part of the overall site compliance determination.

*To be conservative, all rooftop sites are considered uncontrolled for modeling purposes.

Signage and barriers are the primary means of mitigating access to accessible areas of exposure. Below is a summary of existing and recommended signage at this AT&T facility.

Existing Signage and Barriers (AT&T Sectors)		
Location	**Signage**	**Barriers**
Sector A	None	None
Sector B	None	None
Sector C	None	None
Access Point (s)	None	None
Recommended Signage and Barriers (AT&T Sectors)		
Location	**Signage**	**Barriers**
Sector A	Yellow Caution 2 signs	Barrier Required
Sector B	Yellow Caution 2 signs	Barrier Required
Sector C	Yellow Caution 2 signs	Barrier Required
Access Point (s)	INFO 1 signs at each access point	N/A

2.0 SITE SCALE MAP



Operator Antenna Identifiers

- AT&T Antennas
- Sprint Antennas

INFO 1 Sign	Caution 1 Sign
INFO 2 Sign	Tower Caution Sign
Notice 1 Sign	Caution 2 Sign
Notice 2 Sign	Warning Sign

Existing Sign | Proposed/ Installed Sign | Existing Barrier | Proposed/ Installed Barrier

Signage/ Mitigation Plan

Cambridge Memorial Drive / 10546807

3.0 ANTENNA INVENTORY

ANT ID	Operator	Antenna Make	Antenna Model	Type	Freq (MHz)	# of TX	Azimuth (°)	BW (°)	Gain (dBd)	ERP (Watts)	Length (ft)	x	y	Antenna Z Value (ft)**	Ant Z Value Ground (ft)
ATT A1	AT&T	KMW	EPBQ-654L8H8-L2	Panel	LTE 2100	2	30	61	15.40	3708.35	8.0	149	117	5.0	83.0
ATT A2	AT&T	CCI	OPA65R-BU8B	Panel	LTE 2300	2	30	59	15.85	4113.21	8.0	150	115	5.0	83.0
ATT A3	AT&T	CCI	OPA65R-BU8B	Panel	LTE 850	2	30	66	13.65	2478.46	8.0	154	112	5.0	83.0
ATT A4	AT&T	CCI	OPA65R-BU8B	Panel	LTE 737	2	30	67	13.15	2208.93	8.0	155	110	5.0	83.0
ATT A4	AT&T	CCI	OPA65R-BU8B	Panel	LTE 1900	2	30	62	16.05	4307.06	8.0	155	110	5.0	83.0
ATT B1	AT&T	KMW	EPBQ-654L8H8-L2	Panel	LTE 2100	2	160	61	15.40	3708.35	8.0	143	78	5.0	83.0
ATT B2	AT&T	CCI	OPA65R-BU8B	Panel	LTE 2300	2	160	59	15.85	4113.21	8.0	141	78	5.0	83.0
ATT B3	AT&T	CCI	OPA65R-BU8B	Panel	LTE 850	2	160	66	13.65	2478.46	8.0	137	76	5.0	83.0
ATT B4	AT&T	CCI	OPA65R-BU8B	Panel	LTE 737	2	160	67	13.15	2208.93	8.0	135	76	5.0	83.0
ATT B4	AT&T	CCI	OPA65R-BU8B	Panel	LTE 1900	2	160	62	16.05	4307.06	8.0	135	76	5.0	83.0
ATT C1	AT&T	KMW	EPBQ-654L8H8-L2	Panel	LTE 2100	2	260	61	15.40	3708.35	8.0	18	17	5.0	83.0
ATT C2	AT&T	CCI	OPA65R-BU8B	Panel	LTE 2300	2	260	59	15.85	4113.21	8.0	17	19	5.0	83.0
ATT C3	AT&T	CCI	OPA65R-BU8B	Panel	LTE 850	2	260	66	13.65	2478.46	8.0	16	26	5.0	83.0
ATT C4	AT&T	CCI	OPA65R-BU8B	Panel	LTE 737	2	260	67	13.15	2208.93	8.0	15	28	5.0	83.0
ATT C4	AT&T	CCI	OPA65R-BU8B	Panel	LTE 1900	2	260	62	16.05	4307.06	8.0	15	28	5.0	83.0
SPT A1	Sprint	Unknown	Unknown	Panel	800	1	100	65	13.40	219.30	5.0	130	33	2.5	80.5
SPT A2	Sprint	Unknown	Unknown	Panel	1900	6	100	65	15.90	2339.81	5.0	127	20	2.5	80.5
SPT B1	Sprint	Unknown	Unknown	Panel	800	1	240	65	13.40	219.30	5.0	18	76	2.5	80.5
SPT B2	Sprint	Unknown	Unknown	Panel	1900	6	240	65	15.90	2339.81	5.0	10	87	2.5	80.5
SPT C1	Sprint	Unknown	Unknown	Panel	800	1	300	65	13.40	219.30	5.0	13	88	2.5	80.5
SPT C2	Sprint	Unknown	Unknown	Panel	1900	6	300	65	15.90	2339.81	5.0	22	98	2.5	80.5

*Table 1: Total Site data table **(Z Value is distance from bottom of antenna to walking surface)*

3.1 ROOFVIEW® EXPORT FILE

Ant Num	ID	Name	(MHz) Freq	Trans Power	Trans Count	Coax Len	Coax Type	Other Loss	Input Power	Calc Power	Mfg	Model	(ft) X	(ft) Y	(ft) Z	Type	(ft) Aper	dBd Gain	BWdth Pt Dir
1	ATT A1	LTE	2100.00000	60.0	2			0.5		107.0	KMW	EPBQ-654L8H	149.0	117.0	5.0		8.0	15.4	61;30
2	ATT A2	LTE	2300.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	150.0	115.0	5.0		8.0	15.85	59;30
3	ATT A3	LTE	850.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	154.0	112.0	5.0		8.0	13.65	66;30
4	ATT A4	LTE	737.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	155.0	110.0	5.0		8.0	13.15	67;30
5	ATT A4	LTE	1900.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	155.0	110.0	5.0		8.0	16.05	62;30
6	ATT B1	LTE	2100.00000	60.0	2			0.5		107.0	KMW	EPBQ-654L8H	143.0	78.0	5.0		8.0	15.4	61;160
7	ATT B2	LTE	2300.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	141.0	78.0	5.0		8.0	15.85	59;160
8	ATT B3	LTE	850.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	137.0	76.0	5.0		8.0	13.65	66;160
9	ATT B4	LTE	737.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	135.0	76.0	5.0		8.0	13.15	67;160
10	ATT B4	LTE	1900.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	135.0	76.0	5.0		8.0	16.05	62;160
11	ATT C1	LTE	2100.00000	60.0	2			0.5		107.0	KMW	EPBQ-654L8H	18.0	17.0	5.0		8.0	15.4	61;260
12	ATT C2	LTE	2300.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	17.0	19.0	5.0		8.0	15.85	59;260
13	ATT C3	LTE	850.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	16.0	26.0	5.0		8.0	13.65	66;260
14	ATT C4	LTE	737.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	15.0	28.0	5.0		8.0	13.15	67;260
15	ATT C4	LTE	1900.00000	60.0	2			0.5		107.0	CCI	OPA65R-BU8	15.0	28.0	5.0		8.0	16.05	62;260
16	SPT A1	Sprint	800.00000	20.0	1			3.0		10.0	Unknown	Unknown	130.0	33.0	2.5		5.0	13.4	65;100
17	SPT A2	Sprint	1900.00000	20.0	6			3.0		60.1	Unknown	Unknown	127.0	20.0	2.5		5.0	15.9	65;100
18	SPT B1	Sprint	800.00000	20.0	1			3.0		10.0	Unknown	Unknown	18.0	76.0	2.5		5.0	13.4	65;240
19	SPT B2	Sprint	1900.00000	20.0	6			3.0		60.1	Unknown	Unknown	10.0	87.0	2.5		5.0	15.9	65;240
20	SPT C1	Sprint	800.00000	20.0	1			3.0		10.0	Unknown	Unknown	13.0	88.0	2.5		5.0	13.4	65;300
21	SPT C2	Sprint	1900.00000	20.0	6			3.0		60.1	Unknown	Unknown	22.0	98.0	2.5		5.0	15.9	65;300

Table 2: Roofview® Export File

4.0 PREDICTED EMISSION LEVELS AND DISCUSSION

All calculations performed based upon the data listed for this facility have produced results that are above allowable limits for General Population and Occupational limits for exposure to RF emissions as specified by federal standards. AT&T can ensure compliance on this facility by following the signage and barrier recommendations presented in this report

The anticipated maximum power density value (% MPE) calculated in front of any of the AT&T sectors is **653.40 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**130.68 %** of the FCC's allowable Occupational limit). This was determined based upon worst-case theoretical modeling as described in this report for all walking surfaces in close proximity to the antenna arrays. The following is a summary for each AT&T Sector.

Sector A: There is an area that extends out **9 feet** from the antennas along the walking surface that exceeds the **FCC's General Population limit** for exposure to radio frequency emissions. There is an area that extends out **1 foot** from the antennas along the walking surface that exceeds the **FCC's Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for AT&T's Sector A antennas is **642.10 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**128.42 %** of the FCC's allowable Occupational limit). The Sector A antennas are transmitting over the main roof level.

Sector B: There is an area that extends out **10 feet** from the antennas along the walking surface that exceeds the **FCC's General Population limit** for exposure to radio frequency emissions. There is an area that extends out **1 foot** from the antennas along the walking surface that exceeds the **FCC's Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for AT&T's Sector B antennas is **643.70 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**128.74 %** of the FCC's allowable Occupational limit). The Sector B antennas are transmitting over the main roof level.

Sector C: There is an area that extends out **9 feet** from the antennas along the walking surface that exceeds the **FCC's General Population limit** for exposure to radio frequency emissions. There is an area that extends out **2 feet** from the antennas along the walking surface that exceeds the **FCC's Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for AT&T's Sector C antennas is **653.40 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**130.68%** of the FCC's allowable Occupational limit). The Sector C antennas are transmitting over the main roof level.

At the ground level the maximum power density value calculated from the AT&T radio equipment is **2.00 %** of the **FCC's General Population limit** for exposure to radio frequency emissions. At ground level the maximum composite power density for all system operators on this facility is **0.40 %** of the **FCC's Occupational limit** for exposure to radio frequency emissions.

The anticipated maximum composite power density value (% MPE) for all transmission sources on this facility is **653.40%** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**130.68 %** of the FCC's allowable Occupational limit). This composite value determines the overall compliance status for facility and will identify any potential hot spots that may exceed either limit

as specified in this report and will help identify any systems that may require mitigation solutions. The below table is a summary of emissions calculations for all other system operators.

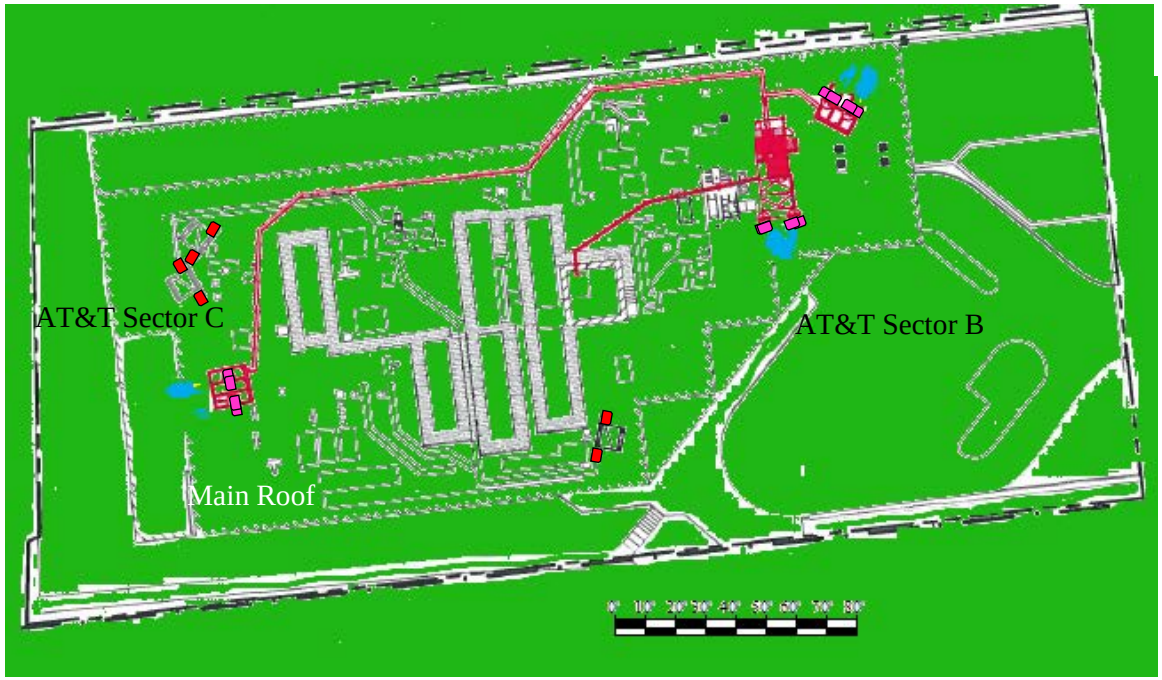
Other Carrier Emissions				
Carrier	**Distance GP (feet)**	**Distance Occupational (feet)**	**% GP**	**% Occupational**
Sprint A	4	2	665.9	133.18
Sprint B	5	1	665.9	133.18
Sprint C	5	1	665.9	133.18

The FCC mandates that if a site is found to be out of compliance with regard to emissions that any system operator contributing 5% or more to areas exceeding the FCC's allowable limits, as outlined in this report, will be responsible for bringing the site into compliance. Exhibit 1d shows a graphical representation of all areas where AT&T contributes 5% or more to the FCC general public limit on the site.

AT&T's RF Exposure: Responsibilities, Procedures & Guidelines document states that microwave dishes are compliant if they are mounted 20 feet or greater above any accessible walking or working surface. There are no microwaves identified on site.

Emissions threshold plots which graphically show power density values is shown following in **Exhibits 1a-1d.**

AT&T Sector A



Operator Antenna Identifiers

- AT&T Antennas
- Sprint Antennas

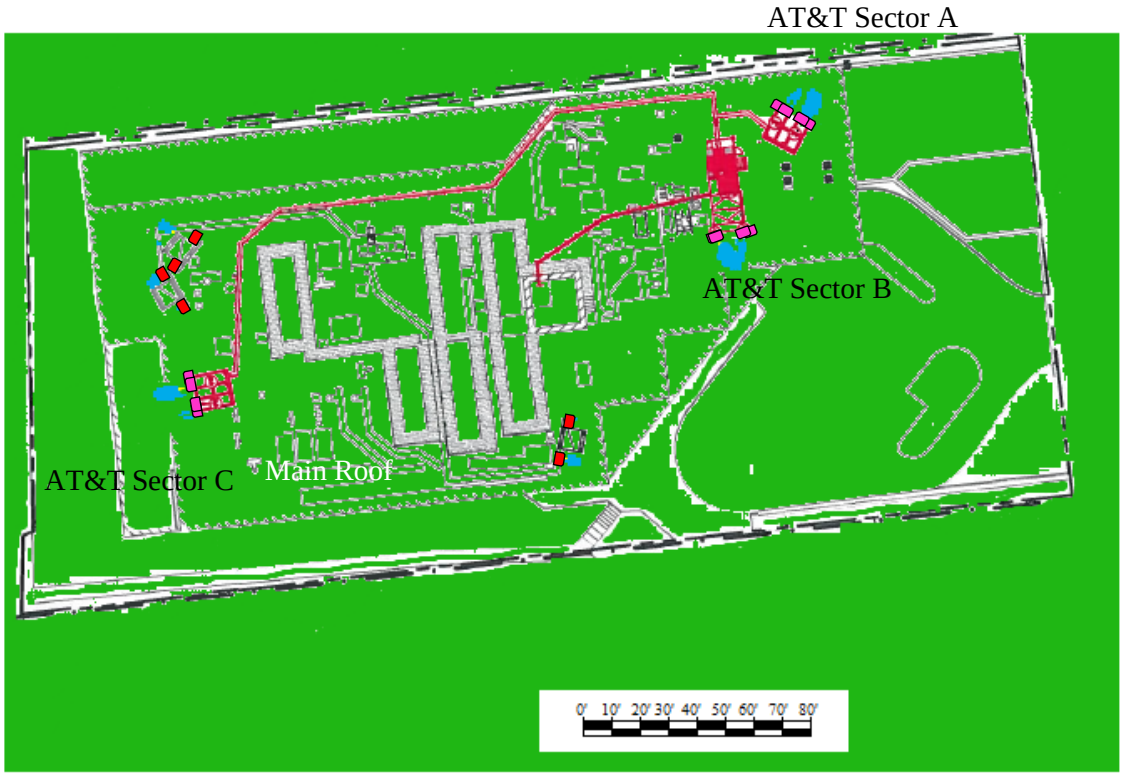
% FCC General Public MPE Limits

- Emissions Value Over 5,000% GP limit
- 500 % GP Limit < Emissions Value ≤ 5,000% GP Limit
- 100 % GP Limit < Emissions Value ≤ 500% GP Limit
- Emissions Value < 100% GP Limit

Exhibit 1a:

Emissions Thresholds for AT&T (Main Roof Level)

Cambridge Memorial Drive / 10546807



Operator Antenna Identifiers

- AT&T Antennas
- Sprint Antennas

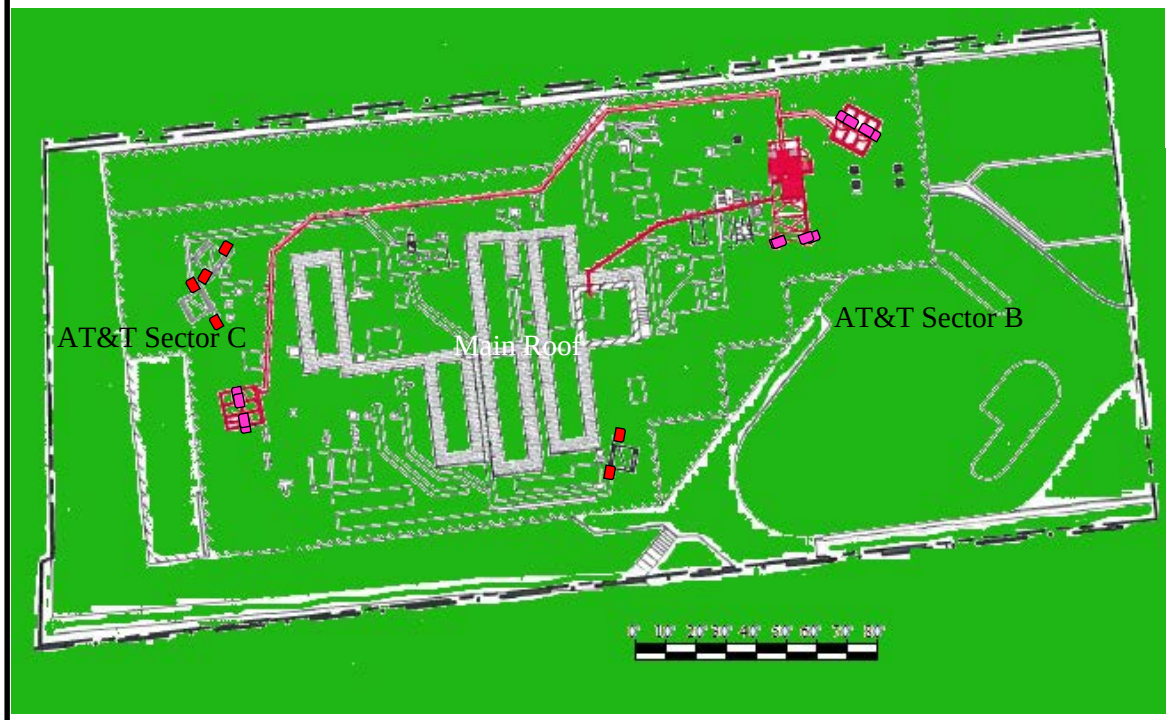
% FCC General Public MPE Limits

- Emissions Value Over 5,000% GP limit
- 500 % GP Limit < Emissions Value ≤ 5,000% GP Limit
- 100 % GP Limit < Emissions Value ≤ 500% GP Limit
- Emissions Value < 100% GP Limit

Exhibit 1b:

Emissions Thresholds All Sources (Roof Level)

Cambridge Memorial Drive / 10546807



Operator Antenna Identifiers

- AT&T Antennas
- Sprint Antennas

% FCC General Public MPE Limits

- Emissions Value Over 5,000% GP limit
- 500 % GP Limit < Emissions Value ≤ 5,000% GP Limit
- 100 % GP Limit < Emissions Value ≤ 500% GP Limit
- Emissions Value < 100% GP Limit

Exhibit 1c:

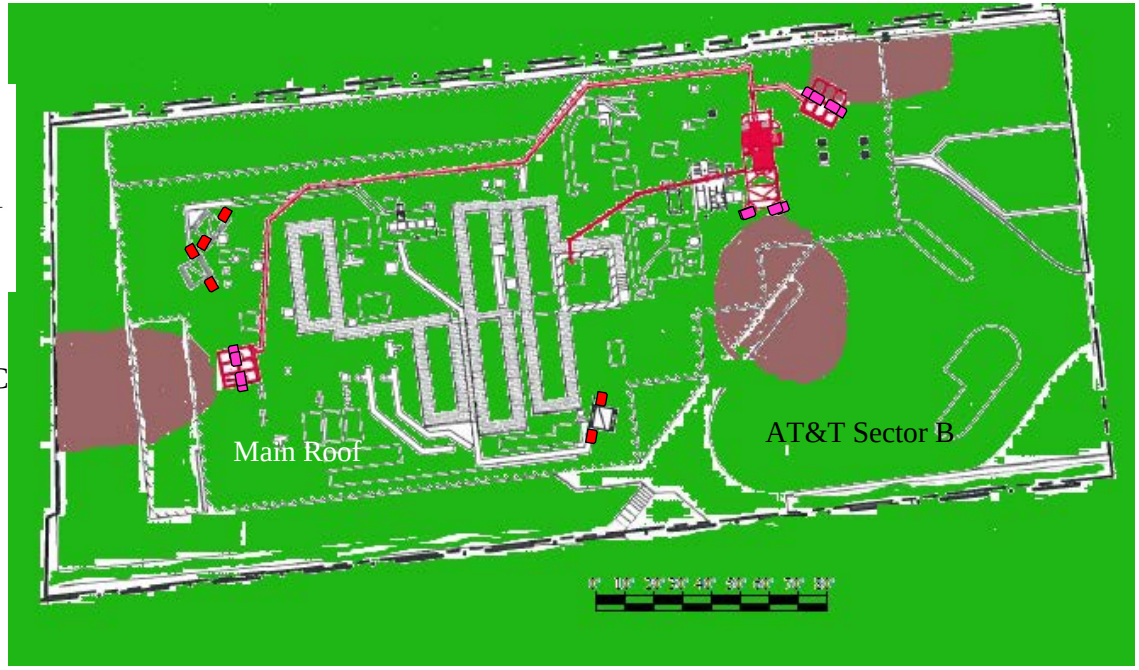
Emissions Thresholds All Sources (Ground)

Cambridge Memorial Drive / 10546807

Operator Antenna Identifiers

- AT&T Antennas
- Sprint Antennas

AT&T Sector A



% FCC General Public MPE Limits

- Emissions Value > 5% GP Limit
- Emissions Value ≤ 5% GP Limit

Exhibit 1d:

5% Emissions Thresholds From AT&T

Cambridge Memorial Drive/ 10546807

5.0 STATEMENT OF COMPLIANCE

Centerline conducted worst case modeling to determine whether the rooftop facility located at 840 Memorial Drive in Cambridge, Massachusetts is in compliance with FCC Regulations.

5.1 STATEMENT OF AT&T MOBILITY COMPLIANCE

Based on the information analyzed, AT&T will be compliant with FCC Regulations once the mitigation measures recommended in this report are implemented.

5.2 RECOMMENDATIONS

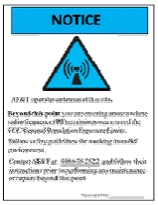
AT&T Mitigation Recommendations		
Location	**Signage**	**Barriers**
Sector A	Yellow Caution 2 signs	Barrier Required
Sector B	Yellow Caution 2 signs	Barrier Required
Sector C	Yellow Caution 2 signs	Barrier Required
Access Point (s)	INFO 1 signs at each access point	N/A

6.0 FALL ARREST AND PARAPET INFORMATION

As per AT&T barrier policy, rooftop edges that are protected with a 36-inch parapet wall or guardrail are safe for work activity within six (6) feet of the edge. OSHA has stated that an existing 36-inch guardrail or parapet provides sufficient protection for employees. The height of the top rail or equivalent component of guardrail systems in new construction shall be at least 42 inches above the walking or working surface. It should also be noted that the height of the parapet or guardrail may be reduced to no less than 30 inches at any point provided the sum of the depth (horizontal distance) of the top edge, and the height of the top edge (vertical distance from the work surface to the top edge of the top member, is at least 48 inches. If there is no reason for working atop the roof, then edge protection is not required. In addition, workers may use personnel lifts or temporary fall protection measures to perform work within 6 feet of the roof edge in place of permanent edge protection. Reference: 29 CFR 1910.28, 29 CFR 1910.23 (NPRM-1990); OSHA Letters of Interpretation 2/9/83 and 3/8/9

APPENDIX A: RF SIGNAGE

AT&T RF Signage

Sign	Description	Sign	Description
	**Information 1 Sign** Gives guidelines on how to proceed and who to contact regarding areas that may exceed either the FCC's General Population or Occupational emissions limits.		**Information 2 Sign** Gives specific information on how to proceed and who to contact regarding antennas that are façade mounted, concealed or on stand-alone structures.
	**Blue Notice 1 Sign** Used to alert individuals that they are entering an area that may exceed the FCC's General Population emissions limit. Must be positioned such that persons approaching from any angle have ample warning to avoid the marked areas.		**Blue Notice 2 Sign** Used to alert individuals that they are entering an area that may exceed either the FCC's General Population emissions limits. To be used on barriers or antenna sectors as a hybrid of the Information 1 and Blue Notice 1 signs.
	**Yellow Caution 1 Sign-Rooftop** Used to inform individuals that they are entering an area that may exceed the FCC's Occupational emissions limit. Must be positioned such that persons approaching from any angle have ample warning to avoid the marked areas.		**Yellow Caution 2 Sign-Rooftop** Used to alert individuals that they are entering an area that may exceed the FCC's Occupational emissions limit. To be used on barriers or antenna sectors as a hybrid of the Information 1 and Yellow Caution 1 signs.
	**Yellow Caution 1 Sign-Tower** Used to inform individuals that they are entering an area that may exceed the FCC's Occupational emissions limits. Must be placed at the base of the tower to warn tower climbers of potential for exposure.		**Red Warning Sign** Used to inform individuals that they are entering an area that may exceed the FCC's Occupational emissions limit by a factor of 10 or greater. Must be positioned such that persons approaching from any angle have ample warning to avoid the marked areas.

APPENDIX B: FCC GUIDELINES AND EMISSIONS THRESHOLD LIMITS

All power density values used in this report were analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ($\mu W/cm^2$). The number of $\mu W/cm^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General Population/Uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limit for the 700 and 800 MHz Bands is approximately 467 $\mu W/cm^2$ and 567 $\mu W/cm^2$ respectively, and the general population exposure limit for the 1900 MHz PCS and 2100 MHz AWS bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

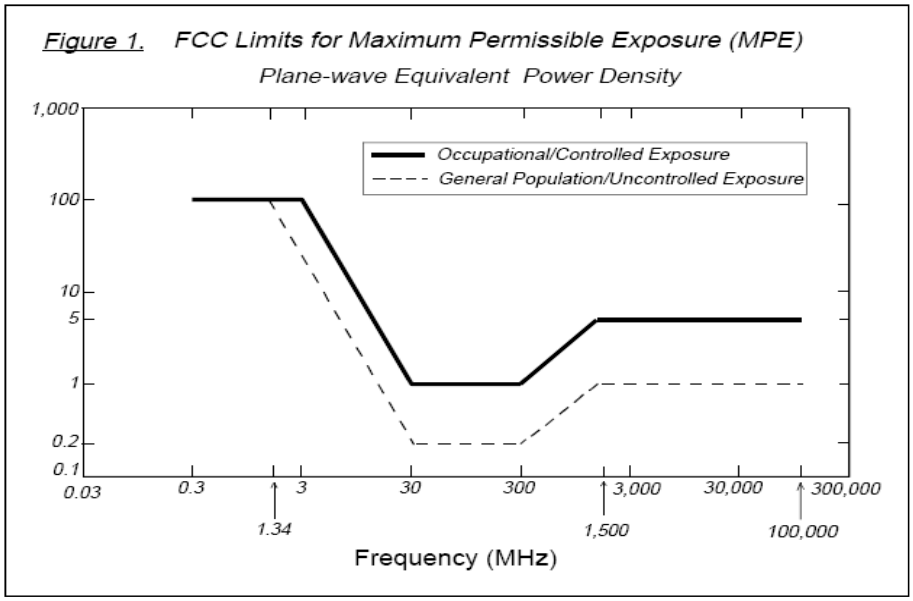
Occupational/Controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure, have been properly trained in RF safety and can exercise control over their exposure. Occupational/Controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure, have been trained in RF safety and can exercise control over his or her exposure by leaving the area or by some other appropriate means. The Occupational/Controlled exposure limits all utilized frequency bands is five (5) times the FCC's General Public / Uncontrolled exposure limit.

Additional details can be found in FCC OET 65.

Table 1: Limits for Maximum Permissible Exposure (MPE)				
(A) Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	**Electric Field Strength (E) (V/m)**	**Magnetic Field Strength (H) (A/m)**	**Power Density (S) (mW/cm^2)**	**Averaging Time $[E]^2$, $[H]^2$, or S (minutes)**
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-I,500	--	--	f/300	6
1,500-100,000	--	--	5	6
(B) Limits for General Public/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (E) (V/m)**	**Magnetic Field Strength (H) (A/m)**	**Power Density (S) (mW/cm^2)**	**Averaging Time $[E]^2$, $[H]^2$, or S (minutes)**
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-I,500	--	--	f/1,500	30
1,500-100,000	--	--	1.0	30

f = Frequency in (MHz)

* Plane-wave equivalent power density



APPENDIX C: CALCULATION METHODOLOGY

Centerline has performed theoretical calculations on all transmission equipment located on this facility. All calculations have been performed using the RoofView® software from Richard Tell Associates. This software performs calculations using a cylindrical model for very conservative power density predictions within the near-field of the antenna where the antenna pattern has not truly formed yet. Within this area power density values tend to decrease based upon an inverse distance function. At the point where it is appropriate for modeling to change from near-field calculations to far-field calculations the power decreases inversely with the square of the distance. This modeling technique is very accurate with very low antenna centerlines, such as rooftops, where persons can get very close to the antennas and pass through fields in close proximity.

The below calculation in Figure 1 shows the theoretical distribution of power over an imaginary cylinder with equal power distribution in all directions.

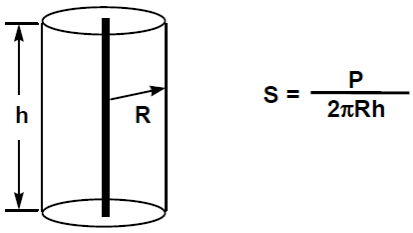


Figure 1: Distribution of power over an imaginary cylinder in all directions

This model can be modified for directional antennas to show directionality of power distribution. This formula will tend to be conservative as it assumes that all power is focused between the 3 dB power roll off points as shown in Figure 2.

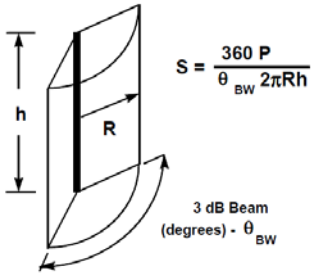


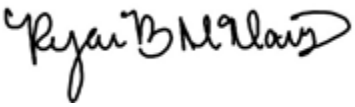
Figure 2: Distribution of power over an imaginary cylinder between the half power (3dB) roll off points (HBW) for directional antennas

APPENDIX D: CERTIFICATIONS

I, Michelle Stone, preparer of this report certify that I am fully trained and aware of the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation. I have been trained in the procedures and requirements outlined in AT&T's RF Exposure: Responsibilities, Procedures & Guidelines document.

_____ 4/17/2018

I, Ryan McManus, reviewer and approver of this report certify that I am fully trained and aware of the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation. I have been trained in the procedures and requirements outlined in AT&T's RF Exposure: Responsibilities, Procedures & Guidelines document.



_____ 4/17/2018

APPENDIX E: PROPRIETARY STATEMENT

This report was prepared for the use of AT&T Mobility, LLC to meet requirements specified in AT&T's corporate RF safety guidelines. It was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same locale under like circumstances. The conclusions provided by Centerline Communications, LLC are based solely on the information provided by AT&T Mobility and all observations in this report are valid on the date of the investigation. Any additional information that becomes available concerning the site should be provided to Centerline Communications, LLC so that our conclusions may be revised and modified, if necessary. This report has been prepared in accordance with Standard Conditions for Engagement and authorized proposal, both of which are integral parts of this report. No other warranty, expressed or implied, is made.

EXHIBIT 9

QUITCLAIM DEED

RIVERTECH ASSOCIATES LLC a Massachusetts limited liability company with a principal address at 840 Memorial Drive, Cambridge, Massachusetts, owner in fee simple (the "Grantor"); for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, grants, with QUITCLAIM COVENANTS to: **RIVERTECH ASSOCIATES II, LLC,** a Massachusetts limited liability company created pursuant to G.L. c. 156C, (the "Grantee"); the land and buildings thereon known as 840 Memorial Drive (a/k/a 18 Blackstone Street) situated in Cambridge, Middlesex County, Massachusetts, more particularly described as follows:

WESTERLY by the Easterly line of Memorial Drive (formerly Charles River Road) twenty six and 21/100 feet;

NORTHERLY by the Southerly line of said Road, three and 96/100 feet;

WESTERLY by the Easterly line of said Road, one hundred twenty six and 59/100 feet;

NORTHERLY by the Southerly line of Albro Street, three hundred thirty two and 31/100 feet;

EASTERLY by the Westerly line of Blackstone Street, one hundred and fifty three feet; and

SOUTHERLY by lot 2 as shown on plan hereinafter mentioned, three hundred fifty one and 45/100 feet.

Said parcel is shown as Lot 1 on the plan filed as Plan No. 8817C, with Certificate 154579 in Book 903, Page 29 of the Middlesex South Registry District of the Land Court.

Containing an area of 52,062 square feet.

The above described land is subject to and has the benefit of the provisions of an indenture dated September 20, 1922, recorded in Book 4564, Page 561, affected by Releases, filed as Document Nos. 598776 and 598777.

Also conveyed subject to all encumbrances of record as of the date hereof.

WITNESS our hands and seals as of this 9th day of January 2004.

RIVERTECH ASSOCIATES LLC

By: _____
Robert Epstein, Manager

By: _____
David Epstein, Manager

By: _____
John R. Svenson, Manager

THE CONSIDERATION ~~BEING LESS THAN~~ $100.00, NO DEED STAMPS REQUIRED

COMMONWEALTH OF MASSACHUSETTS

Suffolk, ss. January 13 2004

Then personally appeared before me the above named Robert Epstein, and acknowledged the foregoing to be his free act and deed.

_____
Notary Public
My Commission Expires:

JANA E. MURPHY
Notary Public
My Commission Expires
November [illegible]

#468884

COMMONWEALTH OF MASSACHUSETTS

Suffolk, ss. January 13, 2004

Then personally appeared before me the above named John R. Svenson, and acknowledged the foregoing to be his free act and deed.

Notary Public
My Commission Expires:

COMMONWEALTH OF MASSACHUSETTS

Suffolk, ss. January 13, 2004

Then personally appeared before me the above named David Epstein, and acknowledged the foregoing to be his free act and deed.

Notary Public
My Commission Expires:

DOCUMENT 1306085

SO. MIDDLESEX LAND COURT
REGISTRY DISTRICT
RECEIVED FOR REGISTRATION

ON 01/14/04 AT 01:53:30 205.00 CAD

NOTED ON:
CERT 0207166 BK 1166 PG 16

NEW CERTIFICATE(S) CREATED:
CERT 0229899 BK 1279 PG 149

1 PHOTOSTAT

Hinckley, Allen & Snyder LLP
28 State St
Boston, MA
02109.

Jo-Ann Allen
NAME

TEL

STREET ADDRESS

CITY OR TOWN

ZIP

617-722-9247 or
1-800-225-1546 (ext 247)

EXHIBIT 10

Noise Control
Engineering, LLC

799 MIDDLESEX TNPK.
BILLERICA MA 01821-3445
PHONE: 978-670-5339
FAX: 978-667-7047
E-mail: nonoise@noise-control.com

NOISE STUDY

TO:	**Oscar Suarez**
COMPANY	Dewberry Engineers, Inc.
FROM:	Ben Bonnice {B.Bonnice@noise-control.com}
DATE:	May 24, 2018
SUBJECT:	Cell Site MA2881: 840 Memorial Dr, Cambridge, MA

INTRODUCTION

Noise Control Engineering, LLC (NCE) has been retained by Dewberry Engineers, Inc. to perform a site evaluation for a proposed telecommunications site. The proposed equipment is to be located on the rooftop of an existing building at 840 Memorial Dr, Cambridge, MA. After evaluating the proposed equipment, the Mavair ECUA12 Slimpac AC unit located on the side of the 'Walk in Cabinet' and the Polar Power 8220-603-NG-15 Stand by Generator were found to be the only noise generating equipment.

NOISE LIMIT

The "Zoning Bylaws" for the City of Cambridge, Section 8.16, reference [1] states the maximum allowable noise levels for various zoning districts. The property abuts Memorial drive, a park, commercial and residential buildings. To be conservative, NCE has selected the most restrictive City of Cambridge noise limit - that being the one for residential areas for "other times" (night). The maximum overall allowable noise level is 50 dB(A) which allows the units to operate 24 hours per day. In addition to the overall dB(A) limit, an octave band criterion is also given, however, sufficient source level information is not available to assess these limits.

NOISE EVALUATION RESULTS

Noise data for the HVAC unit was not available from the manufacture. NCE evaluated provided noise data of similar sized units from the manufacturer, reference [2], and established a source level based on that. The Stand by Generator will be a Polar Power model 8220-603-NG-15, 15 kW enclosed unit placed next to the proposed AT&T equipment shelter. NCE used measured noise data from the manufacturer of the Generator Set, reference [3]. The Sound Pressure Levels (SPL) was measured at a distance of 5 feet for the HVAC unit and 23 feet for the Stand by Generator as given in Table 1. The generator levels were corrected to 5 ft and combined with the HVAC system to produce a source level for the site, see Table 1.

TABLE 1: Source Sound Pressure Levels (SPL) at noted distance in dB(A).

Direction	North	South	East	West
Marvair ECUA12 Slimpac @ 5 feet	65	65	65	65
Polar DC Generator @ 23 feet	59	59	59	59
Combined Source Level @ 5 feet	**73**	**73**	**73**	**73**

To calculate the noise levels at the base of the building, NCE used the combined Table 1 source sound pressure levels with further attenuation for spherical spreading. NCE determined distances between the equipment and property lines at four locations in the four cardinal directions using the Zoning drawing, reference [3], sheet Z-1. The four locations are shown in Figure 1. Due to the building height and roof location of the HVAC unit and generator, some noise attenuation will be provided by shielding of the subject building to the base of building locations. NCE conservatively used a minimum attenuation factor of 5 dB for the barrier. Table 2 contains the calculations of the projected noise levels from both sources at the property line for each direction.

TABLE 2: Calculated HVAC SPL at the Base of the Building, dB(A)

Direction	**North**	**South**	**East**	**West**
Sound Pressure Level @ 5 ft	73	73	73	73
Horizontal Distance to Base of Building, feet	25	120	74	229
Vertical Distance to Base of Building, feet	84	84	84	84
Total Distance Roof to Property Line, feet	88	146	112	244
Minimum Roof Barrier Attenuation, dB	5	5	5	5
Calculated SPL @ Property Line, dB(A)	**43**	**39**	**41**	**34**
Cambridge Limit at Base of Building	50	50	50	50
Excess to Limit	-	-	-	-

CONCLUSION

The proposed mechanical equipment to be installed on the rooftop at 840 Memorial Dr in Cambridge, MA will comply with the overall dB(A) requirements of the Zoning Bylaws of the City of Cambridge. Insufficient source noise information is available to assess compliance with the octave band limits, however, as the conservative evaluation of the overall level is 34 to 43 dB below the overall limit of 50 dB(A), NCE expects the octave band limits will be met as well.

REFERENCES

1. City of Cambridge Municipal Code, Title 8 Health and Safety, Chapter 8.16 Noise Control. Dated 1991.
2. Marvair Compac I & Compac II 2 to 6 Ton Vertical Wall Mount Air Conditioners Specification.
3. Polar Power 8220-603 Series Back Up DC Generator Sets.
4. AT&T Mobility Drawing (prepared by Dewberry Engineers Inc.), Putnam Avenue, Site MA2881, 840 Memorial Dr, Cambridge, MA 02139, Rev 1, dated 01/23/18.

FIGURE 1: Property Line Noise Evaluation Locations.

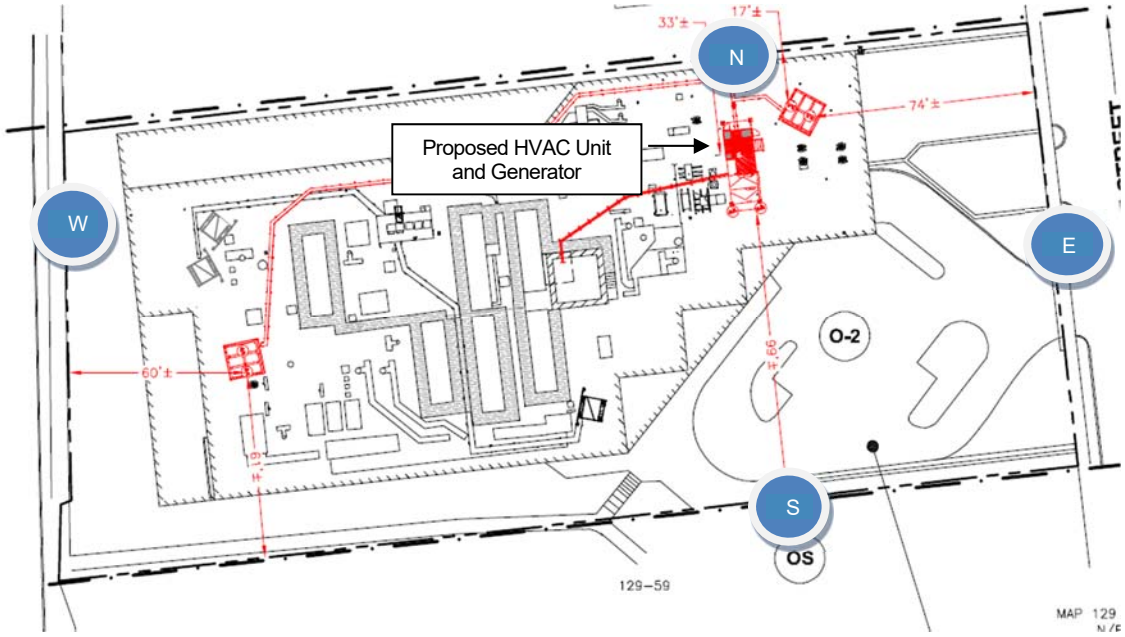


EXHIBIT 11

MARTHA COAKLEY
ATTORNEY GENERAL

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CENTRAL MASSACHUSETTS DIVISION
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June 12, 2013

Gail Garrett, Town Clerk
Town of Mount Washington
118 East Street
Mount Washington, MA 01258

RE: Mount Washington Special Town Meeting of April 1, 2013 - Case # 6642
Warrant Articles # 1, 2, and 3 (Zoning)

Dear Ms. Garrett:

Articles 1, 2, and 3 - We approve the amendments to the Town by-laws adopted under Articles 1, 2, and 3 on the warrant for the Mount Washington Special Town Meeting that convened on April 1, 2013, and the map pertaining to Article 3. Our comments on Articles 1 and 2 are provided below.

Article 1 - The amendments adopted under Article 1 add a new Section 215-27 to the zoning by-laws entitled "Wireless Telecommunication Facility Zoning Bylaw." We approve the new Section 215-27, but offer the following comments.

I. Applicable Law

The federal Telecommunications Act of 1996, 47 U.S.C. § 332 (7) preserves state and municipal zoning authority to regulate personal wireless service facilities, subject to the following limitations:

1. Zoning regulations "shall not unreasonably discriminate among providers of functionally equivalent services." 47 U.S.C. §332(7) (B) (i) (I)

2. Zoning regulations "shall not prohibit or have the effect of prohibiting the provisions of personal wireless services." 47 U.S.C. § 332 (7) (B) (i) (II).

3. The Zoning Authority "shall act on any request for authorization to place, construct, or modify personal wireless service facilities within a reasonable period of time." 47 U.S.C.

§ 332 (7) (B) (ii).

4. Any decision "to deny a request to place, construct, or modify personal wireless service facilities shall be in writing and supported by substantial evidence contained in a written record." 47 U.S.C. § 332 (7) (B) (iii).

5. "No state or local government or instrumentality thereof may regulate the placement, construction and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the [Federal Communications] Commission's regulations concerning emissions." 47 U.S.C. § 332(7) (B) (iv).

Federal courts have construed the limitations listed under 47 U.S.C. § 332(7) as follows. First, even a facially neutral by-law may have the effect of prohibiting the provision of wireless coverage if its application suggests that no service provider is likely to obtain approval. "If the criteria or their administration effectively preclude towers no matter what the carrier does, they may amount to a ban 'in effect'...." Town of Amherst, N.H. v. Omnipoint Communications Enters, Inc., 173 F.3d 9, 14 (1st Cir. 1999).

Second, local zoning decisions and by-laws that prevent the closing of significant gaps in wireless coverage have been found to effectively prohibit the provision of personal wireless services in violation of 47 U.S.C. § 332(7). See, e.g., Nat'l Tower, LLC v. Plainville Zoning Bd. of Appeals, 297 F.3d 14, 20 (1st Cir. 2002) ("local zoning decisions and ordinances that prevent the closing of significant gaps in the availability of wireless services violate the statute"); Omnipoint Communications MB Operations, LLC v. Town of Lincoln, 107 F. Supp. 2d 108, 117 (D. Mass. 2000) (by-law resulting in significant gaps in coverage within town had effect of prohibiting wireless services).

Third, whether the denial of a permit has the effect of prohibiting the provision of personal wireless services depends in part upon the availability of reasonable alternatives. See 360 Degrees Communications Co. v. Bd. of Supervisors, 211 F.3d 79, 85 (4th Cir. 2000). Zoning regulations must allow cellular towers to exist somewhere. Towns may not effectively ban towers throughout the municipality, even under the application of objective criteria. See Virginia Metronet, Inc. v. Bd. of Supervisors, 984 F. Supp. 966, 971 (E.D. Va. 1998).

State law also establishes certain limitations on a municipality's authority to regulate wireless communications facilities and service providers. Under General Laws Chapter 40A, Section 3, wireless service providers may apply to the Department of Telecommunications and Cable for an exemption from local zoning requirements. If a telecommunication provider does not apply for or is not granted an exemption under c. 40A, § 3, it remains subject to local zoning requirements pertaining to cellular towers. See Building Comm'r of Franklin v. Dispatch Communications of New England, Inc., 48 Mass. App. Ct. 709, 722 (2000). Also, G.L. c. 40J, § 6B, charges the Massachusetts Broadband Institute with the task of promoting broadband access throughout the state. Municipal regulation of broadband service providers must not frustrate the achievement of this statewide policy.

In addition, Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012

requires that "[A] state or local government *may not deny, and shall approve*, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station." (emphasis added). The Act defines "eligible facilities request" as any request for modification of an existing wireless tower or base station that involves: 1) collocation of new transmission equipment; 2) removal of transmission equipment; or 3) replacement of transmission equipment. The Act applies "[n]otwithstanding section 704 of the Telecommunications Act of 1996." The Act's requirement that a local government "may not deny, and shall approve, any eligible facilities request" means that a request for modification to an existing facility that does not substantially change the physical dimensions of the tower or base station must be approved. Such qualifying requests also cannot be subject to a discretionary special permit.

We approve the new Section 215-27. However, the Town must apply the by-law in a manner consistent with the applicable law outlined above. In particular, Section IV of the new by-law requires that Wireless Telecommunication Facilities are only allowed by special permit in the Wireless Telecommunication Overlay District. This requirement cannot be applied to eligible facilities requests for modification to existing facilities which qualify for required approval under Section 6409 of the Act, as described above. We urge the Town to consult closely with Town Counsel regarding the appropriate response to applications for collocation in light of these recent amendments.

II. Analysis of Mount Washington's Wireless Telecommunication Facility By-Law

A. Section VIII "Criteria For Approval and Conditions".

This section provides as follows:

> 5. The applicant will remove the Facility, should the Facility be abandoned or cease to operate. The Planning Board may require the applicant to provide a bond, or other form of financial guarantee acceptable to the Planning Board to cover the cost of removal of the Facility, should the Facility be abandoned or cease to operate, and ensure other compliance hereunder.

The Town must apply any bond or other financial guarantee proceeds in a manner consistent with state law. Bond proceeds do not become Town funds unless and until the applicant defaults on the obligation under the proposed by-law. Moreover, if the Town must use the bond to pay for removal of a wireless communication facility or the repair and/or restoration of the premises, an appropriation is required before expenditure is made to do the work. General Laws Chapter 44, Section 53, provides that "[a]ll moneys received by a city, town or district officer or department, except as otherwise provided by special acts and except fees provided for by statute, shall be paid by such officers or department upon their receipt into the city, town or district treasury." Under Section 53 all moneys received by the Town become a part of the general fund, unless the Legislature has expressly made other provisions that are applicable to such receipt. In the absence of any general or special law to the contrary, performance security funds of the sort contemplated here must be deposited with the Town Treasurer and made part of the Town's general fund, pursuant to G.L. c. 44, § 53. The Town must then appropriate the money for the specific purpose of completing the work required for removal and/or restoration.

B. Section X "Permit Revocation For Non-Performance".

Section X authorizes the Planning Board to revoke a special permit for failure to comply with certain conditions. We approve Section X. However, before the Planning Board revokes a permit for failure to comply with certain conditions provided in Section X, the Planning Board should discuss with Town Counsel what due process, including notice and hearing requirements, are required. We suggest that the Town discuss this issue in more detail with Town Counsel.

Finally, the word "ordinance" is used in the by-law. Towns enact "by-laws" and cities enact "ordinances." The Town may wish delete the word "ordinance" from the new Section 215-27 and insert the word "by-law" at a future Town Meeting.

Article 2 - The amendments adopted under Article 2 add a new Section 215-28, "Solar Photovoltaic Installation Moratorium Bylaw," to the Town's zoning by-laws. The temporary moratorium (through one year from the date of enactment of Section 215-28) on solar photovoltaic installation other than those mounted on an existing structure provides as follows:

> Whereas, the Town of Mount Washington is undertaking a comprehensive study with respect to regulating the use of land for Solar Photovoltaic Installations, and
>
> Whereas, there have been significant changes in law regarding Solar Photovoltaic Installations; and,
>
> Whereas, the Town wishes to act carefully in a field with evolving law and technology, to investigate ways to preserve the character of the community while serving the needs of its people, and to devise an orderly process for granting permits by drafting an amendment to the Bylaw which is comprehensive, practical, equitable, and addresses the concerns of the Town on number, size, appearance, site standards, and location of Solar Photovoltaic Installations; and,
>
> Whereas, it is desired to protect the Town from ill-advised and inappropriate development of Solar Photovoltaic Installations pending a thorough review and the formulation of such a zoning amendment; and,
>
> Whereas, the Planning Board has determined that one year is necessary for such a comprehensive review and development of a Bylaw Subsection on Solar Photovoltaic Installations.
>
> Now, therefore, no Solar Photovoltaic Installations other than those mounted on an existing structure, in the usual manner, shall be permitted for one year from the date of enactment of this Bylaw.

We approve the temporary moratorium adopted under Article 2 because the Town has the authority to "impose reasonable time limitations on development, at least where those restrictions are temporary and adopted to provide controlled development while the municipality engages in comprehensive planning studies." Sturges v. Chilmark, 380 Mass. 246, 252-253 (1980). Such a temporary moratorium is within the Town's zoning power where there is a stated need for "study, reflection and decision on a subject matter of [some] complexity..." W.R.

Grace v. Cambridge City Council, 56 Mass. App. Ct. 559, 569 (2002) (City's temporary moratorium on building permits in two districts was within city's authority to zone for public purposes.) The time limit Mount Washington has selected for its temporary moratorium (one year from the date of enactment of the by-law) appears to be reasonable in the circumstances. The moratorium is limited in time period and scope (to the use of land and structures for solar photovoltaic installations), and thus does not present the problem of a rate-of-development bylaw of unlimited duration which the Zuckerman court determined was unconstitutional. Zuckerman v. Hadley, 442 Mass. 511, 512 (2004) ("[A]bsent exceptional circumstances not present here, restrictions of unlimited duration on a municipality's rate of development are in derogation of the general welfare and thus are unconstitutional.")

While we approve the temporary one year moratorium on solar photovoltaic installations, we note that G.L. c. 40A, § 3, protects solar energy systems and the building of structures that facilitate the collection of solar energy from certain local zoning requirements. General Laws Chapter 40A, Section 3, provides in pertinent part as follows:

> No zoning ordinance or by-law shall prohibit or unreasonably regulate the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare.

General Laws Chapter 40A, Section 3, prohibits towns from adopting zoning by-laws that prohibit or *unreasonably regulate* the installation of solar energy systems or the building of structures that facilitate the collection of solar energy, except where necessary to protect the public health, safety or welfare. A temporary moratorium longer than one year may be vulnerable to a challenge in court that it is an unreasonable regulation of solar energy systems under G.L. c. 40A, § 3. We suggest the Town consult closely with Town Counsel on this issue.

Note: Pursuant to G.L. c. 40, § 32, neither general nor zoning by-laws take effect unless the Town has first satisfied the posting/publishing requirements of that statute. Once this statutory duty is fulfilled, (1) general by-laws and amendments take effect on the date these posting and publishing requirements are satisfied unless a later effective date is prescribed in the by-law, and (2) zoning by-laws and amendments are deemed to have taken effect from the date they were approved by the Town Meeting, unless a later effective date is prescribed in the by-law.

Very truly yours,
MARTHA COAKLEY
ATTORNEY GENERAL
Kelli E. Gunagan
By: Kelli E. Gunagan
Assistant Attorney General
Municipal Law Unit
10 Mechanic Street, Suite 301
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(508) 792-7600

cc: Town Counsel Joel Bard (via electronic mail)

MAURA HEALEY
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February 23, 2015

Debra A. Bourbeau, Town Clerk
Town of Montague
1 Avenue A
Montague, MA 01376

RE: Montague Special Town Meeting of October 29, 2014 - Case # 7451
Warrant Article # 17 (Zoning)

Dear Ms. Bourbeau:

Article 17 - We approve Article 17 from the October 29, 2014 Montague Special Town Meeting. Article 17 amends several portions of the Town's zoning by-laws pertaining to site plan review.

1. Section 5.2 (d), Permitted Uses and Special Permits - Procedures

Section 5.2 (d) was deleted in its entirety and replaced with new text that provides as follows (with emphasis added):

> All applications for Special Permits and Site Plan Review from the Board of Appeals or the Planning Board shall be subject to the procedural requirements established by the respective Board. The Board of Appeals or Planning Board may determine that the assistance of outside professional expertise is required due to the size, scale, or complexity of a given project or its potential impact on the health, safety, and welfare of the Town. When outside review is determined to be necessary, the Board may require the applicant pay all reasonable expenses for this purpose, in accordance with the Board's regulations and M.G.L. Chapter 44 Section 53G.

General Laws Chapter 44, Section 53G, authorizes zoning boards, planning boards, boards of health, and conservation commissions, acting under authority conferred by G.L. c. 40A, § 9 and 12, c. 41, § 81Q, c. 40B, § 21, c. 111; and c. 40, § 8C, to impose consultant review fees, to disburse the funds collected, and to return unused portions to the applicant. However, the Legislature did not include Boards acting under the authority conferred solely by a local law within the small class of local boards that enjoy the benefits of G.L. c. 44, § 53G. When the Board is reviewing a site plan application based solely on the authority granted under local law, it cannot avail itself of the provisions of G.L. c. 44, § 53G. We suggest that the Town discuss this issue in more detail with Town Counsel.

2. Section 7.5.2, Telecommunication Facilities - General Provisions

Section 7.5.2, was deleted in its entirety and replaced with new text that provides as follows:

> Telecommunication Facilities may be allowed by Special Permit from the Board of Appeals pursuant to Sections 5.2 and Section 7.5. Conditions shall maximize the shared use of any new or existing structures to minimize the required number of such facilities; and shall minimize[e] adverse visual impacts through careful design, siting, and screening. No facility shall be located in a (RS) Residential District. (see: Section 2, Definitions).

Section 7.5.2 must be applied in a manner consistent with Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012, which requires that "[A] state or local government *may not deny, and shall approve*, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station." (emphasis added). The Act defines "eligible facilities request" as any request for modification of an existing wireless tower or base station that involves: 1) collocation of new transmission equipment; 2) removal of transmission equipment; or 3) replacement of transmission equipment. The Act applies "[n]otwithstanding section 704 of the Telecommunications Act of 1996." The Act's requirement that a local government "may not deny, and shall approve, any eligible facilities request" means that a request for modification to an existing facility that does not substantially change the physical dimensions of the tower or base station must be approved. Such qualifying requests also cannot be subject to a discretionary special permit.

The Town must apply Section 7.5.2 in a manner consistent with the applicable law outlined above. We also urge the Town to consult closely with Town Counsel regarding the appropriate response to applications for collocation in light of these recent amendments.

Note: Pursuant to G.L. c. 40, § 32, neither general nor zoning by-laws take effect unless the Town has first satisfied the posting/publishing requirements of that statute. Once this statutory duty is fulfilled, (1) general by-laws and amendments take effect on the date these posting and publishing requirements are satisfied unless a later effective date is prescribed in the by-law, and (2) zoning by-laws and amendments are deemed to have taken effect from the

date they were approved by the Town Meeting, unless a later effective date is prescribed in the by-law.

Very truly yours,

MAURA HEALEY
ATTORNEY GENERAL

Nicole B. Caprioli

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cc: Town Counsel Gregg J. Corbo

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February 10, 2015

Trudy L. Reid, Town Clerk
Town of Lynnfield
55 Summer Street
Lynnfield, MA 01940

RE: Lynnfield Fall Annual Town Meeting of October 20, 2014 - Case # 7408
Warrant Articles # 12, 13 and 14 (Zoning)
Warrant Articles # 16 and 17 (General)

Dear Ms. Reid:

Articles 12, 13, 14, 16 and 17 - We approve Articles 12, 13, 14, 16 and 17 from the October 20, 2014 Lynnfield Fall Annual Town Meeting. Our comments regarding Article 14 are provided below.

Article 14 - Article 14 makes a number of changes to the Town's zoning by-laws pertaining to Radio Telecommunication Facilities (RTF) and Personal Wireless Service Facilities (PWSF) including adding new definitions to Section 2, amending Section 7.4, "Site Plan" to add a new sub-section 7.4A "Additional Requirements for Personal Wireless Service Facilities"; and amending Section 8, "Special Permits" to add a new sub-section 8.7, "Siting of Radio Telecommunications Facilities."

I. Applicable Law

The federal Telecommunications Act of 1996, 47 U.S.C. § 332 (7) preserves state and municipal zoning authority to regulate personal wireless service facilities, subject to the following limitations:

1. Zoning regulations "shall not unreasonably discriminate among providers of functionally equivalent services." 47 U.S.C. §332(7) (B) (i) (I)

2. Zoning regulations "shall not prohibit or have the effect of prohibiting the provisions of personal wireless services." 47 U.S.C. § 332 (7) (B) (i) (II).

3. The Zoning Authority "shall act on any request for authorization to place, construct, or modify personal wireless service facilities within a reasonable period of time." 47 U.S.C. § 332 (7) (B) (ii).

4. Any decision "to deny a request to place, construct, or modify personal wireless service facilities shall be in writing and supported by substantial evidence contained in a written record." 47 U.S.C. § 332 (7) (B) (iii).

5. "No state or local government or instrumentality thereof may regulate the placement, construction and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the [Federal Communications] Commission's regulations concerning emissions." 47 U.S.C. § 332(7) (B) (iv).

Federal courts have construed the limitations listed under 47 U.S.C. § 332(7) as follows. First, even a facially neutral by-law may have the effect of prohibiting the provision of wireless coverage if its application suggests that no service provider is likely to obtain approval. "If the criteria or their administration effectively preclude towers no matter what the carrier does, they may amount to a ban 'in effect'...." Town of Amherst, N.H. v. Omnipoint Communications Enters, Inc., 173 F.3d 9, 14 (1st Cir. 1999).

Second, local zoning decisions and by-laws that prevent the closing of significant gaps in wireless coverage have been found to effectively prohibit the provision of personal wireless services in violation of 47 U.S.C. § 332(7). See, e.g., Nat'l Tower, LLC v. Plainville Zoning Bd. of Appeals, 297 F.3d 14, 20 (1st Cir. 2002) ("local zoning decisions and ordinances that prevent the closing of significant gaps in the availability of wireless services violate the statute"); Omnipoint Communications MB Operations, LLC v. Town of Lincoln, 107 F. Supp. 2d 108, 117 (D. Mass. 2000) (by-law resulting in significant gaps in coverage within town had effect of prohibiting wireless services).

Third, whether the denial of a permit has the effect of prohibiting the provision of personal wireless services depends in part upon the availability of reasonable alternatives. See 360 Degrees Communications Co. v. Bd. of Supervisors, 211 F.3d 79, 85 (4th Cir. 2000). Zoning regulations must allow cellular towers to exist somewhere. Towns may not effectively ban towers throughout the municipality, even under the application of objective criteria. See Virginia Metronet, Inc. v. Bd. of Supervisors, 984 F. Supp. 966, 971 (E.D. Va. 1998).

State law also establishes certain limitations on a municipality's authority to regulate wireless communications facilities and service providers. Under General Laws Chapter 40A, Section 3, wireless service providers may apply to the Department of Telecommunications and Cable for an exemption from local zoning requirements. If a telecommunication provider does not apply for or is not granted an exemption under c. 40A, § 3, it remains subject to local zoning requirements pertaining to cellular towers. See Building Comm'r of Franklin v. Dispatch Communications of New England, Inc., 48 Mass. App. Ct. 709, 722 (2000). Also, G.L. c. 40J, § 6B, charges the Massachusetts Broadband Institute with the task of promoting broadband access throughout the state. Municipal regulation of broadband service providers must not frustrate the achievement of this statewide policy.

In addition, Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012 requires that "[A] state or local government *may not deny, and shall approve*, any eligible

facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station." (emphasis added). The Act defines "eligible facilities request" as any request for modification of an existing wireless tower or base station that involves: 1) collocation of new transmission equipment; 2) removal of transmission equipment; or 3) replacement of transmission equipment. The Act applies "[n]otwithstanding section 704 of the Telecommunications Act of 1996." The Act's requirement that a local government "may not deny, and shall approve, any eligible facilities request" means that a request for modification to an existing facility that does not substantially change the physical dimensions of the tower or base station must be approved. Such qualifying requests also cannot be subject to a discretionary special permit.

The Town must apply Article 14 in a manner consistent with the applicable law outlined above. In particular, Section 8.7.5.1 requires that PWSF may only be erected upon the grant of a special permit. The Town cannot apply this requirement to eligible facilities requests for modification to existing facilities that qualify for required approval under Section 6409 of the Act. We also urge the Town to consult closely with Town Counsel regarding the appropriate response to applications for collocation in light of these recent amendments.

II. Section 8.7, Siting of Radio Telecommunications Facilities

A. Section 8.7.2, Purpose

Section 8.7.2 provides that the purpose of the by-law is to establish general guidelines for the siting of RTFs. Section 8.7.2 (4) establishes one of the by-law's goals as "[t]o make all RTF locations available for municipal agencies use where feasible."

It is unclear whether Section 8.7.2 (4) would require the Town's use of the RTF, and whether such use would be compensated or uncompensated. When applying the by-law, the Town cannot require an applicant to transfer property to the public without fair compensation. "The Fifth Amendment to the United States Constitution, made applicable to the States through the Fourteenth Amendment, provides that private property shall not 'be taken for public use, without just compensation.'" This protection is "designed to bar Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole." Giovanella v. Conservation Commission of Ashland, 447 Mass. 720, 724 (2006) (*quoting* Armstrong v. United States, 364 U.S. 40, 49 (1960). More recently, the court in Collins v. Stow, 79 Mass. App. Ct. 447 (2011) ruled that a town cannot condition subdivision approval on the dedication of open space for public use and actual conveyance of the land to the Town in exchange for waivers. "Although a planning board's authority under the subdivision control law certainly encompasses, in appropriate circumstances, requiring open space, it does not extend to requiring the transfer of that open space to the public for reasons unrelated to adequate access and safety of the subdivision without providing just compensation." Id. at 453. We suggest that the Town consult with Town Counsel regarding the proper application of Section 8.7.2 (4).

B. Section 8.7.5.4, General

Section 8.7.5.4.1 provides in relevant part that:

> An undertaking shall be required, secured by a BOND appropriate in form and amount for removal of the PWSF within 6 months of cessation of operation of said facility or such other activity which may be appropriate to prevent the structures from becoming a nuisance or aesthetic blights.

The Town must apply any bond proceeds in a manner consistent with state law. Bond proceeds do not become Town funds unless and until the applicant defaults on the obligation under the by-law. Moreover, if the Town must use the bond to pay for removal of a PWSF or for other activity to prevent nuisance or blight, an appropriation is required before expenditure is made to do the work. General Laws Chapter 44, Section 53, provides that "[a]ll moneys received by a city, town or district officer or department, except as otherwise provided by special acts and except fees provided for by statute, shall be paid by such officers or department upon their receipt into the city, town or district treasury." Under Section 53 all moneys received by the Town become a part of the general fund, unless the Legislature has expressly made other provisions that are applicable to such receipt. In the absence of any general or special law to the contrary, performance security funds of the sort contemplated here must be deposited with the Town Treasurer and made part of the Town's general fund, pursuant to G.L. c. 44, § 53. The Town must then appropriate the money for the specific purpose of completing the work required for removal and/or other activities. The Town should consult with Town Counsel regarding the proper application of Section 8.7.5.4.

C. Section 8.7.5.5, Application Procedures

Section 8.7.5.5 pertaining to the Special Permit application provides in relevant part, that:

> The Application Phase of the process begins with the receipt by the SPGA of a complete application including all materials required by the Zoning Bylaw and any applicable regulations.
>
> *****
>
> Within 30 days of receipt, the SPGA or its designee shall review the application for consistency and completeness with respect to the Application Requirements in the bylaw and any applicable regulations and shall notify the Applicant in writing of any deficiency in the completeness of the application.
>
> *****
>
> The SPGA shall take regulatory notice of the Federal Communications Commission (FCC) presumption that the final action of the SPGA on a new Antenna Tower should take no more than 150 days from the date of receipt of the completed application, and that final action on a Collocation or Site Sharing application should take no more than 90 days from the date of receipt of the completed application except upon written

extension of these timelines by mutual agreement between the SPGA and the Applicant.

Section 8.7.5.5 must be applied in a manner consistent with the time limits established in G.L. c. 40A, § 9. General Laws Chapter 40A, Section 9, requires that the special permit granting authority "shall hold a public hearing for which notice has been given as provided in section eleven, on any application for a special permit within sixty-five days from the date of filing of such application. . . . The decision of the special permit granting authority shall be made within ninety days following the date of such public hearing. . . Failure by the special permit granting authority to take final action within . . . ninety days . . . shall be deemed to be a grant of the special permit." (emphasis added).

Pursuant to G.L. c. 40A, § 9, the filing of a special permit application "starts the clock" on the time period within which the special permitting authority must act. Section 8.7.5.5 cannot be applied in a manner that "starts the clock" only when a *completed* application is filed. The Town must apply Section 8.7.5.5 consistent with G.L. c. 40A, § 9. *See* Massachusetts Broken Stone Co. v. Town of Weston, 430 Mass. 637, 642 (2000). The Town should consult with Town Counsel regarding the proper application of Section 8.7.5.5.

Note: Pursuant to G.L. c. 40, § 32, neither general nor zoning by-laws take effect unless the Town has first satisfied the posting/publishing requirements of that statute. Once this statutory duty is fulfilled, (1) general by-laws and amendments take effect on the date these posting and publishing requirements are satisfied unless a later effective date is prescribed in the by-law, and (2) zoning by-laws and amendments are deemed to have taken effect from the date they were approved by the Town Meeting, unless a later effective date is prescribed in the by-law.

Very truly yours,

MAURA HEALEY
ATTORNEY GENERAL

Nicole B. Caprioli

By: Nicole B. Caprioli
Assistant Attorney General
Municipal Law Unit
10 Mechanic Street, Suite 301
Worcester, MA 01608
(508) 792-7600 ext. 4418
nicole.caprioli@state.ma.us

cc: Town Counsel Thomas Mullen

EXHIBIT 12

City of Cambridge

MASSACHUSETTS

BOARD OF ZONING APPEAL

831 Mass Avenue, Cambridge, MA.
(617) 349-6100

2014 MAR 26 PM 12 00
OFFICE OF THE CITY CLERK
CAMBRIDGE, MASSACHUSETTS

840 Memorial Drive, Cambridge 02139

CASE NO: BZA-002604-2013

LOCATION: 18 Blackstone Street, Cambridge, MA — Office 2 Zone

Record Owner = Riverteh Associates II LLC

PETITIONER: Centerline Communications, LLC
C/o David Ford

PETITION: Special Permit: AT&T proposes to install twelve (12) panel antennas on the buildings rooftop. Each antenna will be housed within a faux flue pipe canister designed and painted to match the existing pipes on the roof. AT&T's equipment will be housed within the proposed 12'x20' equipment shelter along with an attached pad for a generator.

VIOLATION: Art. 4.000, Sec. 4.32.G.1 & Sec. 4.40 (Footnote 49) (Telecommunication Facility). Art. 10.000, Sec. 10.40 (Special Permit).

2014 01669769
Bk: 01279 Pg: 149 Cert#: 229899
Doc: DECIS 04/29/2014 02:14 PM

DATE OF PUBLIC NOTICE: November 21 & 28, 2014

DATE OF PUBLIC HEARING: December 5, 2013, February 13, 2014

MEMBERS OF THE BOARD:

CONSTANTINE ALEXANDER – CHAIR	✓
TIMOTHY HUGHES – VICE-CHAIR	✓
BRENDAN SULLIVAN	
THOMAS SCOTT	✓
JANET O. GREEN	✓

ASSOCIATE MEMBERS:

DOUGLAS MYERS	
SLATER W. ANDERSON	
LINDSEY T. THORNE-BINGHAM	
ANDREA A. HICKEY	
ARCH HORST	✓

Members of the Board of Zoning Appeal heard testimony and viewed materials submitted regarding the above request for relief from the requirements of the Cambridge Zoning Ordinance. The Board is familiar with the location of the petitioner's property, the layout and other characteristics as well as the surrounding district.

229899

PKG 130685 1-14-04

Case No. BZA-2604-2013
Location: 18 Blackstone Street
Petitioner: Centerline Communications c/o David Ford

On February 13, 2014, Petitioner David Ford appeared before the Board of Zoning Appeal with this attorney Susan Roberts requesting a special permit in order to install twelve panel antennas on the building's rooftop, with each antenna housed within a faux flue pipe canister designed and painted to match the existing pipes on the roof and to house associated equipment within an equipment shelter, along with an attached pad for a generator. The Petitioner requested relief from Article 4, Section 4.32.G.1 of the Cambridge Zoning Ordinance ("Ordinance"). The Petitioner submitted application materials including information about the project, plans, and photographs.

Ms. Roberts stated that installation had been redesigned taking into account the wishes of a neighbor. She stated that the number of canisters had been reduced and that a fiberglass screen was being proposed in order to reduce the visual impacts. She stated that AT&T was licensed to operate wireless facilities. She stated that there would be no negative impacts to traffic, to adjacent uses, to this or adjoining districts, or to the intent and purpose of the Ordinance.

The Chair asked if anyone wished to be heard, no one indicated such. The Chair read a letter of support from the Planning Board.

After discussion, the Chair moved that the Board grant the special permit for relief in order to install twelve panel antennas on the building's rooftop, with each antenna housed within either a faux flue pipe canister designed and painted to match the existing pipes on the roof or behind a flush screen wall along an associated equipment shelter, along with an attached pad for a generator based on the finding that the Petitioner was a duly licensed federal communications carrier in good standing. The Chair moved that the Board find that the Petitioner had taken steps to minimize the visual impact by the use of screening and canisters, the face of which was similar to the face of the structure. The Chair moved that the Board find that traffic generated or patterns of access or egress would not cause congestion, hazard, or substantial change in established neighborhood character. The Chair moved that the Board find that the continued development or operation and development of adjacent uses would not be adversely affected by what was proposed. The Chair moved that the Board find that no nuisance or hazard would be created to the detriment of the health, safety, and/or welfare of the occupant of the proposed use or the citizens of the city. The Chair moved that the Board find that the proposed use would not impair the integrity of the district or adjoining district or otherwise derogate from the intent and purpose of the Ordinance. The Chair moved that the Board note that the project had the support of the Planning

Board and that there was no neighborhood opposition. The Chair moved that the Board find that the site had numerous other rooftop structures, including telecommunications antenna, so the proposed work would not be a departure from established neighborhood character. The Chair moved that the Board grant the Special Permit subject to the following conditions:

1. that the work proceed in accordance with photo simulations, dated 12/27/13, submitted by the Petitioner, with the first page initialed by the Chair,
2. that the work proceed in accordance with drawings and plans submitted by the Petitioner, numbered T1, Z1, Z2, Z3, and Z4, with the first page initialed by the Chair,
3. that the canisters be maintained in the condition shown in the photo simulations throughout their use,
4. that if for any period of six months or more the antennas be discontinued in use, they be promptly removed and the face of the structure be restored to its current state as nearly as reasonably practical.

The five member Board voted unanimously in favor of granting the special permit (Alexander, Hughes, Scott, Green, and Horst). Therefore, the special permit is granted.

The Board based its decision upon all the information presented, the above findings and upon the following:

1) The meeting of the requirements of the Ordinance;
2) Traffic generated or patterns of access or egress would not cause congestion, hazard, or substantial change in the established neighborhood character;
3) The continued operation of or the development of adjacent uses as permitted in the Ordinance would not be adversely affected by the nature of the proposed uses;
4) Nuisance or hazard would not be created to the detriment of the health, safety and /or welfare of the occupants of the proposed use;
5) The proposed use would not impair the integrity of the district or adjoining district or otherwise derogate from the Ordinance, and in fact would be a significant improvement to the structure and benefit the neighborhood, and;
6) The new use or building construction is not inconsistent with the Urban Design Objectives set forth in Section 19.30 of the Cambridge Zoning Ordinance.

The Board of Zoning Appeal is empowered to waive local zoning regulations only. This decision therefore does not relieve the petitioner in any way from the duty to comply with local ordinances and regulations of the other local agencies, including, but not limited to the Historical Commission, License Commission and/or compliance with requirements pursuant to the Building Code and other applicable codes.

Constantine Alexander, Chair

Attest: A true and correct copy of decision filed with the offices of the City Clerk and Planning Board on 3/26/14 by Maria Pacheco, Clerk.

Twenty days have elapsed since the filing of this decision.

No appeal has been filed ✓.

Appeal has been filed and dismissed or denied.

Date: April 22, 2014 Donna P. Lopez City Clerk.

ANDERSON
KREIGER

BRETT ROMAN
broman@andersonkreiger.com
T: 617-621-6508
F: 617-621-6608

December 27, 2018

VIA PRIORITY MAIL

Maria Pacheco
City of Cambridge
Inspectional Services Dept.
831 Massachusetts Ave., #1
Cambridge, MA 02139

Re: City of Cambridge BZA Application Plan No.BZA-017052-2018
840 Memorial Dr.

Dear Ms. Pacheco:

Regarding the above-referenced BZA application, enclosed is a binder containing the documents filed electronically on behalf of New Cingular Wireless PCS, LLC on December 19, 2018. Also enclosed in the opening insert to the binder are the following documents, in response to your office's request for the same:

1. Three copies of the completed application form with original signatures; and

2. One updated, signed and notarized original ownership form.

Do not hesitate to contact me with any questions or requests for additional or supplemental documentation that you may require.

Best regards,

Brett Roman
Litigation Paralegal

cc: Jonathan T. Elder

{A0534319.2 }


840 Memorial Dr.
Charles River Basin
New Riverside Neighborhood Park
Western Ave
Memorial Dr
Blackstone St
Putnam Ave
Ballord Pl
Hoyt Field
Riverside Press Park
River St
Allston St
River Street Bridge
Charles River Basin
Charles River Basin
30 Hingham St
130-168
389 Western Ave
381 Western Ave
375 Western Ave
343 Western Ave
185 Putnam Ave
325 Western Ave
336 Western Ave
316 Western Ave
318 Western Ave
356 Western Ave
205 Putnam Ave
46 Blackstone St
215 Putnam Ave
217 Putnam Ave
218 Putnam Ave
219 Putnam Ave
220 Putnam Ave
222 Putnam Ave
221 Putnam Ave
223 Putnam Ave
231 Putnam Ave
225 Putnam Ave
232 Putnam Ave
227 Putnam Ave
229 Putnam Ave
11 Montague St
5 Ballord Pl
238 Putnam Ave
2 Pond Pl
24 Blackstone St
19 Blackstone St
244 Putnam Ave
237 Putnam Ave
248 Putnam Ave
252 Putnam Ave
256 Putnam Ave
260 Putnam Ave
263 Putnam Ave
269 Putnam Ave
11 Blackstone St
2 Blackstone St
277 Putnam Ave
3 Blackstone St
1 Blackstone St
321 River St
319 River St
323 River St
327 River St
308 Putnam Ave
314 Putnam Ave
330 River St
320 Putnam Ave
35 Fairmont Ave
340 Putnam Ave
816 Memorial Dr
810 Memorial Dr
812 Memorial Dr
339 Putnam Ave
344 Putnam Ave
340 River St
350 Allston St
288 River St
290 River St
305 River St
281 River St
129-47
46 Blackstone St
129-58
840 Memorial Dr
129-59
129-55
129-54
129-11
129-9
129-20
129-21
129-28
129-29
129-30
129-31
129-32
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128-63
128-72
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126-2
126-3
126-4
126-4A
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126-130
126-8
126-7
126-6
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126-10
126-12
126-13
126-36
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126-32
126-174
126-31
126-120
126-29
126-141
126-28
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126-27
127-132
127-126
127-33
127-34
127-119
127-1
127-150
127-151
127-4
127-152
122-176
122-11
122-194
122-196
122-195
122-197
122-12
122-14
122-13
130-6
130-16
130-13
130-5
130-7
130-125
130-12
130-4
130-8
130-127
130-11
130-124
130-126
130-3
130-9
126-37

840 Memorial Dr. Petitioner

129-9
MORRISON SAMANTHA L.
3-11 BLACKSTONE ST. UNIT 3/1
CAMBRIDGE, MA 02139

129-9
ROMANO, ERIC R. JR., & JENNIFER M. ROMANO
3-11 BLACKSTONE ST
CAMBRIDGE, MA 02139

ANDERSON & KREIGER LLP
C/O BRETT ROMAN, LITIGATION PARALEGAL
50 MILK STREET – 21ST FLOOR
BOSTON, MA 02109

129-9
SHEPHERD, MARY K.
3-11 BLACKSTONE ST., # 3/4
CAMBRIDGE, MA 02139

129-9
ADELMANN, PATRICIA &
JAMES JOSEPH MCCLURE
3-11 BLACKSTONE ST.,UNIT #11/1
CAMBRIDGE, MA 02139

CENTERLINE COMMUNICATIONS
C/O ALEX MURSHTEYN
750 WEST CENTER STREET – SUITE 301
WEST BRIDGEWATER, MA 02379

129-9
HARWITZ, ALEXANDER L. & LAURA JOHNSON
3-11 BLACKSTONE ST., #11/3
CAMBRIDGE, MA 02139

129-9
ZAPPE JEFFREY A & KIMBERLY J SAUDINO
3-11 BLACKSTONE ST UNIT #11-4
CAMBRIDGE, MA 02139

129-9
PERKINS EVELYN M.
TRUSTEE OF E.M. PERKINS REALTY TRUST
3-11 BLACKSTONE ST. UNIT#11/5
CAMBRIDGE, MA 02139

129-9
WAINWRIGHT, WILLIAM H &
CLARA WAINWRIGHT
11 BLACKSTONE ST #6
CAMBRIDGE, MA 02139

129-9
THOMPSON DONALD J.
3-11 BLACKSTONE ST UNIT #11/7
CAMBRIDGE, MA 02139

129-9
FAULKNER RAYMON E
3-11 BLACKSTONE ST UNIT 11/8
CAMBRIDGE, MA 02139

129-9
KAMISHLIAN, ISABELLE V.
113 ROSAIRE PL NW
ATLANTA, GA 30327

129-9
RUBIN, DONALD
3-11 BLACKSTONE ST., UNIT 11/10
CAMBRIDGE, MA 02139

129-11
BSS LL, LLC,
280 PARK AVENUE
NEW YORK, NY 10017

129-47
PRESIDENT & FELLOWS OF HARVARD COLLEGE
C/O GENERAL COUNSEL HOLYOKE CENTER RM 98
1390 MASSACHUSETTS AVE
CAMBRIDGE, MA 02138

129-55
PECTEN PROPERTIES, LLC
261 LEDYARD ST.
NEW LONDON, CT 06320

129-58
RIVERTECH ASSOCIATES LLC
C/O ABBEY GROUP
177 HUNTINGTON AVE. FL 24
BOSTON, MA 02115

129-9
FIORE, JR. , JAMES A. & KELLIE A. FIORE
11 BLACKSTONE ST., #2
CAMBRIDGE, MA 02139

129-54
SAVRANSKY, SUSAN E.
217 PUTNAM AVE #217-1
CAMBRIDGE, MA 02139

129-54
POOR, MICHAEL J. & SHANNON M. POOR
217 PUTNAM AVE. UNIT#9
CAMBRIDGE, MA 02139

129-54
HAILE, HAREGU
217 PUTNAM AVE., #217/8
CAMBRIDGE, MA 02139

129-54
BONNER, TRECIA
217 PUTNAM AVE., #217/7
CAMBRIDGE, MA 02139

129-54
GRAHAM, RHONDA
217 PUTNAM AVE., #217/6
CAMBRIDGE, MA 02139

129-54
OGBAZGHI, HINESHIM & ELSA MENGISTU
217 PUTNAM AVE., #5
CAMBRIDGE, MA 02139

129-54
BONANNO, KEVIN P. & AIMEE BONANNO
217 PUTNAM AVE., #4
CAMBRIDGE, MA 02139

129-54
WALKER, JEFFREY M.
217 PUTNAM AVE., #3
CAMBRIDGE, MA 02139

129-54
RABINOWITZ, REBECCA
217 PUTNAM AVE #2
CAMBRIDGE, MA 02139

129-54
DOTSANG, JAMYANG T. & TSERING D. DOTSANG
217 PUTNAM AVE., 217/10
CAMBRIDGE, MA 02139

129-54
GENESHSINGH, THAKUR A. &
POONAM G. THAKUR
217 PUTNAM AVE. UNIT#22
CAMBRIDGE, MA 02141

840 Memorial

129-54
THORPE, ROBERT W. & SOPHIA A. THORPE
217 PUTNAM AVE., 217/21
CAMBRIDGE, MA 02139

129-54
CARTER, SUSAN A.
217 PUTNAM AVE. UNIT#217/20
CAMBRIDGE, MA 02139

129-54
FIFIELD, SHANE & FELICIA N. FIFIELD
217 PUTNAM AVE., #19
CAMBRIDGE, MA 02139

129-54
SUAZO, MELBA
217-219 PUTNAM AVE #217-18
CAMBRIDGE, MA 02139

129-54
SELK, CHARLES A. & SABRINA C. SELK
217 PUTNAM AVE., UNIT 17
CAMBRIDGE, MA 02139

129-54
ABDUR-RAHMAN, ALIYYAH
217 PUTNAM AVE., 217/16
CAMBRIDGE, MA 02139

129-54
VILDORT, JEAN R. & CLAUDETTE B. VILDORT
217 PUTNAM AVE., #15
CAMBRIDGE, MA 02139

129-54
GLISOVIC, BRANKO
217 PUTNAM AVE. UNIT#217/14
CAMBRIDGE, MA 02139

129-54
NOLAN, JOHN S. & NINA C. NOLAN
217 PUTNAM AVE., UNIT #13
CAMBRIDGE, MA 02139

129-54
SCANTLEBURY, KIM I.
217 PUTNAM AVE., #217/12
CAMBRIDGE, MA 02139

129-54
LEMMA, ALEMAYEHU G. & SENAYET Y. GIGAR
217 PUTNAM AVE., #217/11
CAMBRIDGE, MA 02139

129-54
CHAN, SOPHEA
217 PUTNAM AVE., #229
CAMBRIDGE, MA 02139

129-54
O'CONNOR, JESSICA ALISON
227 PUTNAM AVE.,
CAMBRIDGE, MA 02139

129-54
COLLINS, CHADWICK W.
217-229 PUTNAM AVE #225
CAMBRIDGE, MA 02139

129-54
EDOUAZIN, MARYSE
217 PUTNAM AVE., #223/6
CAMBRIDGE, MA 02139

129-54
PERDOMO, AZLILN
223 PUTNAM AVE., #5
CAMBRIDGE, MA 02139

129-54
WEEMAN, MATTHEW & ELIN B. WEEMAN
223 PUTNAM AVE., #4
CAMBRIDGE, MA 02139

129-54
GACHETTE, MAX A. & MARIE L. GACHETTE
217 PUTNAM AVE., #223/3
CAMBRIDGE, MA 02139

129-54
CRASTA, FREDRICK & APOLINE RODRIGUES
223 PUTNAM AVE #223-2
CAMBRIDGE, MA 02139

129-54
AKIN, MOLLY & MOLLY AKIN
223 PUTNAM AVE., #1
CAMBRIDGE, MA 02139

129-54
SUWAL, MAHESH R. & RADHIKA SUWAL
221 PUTNAM AVE
CAMBRIDGE, MA 02139

129-54
KARMACHARYA, SUDDYAM &
BABA KARMACHARYA
219 PUTNAM AVE
CAMBRIDGE, MA 02139

129-9
MORRISON, SAMANTHA
3-11 BLACKSTONE ST., #3/3
CAMBRIDGE, MA 02139

DEPARTMENT OF CONSERVATION &
RECREATION
251 CAUSEWAY STREET – SUITE 600
BOSTON, MA 02114-2119

129-59
CITY OF CAMBRIDGE
C/O NANCY GLOWA
CITY SOLICITOR

129-59
CITY OF CAMBRIDGE
C/O LOUIS DEPASQUALE
CITY MANAGER

CITY OF CAMBRIDGE
MASSACHUSETTS
BOARD OF ZONING APPEAL
831 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02139
617 349-6100

2019 JAN -2 PM 12: 18

OFFICE OF THE CITY CLERK
CAMBRIDGE, MASSACHUSETTS

BZA APPLICATION FORM Plan No: BZA-017052-2018

GENERAL INFORMATION

The undersigned hereby petitions the Board of Zoning Appeal for the following:

Special Permit : √ **Variance :** _____ **Appeal :** _____

PETITIONER : AT&T - C/O Alex Murshteyn, Centerline Communications

PETITIONER'S ADDRESS : 750 West Center St., Suite #301 West Bridgewater, MA 02379

LOCATION OF PROPERTY : 840 Memorial Dr Cambridge, MA 02139

TYPE OF OCCUPANCY : Retail Office **ZONING DISTRICT :** Office 2 Zone/Overlay Districts MXR; MIT

REASON FOR PETITION :

Other: Wireless Communications

DESCRIPTION OF PETITIONER'S PROPOSAL :

AT&T proposes to add twelve (12) antennas on the building's rooftop. Antennas will be housed within six (6) faux flue pipe canisters designed and painted to match the existing pipes on the roof. AT&T's other rooftop equipment will be house within the proposed 8'x8' walk-in-cabinet on steel fram, along with the attached space for a generator. See latest plans attached.

SECTIONS OF ZONING ORDINANCE CITED :

Article 4.000 Section 4.32.G.1 (Telecommunication Facility).
Article 4.000 Section 4.40 (Footnote 49) (Telecommunication Facility).
Article 10.000 Section 10.40-10.46 (Special Permit).
Article 6409 Section Middle Class Tax Relief Act

Original Signature(s) : _____
(Petitioner(s) / Owner)

Alex Murshteyn
(Print Name)

Address : 750 W. Center St., #301
W. Bridgewater, MA 02379

Tel. No. : 508-821-0150

E-Mail Address : amurshteyn@clinellc.com

Date : 12/21/2018

Special Permit Application

840 Memorial Drive

Map 129, Lot 58

Applicant:

New Cingular Wireless PCS, LLC ("AT&T")

c/o Alex Murshetyn, Centerline Communications LLC

amurshteyn@clinellc.com

(508.821.0159)

December 19, 2018

CENTERLINE COMMUNICATIONS LLC

December 19, 2018

Via Online Submission

Donna P. Lopez, City Clerk
City of Cambridge
City Hall
795 Massachusetts Avenue
Cambridge, MA 02139

Constantine Alexander, Chair
Board of Zoning Appeal
City Hall
795 Massachusetts Avenue
Cambridge, MA 02139

Applicant:	New Cingular Wireless PCS, LLC ("AT&T")
Property Address:	840 Memorial Drive Assessor's Map 129, Lot 58 (the "Property")
Re:	Application for: (i) Special Permit under Cambridge Zoning Ordinance Section 4.32(g)(1) and M.G.L. c. 40A, Section 9; and (ii) Any other zoning relief required. (All relief if and to the extent necessary, all rights reserved)

Dear Ms. Lopez, Mr. Alexander and Members of the Board of Zoning Appeal:

Pursuant to Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012 (a/k/a the "Spectrum Act" or "Section 6409"), 47 U.S.C. § 1455, as further implemented by the Federal Communications Commission's Report and Order *In re Acceleration of Broadband Deployment by Improving Wireless Facilities Siting Policies*, FCC Docket No. 13-238, Report and Order No. 14-153 (October 17, 2014) (the "FCC Order"), Centerline Communications hereby submits on behalf of New Cingular Wireless PCS, LLC ("AT&T") this Eligible Facilities Request ("Request"); and, in the alternative, applies for a special permit from the City of Cambridge Board of Zoning Appeal (the "Board") under Section 432(g)(1) of the Cambridge Zoning Ordinance (the "Ordinance") to collocate its "Telephone Exchange including Transmission Facilities to serve a Mobile Communication System" (the "Facility") on and within the existing building located at 840 Memorial Drive (the "Special Permit Application").[1]

[1] AT&T submits this Request, Special Permit application and supporting materials subject to a full and complete reservation of AT&T's rights under the Spectrum Act and the FCC Order including without limitation its rights with respect to (i) any submittal requirements or approval criteria that are inconsistent with the prohibitions established by the FCC Order, (ii) any delay beyond the deadlines established in the FCC Order, (iii) the imposition of conditions on any approval that are inconsistent with the FCC Order, and (iv) referral or requirement to a discretionary review process such as a special permit.

Under Section 6409, AT&T's proposed collocation of the proposed Facility with the existing transmission equipment on and within the existing building, previously approved by the Board for use as a wireless communication base station by another carrier, does "not substantially change the physical dimensions" of the existing building. Therefore, AT&T's Request must be approved administratively, including the issuance of a building permit, to enable AT&T to make the proposed modifications to its transmission equipment.

In the alternative, as demonstrated in this application letter, AT&T's proposed collocation of the Facility on the Property located in the non-residential O-2 zoning district satisfy the requirements for the grant of a special permit pursuant to Section 10.43 of the Ordinance.

I. APPLICATION PACKAGE

Enclosed with this letter are the following Exhibits, numbered 1 through 12:

1. The following completed and signed application forms:

    a. BZA Application Form – General Information;
    b. BZA Application Form – Ownership Information;
    c. BZA Application Form – Dimensional Requirements; and
    d. BZA Application Form – Supporting Statement for a Special Permit;

2. AT&T's relevant FCC License information;

3. The following Zoning Drawings (11" x 17") prepared by Dewberry Engineers, Inc.:

SHEET	**TITLE**	**REV. DATE**
T-1	Title Sheet	01/23/18
Z-1	Abutters Plan	01/23/18
Z-2	Roof Plan	01/23/18
Z-3	Detailed Roof Plan	01/23/18
Z-4	East & West Elevation	01/23/18
Z-5	Conceptual Antenna Details	01/23/18

4. Manufacturer's specification sheets for AT&T's proposed antennas and supporting equipment;[2]

5. 11" x 17" photographs of the existing building with simulations of the proposed Facility, dated 12/27/13, and based on zoning drawings dated 11/03/17;

[2] AT&T reserves the right to change the manufacturer, make, model, type and operating characteristics of the antennas and any other equipment based on availability, price, performance and other considerations and in accordance with all applicable laws.

6. Radio Frequency Report, prepared by Radu Alecsandru, AT&T, dated September 24, 2018, demonstrating the public need for the Facility, and radio frequency coverage maps showing (a) existing coverage and (b) coverage with the proposed Facility;

7. Structural Report prepared by Dewberry Engineers, Inc., dated January 16, 2018;

8. Radio Frequency Safety Survey Report Prediction, dated April 17, 2018;

9. Deed to subject property;

10. Noise Study, prepared by Noise Control Engineering, Inc., dated May 24, 2018;

11. Attorney General's letters to the Towns of Montague, Mount Washington, and Lynnfield; and

12. Special Permit granted to AT&T by the Board dated April 29, 2014, for a similar facility at the same location , which AT&T did not install.[2]

II. PROPOSED FACILITY DESIGN

AT&T seeks to co-locate its Facility on the roof of the building located at the Property. The roof is partially occupied by an existing facility that is operated by Sprint under a special permit granted by the Board on April 29, 2014. AT&T's proposed Facility would be installed in the same area occupied by the existing Sprint facility.

AT&T's proposed design will install twelve (12) antennas (Alpha Sector: 4 antennas, Beta Sector: 4 antennas, and Gamma Sector: 4 antennas) that will be ballast mounted to the building roof and will be contained within canisters to mimic the existing equipment on the roof. Twenty-seven (27) remote radio-head units (RRUs), nine (9) per sector will be mounted to the ballast mounts on the roof and will sit directly behind the antennas on the roof floor. AT&T also proposes to install an 8' x 8' shelter and an attached generator that will be painted to match the existing rooftop equipment.

There will be additional ancillary equipment such as associated cabling, cable trays, and conduits located on the rooftop along with three (3) federally-mandated GPS antennas (one per sector) mounted to the cable trays. There will be cabling within an existing cable tray leading from the rooftop equipment to the equipment shelter. The Facility's design is shown in detail in the Zoning Drawings attached as Exhibit 3 to this application letter and in the manufacturers' specification sheets attached as Exhibit 4. The photographs and photosimulations (Exhibit 5) show the Facility as existing and as designed.

The Facility will bring advanced wireless voice, text and data communications services to the surrounding areas. It will allow residents, professionals, government, businesses and

[2] AT&T refers to this previous special permit only to highlight the Board's unanimous approval of a similar installation at the same location, which has not substantially changed since.

students to communicate locally, nationally and internationally from virtually any location within the coverage area. In the event of an emergency, the Facility will allow immediate contact with fire, rescue and other emergency personnel. The Facility will thus enhance public health, safety and welfare both in ordinary daily living and in the event of fire, accident, medical emergency, natural disaster or other dangers.

III. BACKGROUND

AT&T is licensed by the Federal Communications Commission to construct and operate a wireless telecommunications network in various markets throughout the country, including the Commonwealth of Massachusetts and the City of Cambridge. A copy of the AT&T's FCC license that covers the area of the proposed Facility is included with this application. AT&T is in the process of designing and constructing additional wireless facilities to its existing telecommunication system to serve Massachusetts. One of the key design objectives of its systems is to provide adequate and reliable coverage. Such a system requires a grid of radio transmitting and receiving links located approximately .5 to 2 miles apart, depending on the location of existing and proposed installations in the surrounding area, the extent of use of AT&T's wireless services within the network, and the existing topography and obstructions. The radio transmitting and receiving facilities operate on a line-of-sight basis, requiring a clear path from the facility to the user on the ground. In urban settings, this dynamic requires the antennas to be located on buildings at heights and in locations where the signal is not obstructed or degraded by other buildings or by topographical features such as hills.

IV. RF COVERAGE DETERMINATION

AT&T has performed a study of radio frequency coverage for the Property and surrounding areas, the results of which are described in the Radio Frequency Report submitted with this application (*see* Exhibit 6). AT&T has a substantial coverage gap in this area of Cambridge and has determined that a wireless communications facility located on the Property will provide adequate coverage to the targeted sections of the City and the immediately surrounding area if AT&T's antennas are located on the building rooftop at the heights requested. The importance of a facility at this location is underscored by AT&T's interest in enhancing its ability to provide its most up-to-date wireless technology, known as long-term evolution technology ("LTE"), in the Memorial Drive section of the City to satisfy its customers' ever-increasing needs for high-speed data services. Radio frequency coverage maps included in the report are provided to pictorially and vividly show the differences in existing and proposed wireless coverage at the various bands authorized for AT&T's service. The maps show dramatic improvements to wireless coverage at all three (3) bands with the inclusion of the proposed Facility, namely, 700, 1900, and 2100 MHz.

V. THE FEDERAL SPECTRUM ACT AND THE FCC ORDER

As set forth below, the proposed modifications constitute an Eligible Facilities Request pursuant to the federal Spectrum Act,[3] as further implemented by the FCC

[3] Pursuant to Section 6409(a)(2) an "eligible facilities request" means any request for modification of an existing wireless tower or base station that involves—

Order.[4]

Under the Spectrum Act, as further clarified by the FCC Order, the streamlined process for this Eligible Facilities Request is limited to non-discretionary review. Specifically, the FCC Order "adopt[s] an objective standard for determining when a proposed modification will 'substantially change the physical dimensions' of an existing tower or base station." *FCC Order*, ¶ 87. As stated in the FCC Order, Section 6409 "states without equivocation that the reviewing authority 'may not deny, and shall approve' any qualifying application. This directive leaves no room for a lengthy and discretionary approach to reviewing an application that meets the statutory criteria." *FCC Order*, ¶ 116.

In issuing the FCC Order and eliminating discretionary review for eligible facilities requests, the FCC's goal was to "adopt a test that is defined by specific, objective factors rather than the contextual and entirely subjective standard advocated by the IAC and municipalities." The FCC intentionally sought to reduce "flexibility" and "open ended context-specific approach" engendered by the discretionary review process:

> While we acknowledge that the IAC approach would provide municipalities with maximum flexibility to consider potential effects, we are concerned that it would invite lengthy review processes that conflict with Congress's intent. Indeed, some municipal commenters anticipate their review of covered requests under a subjective, case-by-case approach could take even longer than their review of collocations absent Section 6409(a). We also anticipate that disputes arising from a subjective approach would tend to require longer and more costly litigation to resolve given the more fact-intensive nature of the IAC's open-ended and context-specific approach. We find that an objective definition, by contrast, will provide an appropriate balance between municipal flexibility and the rapid deployment of covered facilities. We find further support for this approach in State statutes that have implemented Section 6409(a), all of which establish objective standards.

FCC Order, ¶ 88.

As a result, the FCC Order implementing Section 6409 establishes clear and

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(A) collocation of new transmission equipment;
(B) removal of transmission equipment; or
(C) replacement of transmission equipment.

47 U.S.C. § 1455(a)(2).

[4] The Order was effective on February 9, 2015, except for § 1.40001, which became effective on April 8, 2015, except for §§ 1.40001(c)(3)(i), 1.40001(c)(3)(iii), 1.140001(c)(4), and 17.4(c)(1)(vii), which became effective on May 18, 2015, after approval by the Office of Management and Budget. The FCC Order makes clear that under the Spectrum Act discretionary review is not required or permitted for an Eligible Facilities Request.

objective criteria for determining eligibility, limits the types of information that a municipality may require when processing an application for an eligible facilities request, and imposes a "deemed granted" remedy for failure to timely process and eligible facilities request.[5] The FCC Order also establishes significant limits on the information that can be required to be provided with an eligible facilities request and limits it to only that information "reasonably related to determining whether the request meets the requirements of this section. A State or local government may not require an applicant to submit any other documentation". 47 CFR 1.40001(c)(1).

Both before and after the FCC Order was issued, the Massachusetts Attorney General's Office provided clear guidance that an eligible request cannot be subjected to a discretionary special permit process. *See* Attorney General's letters to (i) Town of Mount Washington, dated June 12, 2014, p. 3 (ii) Town of Lynnfield, dated February 10, 2015, p. 3 (the "AG Lynnfield Letter") and (iii) Town of Montague, dated February 23, 2015, p. 2 (all attached hereto at Tab 12). As set forth in each letter [t]he Act's requirement that a local government 'may not deny, and shall approve, any eligible facilities request' means that a request for modification to an existing facility that does not substantially change the physical dimensions of the tower or base station must be approved. ***Such qualifying requests also cannot be subject to a discretionary special permit***.")(Emphasis added). In providing these opinions, the Attorney General's Office specifically opined that provisions in zoning ordinances that specifically required a special permit for modifications to existing facilities could not be applied to eligible facilities requests. While approving the Town of Lynnfield's Zoning Bylaw, the Attorney General stated that "Section 8.7.5.1 requires that PWSF may only be erected upon the grant of a special permit. The Town cannot apply this requirement to eligible facilities requests for modification to existing facilities that qualify for required approval under Section 6409 of the Act." *AG Lynnfield Letter*, p. 3.

Therefore, as set forth in the FCC Order and Attorney General's opinion letters, the City cannot impose a requirement that AT&T obtain a special permit, or an amendment to an existing special permit utilizing the same discretionary review process, in connection with its eligible facilities request. To the extent that the City of Cambridge's Zoning Ordinance and any prior decisions by the Board include provisions seeking to further regulate the modification of wireless communication facilities, federal law overrules those requirements. *See* Sprint Spectrum L.P. v. Town of Swansea, 574 F.Supp.2d 227, 236 (2008) (Board is obligated to consider whether its actions would violate federal law even if a different outcome would be permitted under state law). The standard of review for an application to modify an existing wireless communication facility on an existing tower or base station is governed by the Spectrum Act and the FCC Order which require eligible facilities requests to be permitted "by right."

In addition, the FCC Order establishes a 60-day period for approval from the time of AT&T's submission. 47 CFR §1.40001(c)(2). Within the context of the Spectrum Act and FCC Order, approval means all necessary approvals to permit the proposed

[5] *See* 47 CFR §§1.40001(c)(1) - (c)(4).

modifications, including the issuance of a building permit, if required. The FCC found that this 60-day period is appropriate due to "the more restricted scope of review applicable to applications under section 6409(a)." *FCC Order*, ¶ 108. If the Request is not acted upon within the 60-day period, it is deemed granted. 47 CFR §1.40001(c)(4).

As set forth below, the proposed modifications constitute an eligible facilities request. Therefore, AT&T respectfully requests the Board to find that Section 4.32(g)(1) of the Ordinance does not apply to its Request.

VI. THE PROPOSED FACILITY IS AN ELIGIBLE FACILITIES REQUEST

Under Section 6409 and the FCC Order, a "base station" means "[a] structure or equipment at a fixed location that enables Commission-licensed or authorized wireless communications between user equipment and a communications network." 47 C.F.R §1.40001(b)(1). A Base Station includes "any structure other than a tower" that supports or houses "authorized wireless communications between user equipment and a communications network." 47 C.F.R §1.40001(b)(1). Therefore, the existing building that is currently used for FCC-licensed transmissions for personal wireless services (through the Sprint facility on ther building roof) is a "base station" for purposes of Section 6409.

AT&T proposes to collate its proposed Facility with the existing facility operated by Sprint as described above and depicted on the Plans submitted herewith.

The proposed collocated Facility will not require the installation of any part of the facility on the ground outside of the building.

As a result, AT&T's proposed Facility, involving the collocation of transmission equipment with existing transmission equipment constitute an "eligible facilities request" under Section 6409.

The proposed eligible facilities request is not a "substantial modification" under Section 6409 and the FCC Order because it does not:

(i) Result in an increase in "the height of the structure by more than 10% or more than ten feet, whichever is greater," because the proposed antennas will be housed in 8-foot tall canisters that when mounted will be less than 10 feet taller than the existing Sprint antennae, and will not exceed the height of the tallest existing appurtenances on the building roof;

(ii) Protrude from the edge of the building by more than six feet, because AT&T's proposed antennas all will be set back from the roof edge by 10 or more feet;

(iii) Involve the installation of more than the standard number of new equipment cabinets for the technology involved, as only one new cabinet will be installed;

(iv) Require any excavation or deployment outside the current site of the base station because all antennas, equipment cabinets and related equipment will be installed entirely on and within the existing building; or

(v) Otherwise defeat the existing concealment elements of the base station. AT&T's proposed antennae will use "stealth" canister design that is visually less obtrusive than the existing exposed, ballast-mounted antennae currently used for the Sprint facility. AT&T's canister design will integrate the proposed Facility into the existing equipment on the building roof. Therefore, AT&T's proposed Facility will remain aesthetically consistent with the exterior finish of the building, and feature improved concealment elements compared to the corresponding elements of the existing Sprint facility design.

VII. COMPLIANCE WITH THE CAMBRIDGE ZONING ORDINANCE

In the alternative, AT&T respectfully requests that the Board grant a special permit for the proposed Facility.[6]

A. AT&T complies with the Wireless Communications provisions set forth in Section 4.32(g)(1), and Section 4.40, Footnote 49 of the Ordinance.

AT&T's proposed Facility complies with Section 4.32(g)(1), and Section 4.40, Footnote 49 of the Ordinance as follows:[7]

Section 4.32(g)(1): Section 4.32(g)(1) of the Ordinance allows for the use of a "*[t]elephone exchange (including switching, relay, and transmission facilities serving mobile communications systems) and any towers or antennas accessory thereto."* Under the Table of Use Regulations beginning at Section 4.30, AT&T's proposed use of the Facility as a transmission facility serving a mobile communications system is permitted by special permit in the O-2 zoning district *(see* the table at Section 4.32(g)(1)).

Section 4.40, Footnote 49: Section 4.32(g)(1) includes a reference to Section 4.40, Footnote 49 which sets out the standards for granting the special permit. AT&T's proposed Facility complies with Footnote 49's standards as noted below:

[6] AT&T's request is made, if and to the extent necessary, with all rights reserved. As discussed above, the FCC Order establishes a 60-day period for receipt of all necessary approvals from the time of AT&T's submission, including a building permit, if required. 47 CFR §1.40001(c)(2). If the Request is not acted upon within the 60-day period, it is deemed granted. 47 CFR §1.40001(c)(4). Therefore, AT&T expressly reserves its rights under 47 CFR §1.40001(c)(2) and (4).

[7] To the extent that Section 4.32(g)(1), and Section 4.40, Footnote 49 of the Ordinance purport to require the submission of information that is beyond the scope permitted by the FCC Order or Spectrum Act, AT&T expressly reserves, and does not waive, its right to assert that such information is not required under the Spectrum Act and the submission of such information shall not constitute a waiver of AT&T's rights pursuant thereto.

1. **The Board of Zoning Appeal shall consider "[t]he scope of or limitations imposed by any license secured from any state or federal agency having jurisdiction over such matters."**

AT&T's Response: AT&T's FCC license is included with this application and the license information included shows that AT&T is authorized to provide wireless service at the bandwidth spectrums in the area to be served by the Facility (*see* Exhibit 2).

2. **The Board of Zoning Appeal shall consider "[t]he extent to which the visual impact of the various elements of the proposed facility is minimized: (1) through the use of existing mechanical elements on the building's roof or other features of the building as support and background, (2) through the use in materials that in texture and color blend with the materials to which the facilities are attached, or (3) other effective means to reduce the visual impact of the facility on the site."**

AT&T's Response: The design of the overall Facility, including the choice and placement of antennas and associated equipment on the building rooftop, minimizes the visual impact of the proposed Facility in that (i) the antennas on the building rooftop are proposed to be located with canisters that match existing equipment on the roof in both size and color, (ii) all other equipment will be within an equipment shelter that is painted to match existing equipment on the roof and blends with the existing characteristics, and proposed RRUs and cable trays will be placed on the rooftop floor so that they will not be seen from the street. The visual impact of the Facility is shown in the photographs of the existing roof and the photosimulations that superimpose the proposed Facility (*see* Exhibit 5).

3. **The Board of Zoning Appeal shall consider "[w]here it is proposed to erect such a facility in any residential zoning district, the extent to which there is a demonstrated public need for the facility at the proposed locations, the existence of alternative, functionally suitable sites in nonresidential locations, the character of the prevailing uses in the area, and the prevalence of other existing mechanical systems and equipment carried on or above the roof of nearby structures. The Board of Zoning Appeal shall grant a special permit to erect such a facility in a residential zoning district only upon finding that nonresidential uses predominate in the vicinity of the proposed facility's location and that the telecommunications facility is not inconsistent with the character that does prevail in the surrounding neighborhood.**

In granting a special permit the Board of Zoning Appeal shall set forth in its decision under which circumstances or procedures, if any, the permittee shall be allowed to replace and upgrade its equipment without the necessity of seeking a new special permit."

AT&T's Response: The O-2 district is not a residential zoning district, so the Board need not make any findings with respect to the predominance of non-residential uses in the vicinity of the Facility.

In any event, as shown in the Radio Frequency Report and the associated coverage maps, AT&T has demonstrated an immediate and compelling need for the Facility to be located at the Property in order to provide substantially improved indoor coverage to residents, businesses, travelers, and the general public in that area.[8] AT&T also seeks to substantially improve its ability to satisfy the ever-increasing need of its customers for data accessibility, navigation and use. AT&T proposes to accomplish this by including in the Facility the antennas and equipment that will provide the latest LTE wireless communications service technology.

As provided in Footnote 49, AT&T requests that once permission is received from the City to site the Facility at the Property, the Board permit AT&T to replace and upgrade the equipment at this Facility in the future without further zoning proceedings or a new special permit, provided that such equipment shall be in the same location and not substantially larger than equipment previously permitted.

B. <u>AT&T complies with the Special Permit Criteria set forth in Section 10.43 of the Ordinance</u>.

Section 10.43 of the Ordinance specifies the following criteria for issuance of a special permit: "Special permits will normally be granted where specific provisions of this Ordinance are met, except when particulars of the location or use, not generally true of the district or of the uses permitted in it, would cause granting of such permit to be to the detriment of the public interest because:

(a) The requirements of this Ordinance cannot or will not be met, or

<u>AT&T's Response</u>: As provided above, AT&T has met the requirements set forth in Section 4.32(g), Footnote 49 of the Ordinance.

(b) Traffic generated or patterns of access or egress would cause congestion, hazard, or substantial change in established neighborhood character for the following reasons, or

<u>AT&T's Response</u>: Given that the proposed Facility will be unmanned and only require infrequent visits by a technician (typically two times per month for routine diagnostics and/or maintenance, except in cases of emergency), there will be no material increase in traffic or disruption to patterns of access or egress that will cause congestion, hazards or a substantial change in the established neighborhood character. AT&T's maintenance personnel will make use of the existing access roads and parking at the building.

[8] AT&T must generate a signal strength of at least -74 dBm to provide serviceable voice and data coverage on its mobile wireless devices in indoor environments. AT&T also seeks to substantially improve its data navigation service coverage in the area by including antennas and equipment that will provide LTE service.

(c) The continued operation of or the development of adjacent uses as permitted in the Zoning Ordinance would be adversely affected by the nature of the proposed use, or

AT&T's Response: As described above and illustrated on the attached photograph simulations, the proposed Facility will produce a minimal change in the appearance of the building because the antennas and other aspects of the Facility will be designed and painted to match the existing rooftop equipment. As a result, the Facility will visually blend with existing characteristics of the building and the surrounding neighborhood. Because the proposed installation will not generate any traffic, smoke, dust, heat or glare, discharge noxious substances, nor pollute waterways or groundwater, it will not adversely affect adjacent commercial uses. Conversely, the surrounding properties and general public will benefit from the potential to enjoy improved wireless communications services.

(d) Nuisance or hazard would be created to the detriment of the health, safety and/or welfare of the occupant of the proposed use or the citizens of the City, or

AT&T's Response: Because the proposed Facility will not generate any traffic, smoke, dust, heat or glare, discharge noxious substances, nor pollute waterways or groundwater, no nuisance or hazard will be created to the detriment of the health, safety, or welfare of the occupants of the building or the residents of the City of Cambridge. To the contrary, the proposed Facility will benefit the City and promote the safety and welfare of its residents, businesses and drivers by providing reliable state-of-the-art digital wireless voice and data services that will improve the reliability of emergency communications with the police and fire departments by eliminating dropped or blocked calls due to inadequate signal strength or insufficient network capacity to handle call volume, particularly important during emergency situations. The proposed Facility will comply with all federal, state and local safety requirements including the standards established by the FCC and Federal Aviation Administration (FAA). (*See* Exhibit 8, Radio Frequency Safety Survey Report Prediction).

(e) For other reasons, the proposed installation would impair the integrity of the district or adjoining district or otherwise derogate from the intent or purpose of this Ordinance, or

AT&T's Response: The purpose of the Ordinance is multifaceted, the relevant aspects of which relating to wireless telecommunications facilities include the lessening of congestion in the streets, conserving health, securing safety from fire, flood, panic and other danger, conserving the value of land and buildings and natural resources, preventing blight and pollution, encouraging the most rational use of land throughout the city, including encouraging appropriate economic development, and protecting residential neighborhoods from incompatible activities.

As noted above, the proposed Facility directly accords with the purposes of the Ordinance because it will not generate any traffic, smoke, dust, heat or glare, discharge

noxious substances, nor pollute waterways or groundwater. As the Facility will improve the ability of residents, businesses, travelers and members of the general public in the area to access state-of-the-art wireless technology, the City's ability to provide emergency services will be improved, as will the economic development of the City as more people will be able to conduct commerce by virtue of a mobile platform. Because the proposed Facility will be installed on an existing building that already houses the existing Nextel facility, the proposed Facility does not affect the value of the building nor natural resources of the City. Finally, because the proposed Facility visually is designed to blend with the existing characteristics of the Property, the visual impact on the underlying and adjacent zoning districts is minimal so the Facility is consistent with the Ordinance's purpose to allow for less intrusive wireless telecommunications facilities in all districts (other than Open Space) including the Residence O-2 zoning district.

(f) The new use or building construction is inconsistent with the Urban Design Objectives set forth in Section 19.30

AT&T's Response: As stated in the Section 19.30, the Citywide Urban Design Objectives ("Objectives") "are intended to provide guidance to property owners and the general public as to the city's policies with regard to the form and character desirable for new development in the city. It is understood that application of these principles can vary with the context of specific building proposals in ways that, nevertheless, fully respect the policies' intent. It is intended that proponents of projects, and city staff, the Planning Board and the general public, where public review or approval is required, should be open to creative variations from the detailed provisions presented in this Section as long as the core values expressed are being served. ***A project need not meet all the objectives of this Section 19.30 where this Section serves as the basis for issuance of a special permit. Rather the permit granting authority shall find that on balance the objectives of the city are being served.*** Nor shall a project subject to special permit review be required to conform to the Required Building and Site Plan Requirements set forth in Section 11.50." [emphasis added]. *For the reasons stated in AT&T's response to this Section 10.43(f) of the Zoning Ordinance and in its application generally, "on balance, the objectives of the city are being served" by the installation of the proposed Facility at the Property so that granting the special permit would not be a detriment to the public interest and is consistent with the Board's obligations pursuant to the Spectrum Act and FCC Order*.

The following are the Objectives' headings as appearing in the Ordinance:

19.31: New projects should be responsive to the existing or anticipated pattern of development.

AT&T's Response: The proposed Facility is located on the rooftop of an existing commercial building, the visibility of which blends with the structures and colors of the building that already hosts a similar facility of another wireless carrier. The proposed Facility is consistent with the previously approved design and concealment elements of the existing Facility. The proposed Facility therefore is responsive to the existing pattern of development in the Property's applicable zoning district.

19.32: Development should be pedestrian and bicycle-friendly, with a positive relationship to its surroundings.

AT&T's Response: The proposed Facility is located on the rooftop of an existing commercial building, access to which will be made only by AT&T's maintenance contractors monthly and will not be made by the general public. Therefore, there will be no change in traffic patterns in the vicinity of the Property that would affect pedestrian flow or cyclists' access to the building or surrounding areas within the Property's applicable zoning districts.

19.33 The building and site design should mitigate adverse environmental impacts of a development upon its neighbors. Indicators include[4]

(1) Mechanical equipment that is carefully designed, well organized or visually screened from its surroundings and is acoustically buffered from neighbors. Consideration is given to the size, complexity and appearance of the equipment, its proximity to residential areas, and its impact on the existing streetscape and skyline. The extent to which screening can bring order, lessen negative visual impacts, and enhance the overall appearance of the equipment should be taken into account. More specifically:

(a) Reasonable attempts have been made to avoid exposing rooftop mechanical equipment to public view from city streets. Among the techniques that might be considered are the inclusion of screens or a parapet around the roof of the building to shield low ducts and other equipment on the roof from view.

(b) Treatment of the mechanical equipment (including design and massing of screening devices as well as exposed mechanical elements) that relates well to the overall design, massing, scale and character of the building.

(c) Placement of mechanical equipment at locations on the site other than on the rooftop (such as in the basement), which reduces the bulk of elements located on the roof; however, at-grade locations external to the building should not be viewed as desirable alternatives.

(d) Tall elements, such as chimneys and air exhaust stacks, which are typically carried above screening devices for functioning reasons, are carefully designed as features of the building, thus creating interest on the skyline.

(e) All aspects of the mechanical equipment have been designed with attention to their visual impact on adjacent areas, particularly with regard to residential neighborhoods and views and vistas.

4 Inasmuch as Section 19.33 is most relevant to the proposed Facility, it is stated here in full.

AT&T's Response: As shown in the photosimulations, the proposed Facility is visually consistent with the color of the building rooftop and the existing facility's equipment. Accordingly, the antennas all will visually blended by housed within canisters that will match the building's existing rooftop equipment in size and color. In addition, the placement of cabling will be along the floor or just above the floor of the rooftop, and all proposed equipment will be housed within the a rooftop shelter that will be designed and painted to match existing generators and equipment rooms on the roof. Given that the design will remain consistent with the current rooftop characteristic of the Property and surrounding buildings, AT&T's proposed Facility is in keeping with the building's existing features without adversely affecting the building's overall design, massing, scale or character.

(2) Trash that is handled to avoid impacts (noise, odor, and visual quality) on neighbors, e.g. the use of trash compactors or containment of all trash storage and handling within a building is encouraged.

AT&T's Response: The proposed Facility will not generate trash, so this design objective is inapplicable.

(3) Loading docks that are located and designed to minimize impacts (visual and operational) on neighbors.

AT&T's Response: The proposed Facility will not utilize any loading dock, so this design objective is inapplicable.

(4) Stormwater Best Management Practices and other measures to minimize runoff and improve water quality are implemented.

AT&T's Response: Neither the proposed Facility's installation nor its operation will affect stormwater runoff, so this design objective is inapplicable.

(5) Landscaped areas and required Green Area Open Space, in addition to serving as visual amenities, are employed to reduce the rate and volume of stormwater runoff compared to pre-development conditions.

AT&T's Response: Inasmuch as the proposed Facility is a rooftop installation that will not affect any landscaped or Green Area Open Space, this design objective is inapplicable.

(6) The structure is designed and sited to minimize shadow impacts on neighboring lots, especially shadows that would have a significant impact on the use and enjoyment of adjacent open space and shadows that might impact the operation of a Registered Solar Energy System as defined in Section 22.60 of this Zoning Ordinance.

AT&T's Response: While **t**he proposed Facility will include a proposed equipment shelter on the roof, rooftop antennas within canisters and other equipment will be

substantially similar to the existing equipment used by Sprint's facility on the roof, so the proposed Facility will not have shadow impacts on neighboring lots.

(7) Changes in grade across the lot are designed in ways that minimize the need for structural retaining walls close to property lines.

AT&T's Response: The proposed Facility will not change any grade respecting the Property, so this design objective is inapplicable.

(8) Building scale and wall treatment, including the provision of windows, are sensitive to existing residential uses on adjacent lots.

AT&T's Response: The proposed Facility will not change the building's scale or wall treatment. Given that the antennas will be located on the rooftop and not directly mounted on the fascade, any visual impact will be minimal.

(9) Outdoor lighting is designed to provide minimum lighting and necessary to ensure adequate safety, night vision, and comfort, while minimizing light pollution.

AT&T's Response: The proposed Facility will not use any outdoor lighting except localized lighting for nighttime repairs, so this design objective is inapplicable.

(10) The creation of a Tree Protection Plan that identifies important trees on the site, encourages their protection, or provides for adequate replacement of trees lost to development on the site.

AT&T's Response: The proposed Facility will not affect any trees at the Property, so this design objective is inapplicable.

19.34: Projects should not overburden the City infrastructure services, including neighborhood roads, city water supply system, and sewer system.

AT&T's Response: Operation of the proposed Facility is a passive use and will not generate trash, odor, excess noise, or utilize water or wastewater services. As such, it will not burden the City's infrastructure services.

19.35: New construction should reinforce and enhance the complex urban aspects of Cambridge as it has developed historically.

AT&T's Response: Given the proposed Facility's installation on an existing building that already houses the wireless facility of another wireless carrier and the efforts to ensure the visual blending of the proposed Facility with the existing structures and colors building's rooftop, the proposed Facility will reinforce the existing Cambridge landscape as it currently exists at the Property.

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19.36: Expansion of the inventory of housing in the city is encouraged.

AT&T's Response: Inasmuch as the proposed Facility will provide wireless services to AT&T's customers, it will have no effect on the City's housing inventory.

19.37. Enhancement and expansion of open space amenities in the city should be incorporated into new development in the city.

AT&T's Response: Given the proposed Facility's installation on an existing commercial building, the proposed Facility will not affect open space amenities in that no existing open space will be used in the project.

SUMMARY

For the foregoing reasons AT&T respectfully requests that the Board determine that pursuant to the Spectrum Act and the FCC Order, the Request constitutes an eligible facilities request and therefore AT&T's Request must be approved administratively, including the issuance of a building permit, without the need for further relief from the Board.

In the alternative, without waiving its rights, AT&T requests the Board grant the foregoing zoning relief in the form of a Special Permit and such other relief as the Board deems necessary to allow the modification and operation of AT&T's proposed Facility.

Best Regards,

/s/ *Alex Murshteyn*

Alex Murshteyn
Authorized Agent to New Cingular Wireless PCS, LLC ("AT&T")

cc: Jonathan Elder, Esq.

EXHIBIT 1-A

BZA APPLICATION FORM

GENERAL INFORMATION

The undersigned hereby petitions the Board of Zoning Appeal for the following:

Special Permit: X **Variance:** _____ **Appeal:** _____

PETITIONER: AT&T c/o Alex Murshteyn, Centerline Communications

PETITIONER'S ADDRESS: 750 West Center St., Suite #301, West Bridgewater, MA 02379

LOCATION OF PROPERTY: 238 Main St.

TYPE OF OCCUPANCY: RETAIL-OFFICE **ZONING DISTRICT:** C-3B; Overlay Districts- MXR, MIT

REASON FOR PETITION:

_____ Additions	_____ New Structure
_____ Change in Use/Occupancy	_____ Parking
_____ Conversion to Addi'l Dwelling Unit's	_____ Sign
_____ Dormer	_____ Subdivision
X Other: Wireless Communications	

DESCRIPTION OF PETITIONER'S PROPOSAL:

AT&T proposes to add twelve (12) antennas on the building's rooftop. Antennas will be housed within six (6) faux flue pipe canisters designed and painted to match the existing pipes on the roof. AT&T's other rooftop equipment will be housed within the proposed 8'x8' walk-in-cabinet on steel frame, along with the attached space for a generator. See latest plans attached.

SECTIONS OF ZONING ORDINANCE CITED:

Article 4 Section 4.32 (g) (1) and 4.40(49)

Article 10 Section 10.40-10.46

Article _____ Section _____

Applicants for a **Variance** must complete Pages 1-5
Applicants for a **Special Permit** must complete Pages 1-4 and 6
Applicants for an **Appeal** to the BZA of a Zoning determination by the Inspectional Services Department must attach a statement concerning the reasons for the appeal

Original Signature(s): _____
(Petitioner(s)/Owner)

_____
(Print Name)

Address: _____

_____

Tel. No.: _____

E-Mail Address: _____

Date: _____

EXHIBIT 2

http://wireless2.fcc.gov/UlsApp/UlsSearch/license.jsp?licKey=8893

Universal Licensing System

ULS License

PCS Broadband License - KNLF216 - New Cingular Wireless PCS, LLC

This license has pending applications: 0002158279

Call Sign	KNLF216	Radio Service	CW - PCS Broadband
Status	Active	Auth Type	Regular
Market			
Market	MTA008 - Boston-Providence	Channel Block	A
Submarket	11	Associated Frequencies (MHz)	1850.00000-1865.00000 1930.00000-1945.00000
Dates			
Grant	06/23/1995	Expiration	06/23/2005
Effective	10/28/2004	Cancellation	
Buildout Deadlines			
1st	06/23/2000	2nd	06/23/2005
Notification Dates			
1st	06/28/2000	2nd	03/08/2005

Licensee

Licensee ID SGIN	L00024153000	FRN	0003291192 (View Ownership)	Type	Corporation

Licensee

New Cingular Wireless PCS, LLC 17330 Preston Road, Suite 100A Dallas, TX 75252	P:(972)733-2092 F:(972)733-8141

ATTN Kellye E. Abernathy	

Contact

Cingular Wireless LLC Kellye E Abernathy Esq 17330 Preston Road, Suite 100A Dallas, TX 75252	P:(972)733-2092 F:(972)733-8141

Qualifications, Ownership, and Demographics

Radio Service Type	Mobile		
Regulatory Status	Common Carrier	Interconnected	Yes

Alien Ownership
The Applicant answered "No" to each of the Alien Ownership questions.

Basic Qualifications

Has the Applicant or any party to this application or amendment had any FCC station authorization, license, or construction permit revoked or had any application for an initial, modification or renewal of FCC station authorization, license, construction permit denied by the Commission?	No
Has the Applicant or any party to this application or amendment, or any party directly or indirectly controlling the Applicant, ever been convicted of a felony by any state or federal court?	No
Has any court finally adjudged the Applicant or any party directly or indirectly controlling the Applicant guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement, or any other means or unfair methods of competition?	No
Is the Applicant or any party directly or indirectly controlling the Applicant, currently a party in any pending matter referred to in the preceding two items?	**Yes**

Tribal Land Bidding Credits
This license did not have tribal land bidding credits.

Race			
Hispanic/Latino		Gender	

http://wireless2.fcc.gov/UlsApp/UlsSearch/license.jsp?licKey=12925

Universal Licensing System

ULS License

Cellular License - KNKA226 - ORANGE LICENSES HOLDING, LLC

HELP

New Search | Refine Search | Return to Results | Printable Page | Reference Copy | Map License

MAIN | ADMIN | LOCATIONS

Call Sign	KNKA226	Radio Service	CL - Cellular
Status	Active	Auth Type	Regular
Market			
Market	CMA006 - Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH	Channel Block	A (View Frequencies)
Submarket	0	Phase	2
Dates			
Grant	10/05/2004	Expiration	10/01/2014
Effective	01/20/2005	Cancellation	
Five Year Buildout Date			
06/28/1999			
Control Points			
2	100 LOWDER BROOK DR, NORFOLK, WESTWOOD, MA P: (617)462-7094		

Licensee					
Licensee ID SGIN	L00963843 000	FRN	0012362919 (View Ownership)	Type	Limited Liability Corporation
Licensee					
ORANGE LICENSES HOLDING, LLC 17330 PRESTON ROAD, SUITE 100A DALLAS, TX 75252 ATTN KELLYE E. ABERNATHY			P:(972)733-2092 F:(972)733-8141		

Contact	
CINGULAR WIRELESS LLC DAVID G RICHARDS 5565 GLENRIDGE CONNECTOR, SUITE 1700 ATLANTA, GA 30342	P:(404)236-5543 F:(404)236-5575

Qualifications, Ownership, and Demographics			
Radio Service Type	Mobile		
Regulatory Status	Common Carrier	Interconnected	Yes

Alien Ownership
The Applicant answered "No" to each of the Alien Ownership questions.

Basic Qualifications	
Has the Applicant or any party to this application or amendment had any FCC station authorization, license, or construction permit revoked or had any application for an initial, modification or renewal of FCC station authorization, license, construction permit denied by the Commission?	No
Has the Applicant or any party to this application or amendment, or any party directly or indirectly controlling the Applicant, ever been convicted of a felony by any state or federal court?	No
Has any court finally adjudged the Applicant or any party directly or indirectly controlling the Applicant guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement, or any other means or unfair methods of competition?	No
Is the Applicant or any party directly or indirectly controlling the Applicant, currently a party in any pending matter referred to in the preceding two items?	**Yes**

Race			
Hispanic/Latino		Gender	

ULS Help	ULS Glossary - FAQ - Online Help - Technical Support - Licensing Support
ULS Online Systems	CORES/Call Sign Registration - ULS Online Filing - License Search - Application Search
About ULS	Privacy Statement - About ULS - ULS Home
Basic Search	By Call Sign = SEARCH

ULS License

PCS Broadband License - WPOI214 - New Cingular Wireless PCS, LLC

Call Sign	WPOI214	Radio Service	CW - PCS Broadband
Status	Active	Auth Type	Regular

Market

Market	MTA008 - Boston-Providence	Channel Block	A
Submarket	7	Associated Frequencies (MHz)	001850.00000000-001865.00000000 001930.00000000-001945.00000000

Dates

Grant	07/07/2005	Expiration	06/23/2015
Effective	09/27/2005	Cancellation	

Buildout Deadlines

1st	06/23/2000	2nd	06/23/2005

Notification Dates

1st	07/06/2000	2nd	03/08/2005

Licensee

FRN	0003291192	Type	Limited Liability Company

Licensee

New Cingular Wireless PCS, LLC
5601 LEGACY DRIVE, MS: A-3
PLANO, TX 75024
ATTN FCC GROUP

P:(469)229-7422
F:(469)229-7297
E:KELLYE.E.ABERNATHY@CINGULAR.COM

Contact

Cingular Wireless LLC
Kellye E Abernathy Esq
5601 LEGACY DRIVE, MS: A-3
PLANO, TX 75024

P:(469)229-7422
F:(469)229-7297
E:KELLYE.E.ABERNATHY@CINGULAR.COM

Ownership and Qualifications

Radio Service Type	Mobile		
Regulatory Status	Common Carrier	Interconnected	Yes

Alien Ownership
The Applicant answered "No" to each of the Alien Ownership questions.

ULS License

700 MHz Lower Band (Blocks C, D) License - WPWU950 - AT&T Mobility Spectrum LLC

Call Sign	WPWU950	Radio Service	WZ - 700 MHz Lower Band (Blocks C, D)
Status	Active	Auth Type	Regular

Market

Market	CMA006 - Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH	Channel Block	C
Submarket	0	Associated Frequencies (MHz)	000710.00000000-000716.00000000 000740.00000000-000746.00000000

Dates

Grant	01/24/2003	Expiration	06/13/2019
Effective	08/17/2016	Cancellation	

Buildout Deadlines

1st	06/13/2019	2nd	

Notification Dates

1st		2nd	

Licensee

FRN	0014980726	Type	Limited Liability Company

Licensee

AT&T Mobility Spectrum LLC
3300 E. Renner Road, B3132
Richardson, TX 75082
ATTN Leslie A. Wilson

P:(855)699-7073
F:(972)907-1131
E:FCCMW@att.com

Contact

AT&T Mobility LLC
Michael P Goggin
1120 20th Street, NW - Suite 1000
Washington, DC 20036
ATTN Michael P. Goggin

P:(202)457-2055
F:(202)457-3073
E:michael.p.goggin@att.com

Ownership and Qualifications

Radio Service Type	Fixed, Mobile, Radio Location		
Regulatory Status	Common Carrier, Non-Common Carrier, Private Comm	Interconnected	Yes

ULS License

700 MHz Lower Band (Blocks C, D) License - WPZA235 - AT&T Mobility Spectrum LLC

Call Sign	WPZA235	Radio Service	WZ - 700 MHz Lower Band (Blocks C, D)
Status	Active	Auth Type	Regular

Market

Market	EAG701 - Northeast	Channel Block	D
Submarket	0	Associated Frequencies (MHz)	000716.00000000-000722.00000000

Dates

Grant	12/11/2003	Expiration	06/13/2019
Effective	02/12/2014	Cancellation	

Buildout Deadlines

1st	06/13/2019	2nd	

Notification Dates

1st		2nd	

Licensee

FRN	0014980726	Type	Limited Liability Company

Licensee

AT&T Mobility Spectrum LLC
3300 E. Renner Road, B3132
Richardson, TX 75082
ATTN Reginald Youngblood

P:(855)699-7073
F:(972)907-1131
E:FCCMW@att.com

Contact

AT&T Mobility LLC
Michael P Goggin
1120 20th Street, NW - Suite 1000
Washington, DC 20036
ATTN Michael P. Goggin

P:(202)457-2055
F:(202)457-3073
E:michael.p.goggin@att.com

Ownership and Qualifications

Radio Service Type	Fixed, Mobile		
Regulatory Status	Non-Common Carrier	Interconnected	No

Alien Ownership
The Applicant answered "No" to each of the Alien Ownership questions.

ULS License

PCS Broadband License - WPZY689 - NEW CINGULAR WIRELESS PCS, LLC

Call Sign	WPZY689	Radio Service	CW - PCS Broadband
Status	Active	Auth Type	Regular

Market

Market	BTA051 - Boston, MA	Channel Block	C
Submarket	2	Associated Frequencies (MHz)	001895.00000000-001910.00000000 001975.00000000-001990.00000000

Dates

Grant	02/28/2007	Expiration	01/03/2017
Effective	02/08/2007	Cancellation	

Buildout Deadlines

1st	12/07/2003	2nd	01/03/2007

Notification Dates

1st	01/30/2002	2nd	12/22/2006

Licensee

FRN	0003291192	Type	Limited Liability Company

Licensee

NEW CINGULAR WIRELESS PCS, LLC
5601 LEGACY DRIVE, MS: A-3
PLANO, TX 75024
ATTN KELLYE E. ABERNATHY

P:(469)229-7422
F:(469)229-7297
E:KELLYE.E.ABERNATHY@CINGULAR.COM

Contact

AT&T MOBILITY LLC
DAVID C JATLOW
11760 US HIGHWAY 1
NORTH PALM BEACH, FL 33408

P:(202)255-1679
F:(561)279-2097
E:DAVID.JATLOW@CINGULAR.COM

Ownership and Qualifications

Radio Service Type	Mobile		
Regulatory Status	Common Carrier	Interconnected	Yes

Alien Ownership
The Applicant answered "No" to each of the Alien Ownership questions.

ULS License

700 MHz Lower Band (Blocks A, B & E) License - WQIZ616 - AT&T Mobility Spectrum LLC

HELP

New Search | Printable Page | Reference Copy | Map License

MAIN | ADMIN | MARKET | LEASES

Call Sign	WQIZ616	Radio Service	WY - 700 MHz Lower Band (Blocks A, B & E)
Status	Active	Auth Type	Regular
Market			
Market	BEA003 - Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH-RI-VT	Channel Block	E
Submarket	0	Associated Frequencies (MHz)	000722.00000000-000728.00000000
Dates			
Grant	06/26/2008	Expiration	03/07/2021
Effective	02/12/2014	Cancellation	
Buildout Deadlines			
1st	03/07/2017	2nd	03/07/2021
Notification Dates			
1st		2nd	

Licensee			
FRN	0014980726 (View Ownership Filing)	Type	Limited Liability Company
Licensee			
AT&T Mobility Spectrum LLC 3300 E. Renner Road, B3132 Richardson, TX 75082 ATTN Reginald Youngblood		P:(855)699-7073 F:(972)907-1131 E:FCCMW@att.com	

Contact			
AT&T Mobility LLC Michael P Goggin 1120 20th Street, NW - Suite 1000 Washington, DC 20036 ATTN Michael P. Goggin		P:(202)457-2055 F:(202)457-3073 E:michael.p.goggin@att.com	

Ownership and Qualifications			
Radio Service Type	Fixed, Mobile		
Regulatory Status	Non-Common Carrier, Private Comm	Interconnected	No
Alien Ownership The Applicant answered "No" to each of the Alien Ownership questions.			
Basic Qualifications The Applicant answered "No" to each of the Basic Qualification questions.			
Tribal Land Bidding Credits This license did not have tribal land bidding credits.			

Demographics			
Race			
Ethnicity		Gender	

ULS License

700 MHz Lower Band (Blocks A, B & E) License - WQJU427 - AT&T Mobility Spectrum LLC

Call Sign	WQJU427	Radio Service	WY - 700 MHz Lower Band (Blocks A, B & E)
Status	Active	Auth Type	Regular

Market

Market	CMA006 - Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH	Channel Block	B
Submarket	0	Associated Frequencies (MHz)	000704.00000000-000710.00000000 000734.00000000-000740.00000000

Dates

Grant	01/06/2009	Expiration	06/13/2019
Effective	07/30/2016	Cancellation	

Buildout Deadlines

1st	12/13/2016	2nd	06/13/2019

Notification Dates

1st	10/30/2012	2nd	10/30/2012

Licensee

FRN	0014980726	Type	Limited Liability Company

Licensee

AT&T Mobility Spectrum LLC
3300 E. Renner Road, B3132
Richardson, TX 75082
ATTN Leslie A. Wilson

P:(855)699-7073
F:(972)907-1131
E:FCCMW@att.com

Contact

AT&T Mobility LLC
Michael P Goggin
1120 20th Street, NW - Suite 1000
Washington, DC 20036
ATTN Michael P. Goggin

P:(202)457-2055
F:(202)457-3073
E:michael.p.goggin@att.com

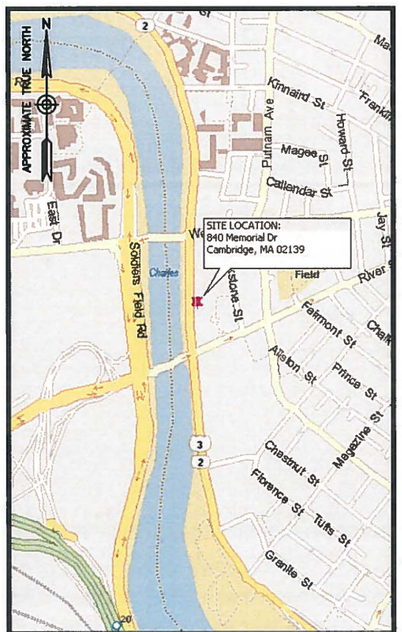
Ownership and Qualifications

Radio Service Type	Mobile		
Regulatory Status	Common Carrier	Interconnected	Yes

Alien Ownership
The Applicant answered "No" to each of the Alien Ownership questions.

EXHIBIT 3

CAMBRIDGE PUTNAM AVE a/k/a
18 BLACKSTONE STREET
SITE NO.: MA2881
840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139



LOCUS MAP

TAKE I-90 E. KEEP RIGHT AT FORK AND MERGE ONTO I-90 E. TAKE EXIT 18 ON THE LEFT TOWARD CAMBRIDGE. SLIGHT LEFT ONTO CAMBRIDGE ST. TURN LEFT ONTO MEMORIAL DR. THE SITE WILL BE ON THE RIGHT

ENGINEER
DEWBERRY ENGINEERS INC.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210

PHONE # (617) 695-3400
FAX # (617) 695-3310

CONTACT: BENJAMIN REVETTE, P.E.

SITE ACQUISITION
CENTERLINE COMMUNICATIONS
95 RYAN DRIVE
SUITE 1
RAYNHAM, MA 02767

PHONE # (508) 821-6509

CONSULTANT TEAM

SITE NAME:
CAMBRIDGE PUTNAM AVENUE

SITE NUMBER:
MA2881

PROPERTY OWNER:
RIVERTECH ASSOCIATES LLC.
C/O ABBEY GROUP
177 HUNTINGTON AVE
FLOOR 24
BOSTON, MA 02115

APPLICANT/DEVELOPER:
AT&T MOBILITY
550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

ELECTRIC UTILITY:
EVERSOURCE
(888) 633-3797

TELEPHONE UTILITY:
VERIZON
(800)-837-4966

COORDINATES*
LATITUDE: 42° 21' 47.11" N (NAD83)
LONGITUDE: 71° 06' 55.47" W (NAD83)
*PER FAA-1A

PROJECT SUMMARY

SITE ADDRESS:
840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

ZONING CLASSIFICATION:
(O-2) OFFICE - 2

PROJECT DIRECTORY

THE SITE WILL CONSIST OF MOUNTING (3) SECTORS OF ANTENNAS CONCEALED INSIDE FIBERGLASS CANISTERS ON PROPOSED STEEL MOUNTS (4 ANTENNAS/SECTOR) (2 CANISTER/SECTOR). A 8'X8' WALK IN CABINET (WIC) WITH A 15KW NATURAL GAS GENERATOR WILL BE INSTALLED ON THE ROOF. UTILITIES WILL COME FROM EXISTING SOURCES LOCATED WITHIN THE BUILDING.

PROJECT DESCRIPTION

	DATE
CENTERLINE CM	
AT&T CM	
AT&T RF	

APPROVALS

THIS DOCUMENT WAS DEVELOPED TO REFLECT A SPECIFIC SITE AND ITS SITE CONDITIONS AND IS NOT TO BE USED FOR ANOTHER SITE OR WHEN OTHER CONDITIONS PERTAIN. REUSE OF THIS DOCUMENT IS AT THE SOLE RISK OF THE USER.

A.D.A. COMPLIANCE:
FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION.

SHT. NO.	DESCRIPTION
T-1	TITLE SHEET
Z-1	ABUTTERS PLAN
Z-2	ROOF PLAN
Z-3	DETAILED ROOF PLAN
Z-4	EAST & WEST ELEVATIONS
Z-5	CONCEPTUAL ANTENNA DETAILS

SHEET INDEX

at&t Mobility
550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS
95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS

1	01/23/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry
Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
PHONE: 617.695.3400
FAX: 617.695.3310

COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

DRAWN BY:	JG
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50093723
JOB NUMBER:	50096257
SITE ADDRESS	

840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

TITLE SHEET

SHEET NUMBER

T-1

ABUTTERS LIST		
N/F*		
MAP/LOT PROPERTY ADDRESS	RECORD OWNER	MAILING ADDRESS
129-47 24 BLACKSTONE ST	PRESIDENT & FELLOWS OF HARVARD COLLEGE C/O GENERAL COUNSEL HOLYOKE CENTER RM	1390 MASSACHUSETTS AVE CAMBRIDGE, MA 02138
129-11 237 PUTNAM AVE	BSS LL, LLC	280 PARK AVENUE NEW YORK, NY 10017
129-59 2 BLACKSTONE ST	CITY OF CAMBRIDGE	795 MASSACHUSETTS AVE CAMBRIDGE, MA 02138
129-54 217-227 PUTNAM AVE	CONDOMINIUM (OWNER'S LIST TO BE SUBMITTED UNDER SEPARATE COVER)	217-229 PUTNAM AVE CAMBRIDGE, MA 02138
*ABUTTER INFORMATION LISTED AS NOW OR FORMERLY AS OF 10/30/17. INFORMATION OBTAINED FROM CITY OF CAMBRIDGE ONLINE GIS DATA SYSTEM.		

PER SECTION 5.32 OF CAMBRIDGE ZONING REGULATIONS

SETBACK CALCULATIONS:

FRONT (BLACKSTONE ST.): $\frac{H+L}{4}$ =

$\frac{78'+129'}{4}$ = 51.8'

REAR (MEMORIAL DR.): $\frac{H+L}{4}$ =

$\frac{78'+129'}{4}$ = 51.8'

SIDE: $\frac{H+L}{5}$ =

$\frac{78'+255'}{5}$ = 66.6'

ZONING REQUIREMENTS

ZONING DISTRICT: OFFICE 2

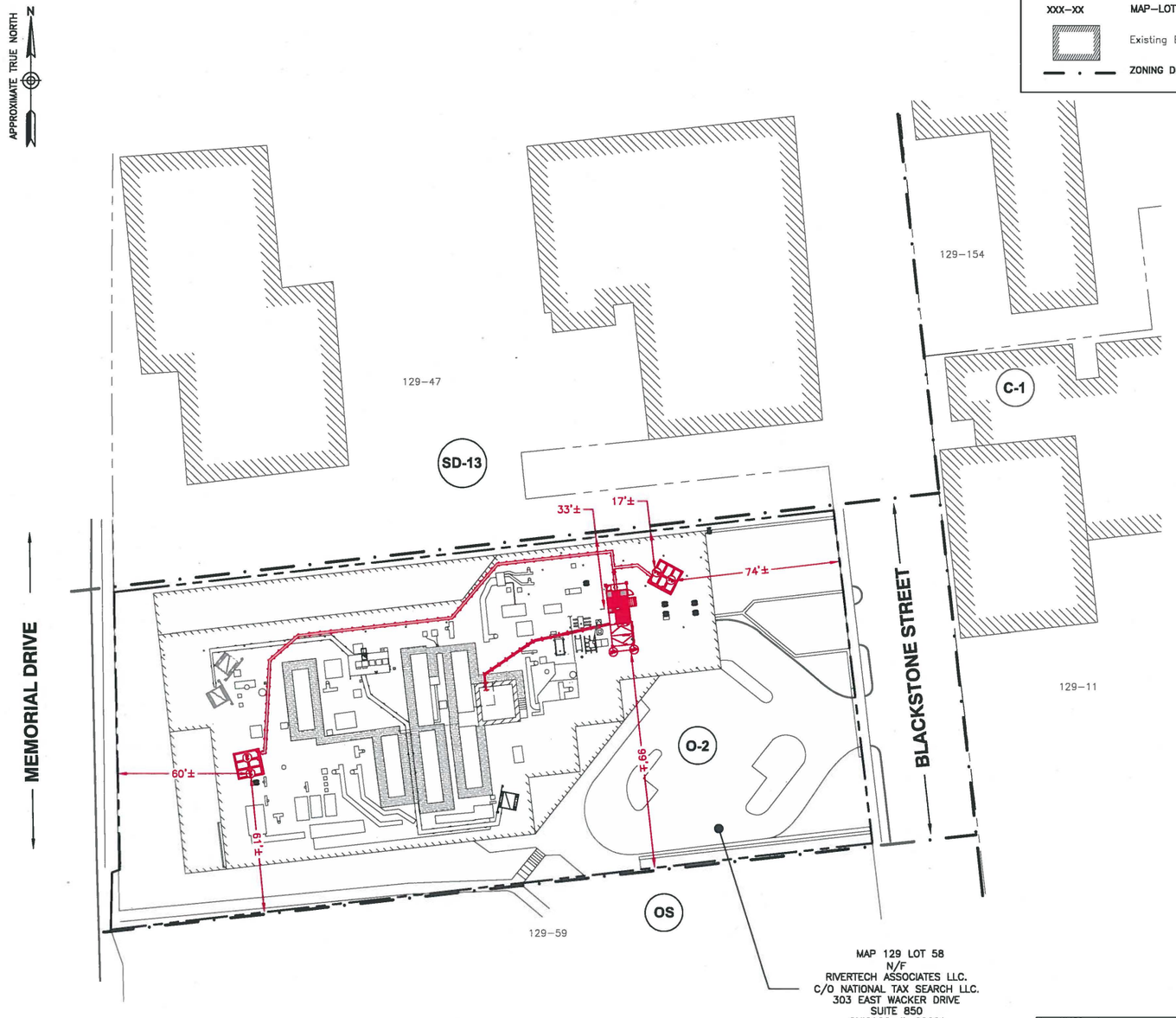
SETBACK:	REQUIREMENT:	PROPOSED*:
ANTENNA FRONT YARD MINIMUM (BLACKSTONE ST.)	51.8'	74'±
ANTENNA REAR YARD MINIMUM (MEMORIAL DR.)	51.8'	60'±
ANTENNA SIDE YARD MINIMUM	66.6'	17'±

*APPROXIMATE DISTANCE FROM PROPERTY LINE TO CLOSEST PROPOSED ANTENNA

NOTES:

1. PLOT PLAN BASED ON ONLINE ASSESSOR'S INFORMATION OBTAINED FROM THE CITY OF CAMBRIDGE GIS DATABASE ON 10/30/17 AND HAVE NOT VERIFIED THROUGH GROUND SURVEY.
2. SOME PROPOSED AND EXISTING INFORMATION NOT SHOWN FOR CLARITY.
3. NORTH ARROW SHOWN AS APPROXIMATE.
4. SETBACKS ARE TAKEN FROM THE CLOSEST POINT OF ANTENNAS AND WALK IN CABINET (WIC) TO PROPERTY LINES.
5. DOCUMENT IS FOR ZONING PURPOSES ONLY, NOT FOR CONSTRUCTION.

APPROXIMATE TRUE NORTH



ABUTTERS PLAN (1)
SCALE: 1"=60' FOR 11"x17"
1"=30' FOR 22"x34"

0' 30' 60'

ZONING DISTRICTS	
C-1	RESIDENCE C-1
O-2	OFFICE - 2
OS	OPEN SPACE
SD-13	SPECIAL DISTRICT - 13

at&t Mobility
550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS
95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS		
1	01/23/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry®
Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
PHONE: 617.336.7900
FAX: 617.336.7910

COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

DRAWN BY:	JG
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50093723
JOB NUMBER:	50096257
SITE ADDRESS	

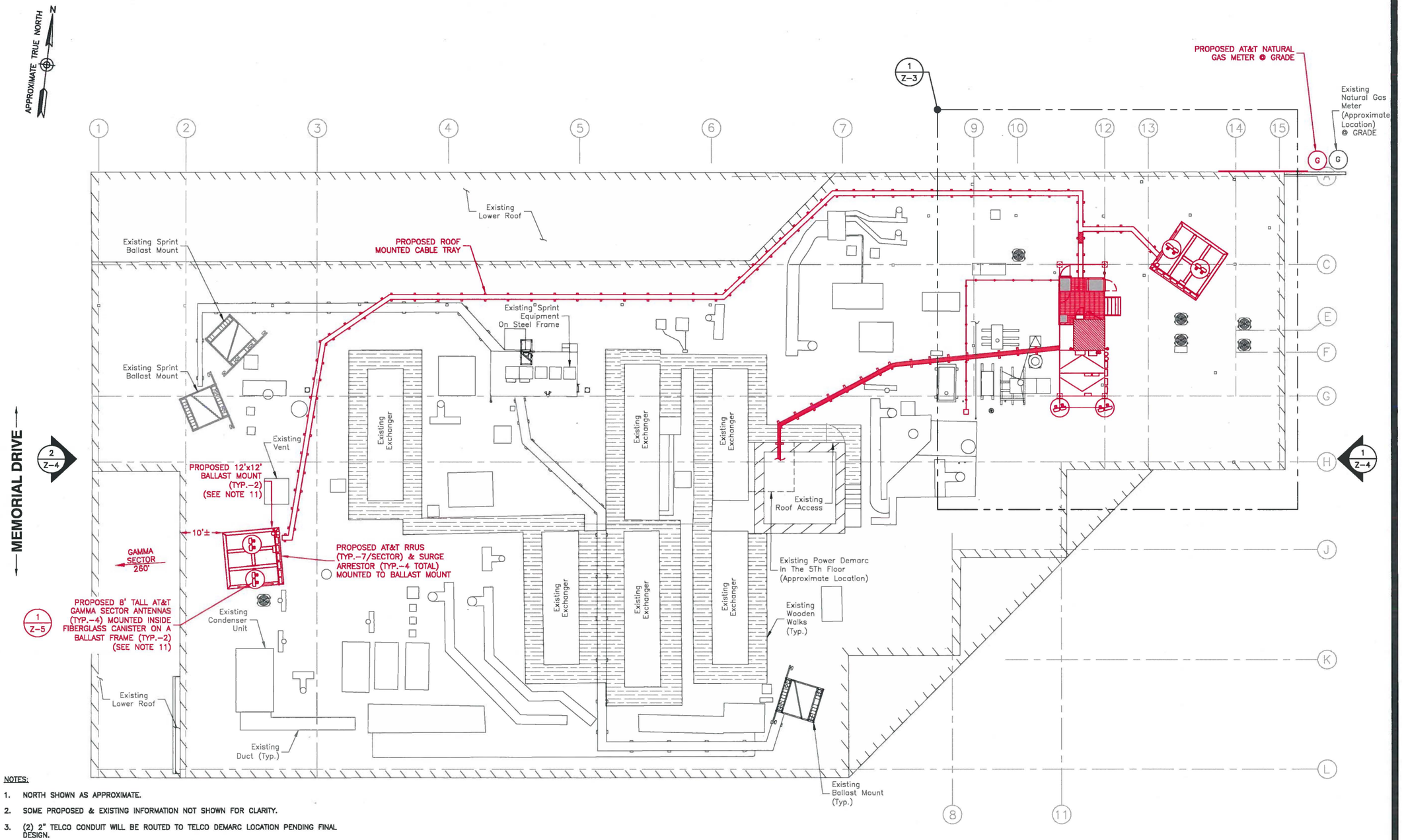
840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

ABUTTERS PLAN

SHEET NUMBER

Z-1



NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. SOME PROPOSED & EXISTING INFORMATION NOT SHOWN FOR CLARITY.
3. (2) 2" TELCO CONDUIT WILL BE ROUTED TO TELCO DEMARC LOCATION PENDING FINAL DESIGN.
4. GROUND WILL BE TO STREET SIDE BASEMENT WATER MAIN.
5. SHELTER IS TO BE TIED INTO THE BUILDING ALARM SYSTEM AT THE CLOSEST POINT.
6. PROPOSED INSTALLATION INCLUDES A BACKUP 15KW DC NATURAL GAS GENERATOR LOCATED OUTSIDE THE PREFABRICATED WALK IN CABINET (WIC).
7. ZONING DRAWINGS BASED ON DRAWINGS BY DEWBERRY ENGINEERS INC. DATED 04/21/14 & EXISTING DRAWINGS PROVIDED BY THE BUILDING OWNER.
8. VERTICAL NATURAL GAS RUN INSIDE BUILDING PENDING FINAL DESIGN.
9. WALK IN CABINET, MODEL# DOOR & LAYOUT, WEIGHT PENDING FINAL DESIGN.
10. PROPOSED LOCATIONS ARE CONCEPTUAL AND FOR ZONING PURPOSES ONLY. NOT FOR CONSTRUCTION.
11. ANTENNA AND EQUIPMENT SHALL BE INSTALLED PER STRUCTURAL ANALYSIS BY DEWBERRY ENGINEERS INC. VO DATED 01/16/18.

ROOF PLAN 1

SCALE: 3/64"=1' FOR 11"x17"
3/32"=1' FOR 22"x34"

0' 8' 16' 24'

LEGEND

- Existing Wooden Walks
- Column Grid Lines

at&t Mobility

550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS

95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS		
1	01/23/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry

Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
PHONE: 617.695.3400
FAX: 617.695.3310

COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

DRAWN BY:	JG
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50093723
JOB NUMBER:	50096257
SITE ADDRESS	

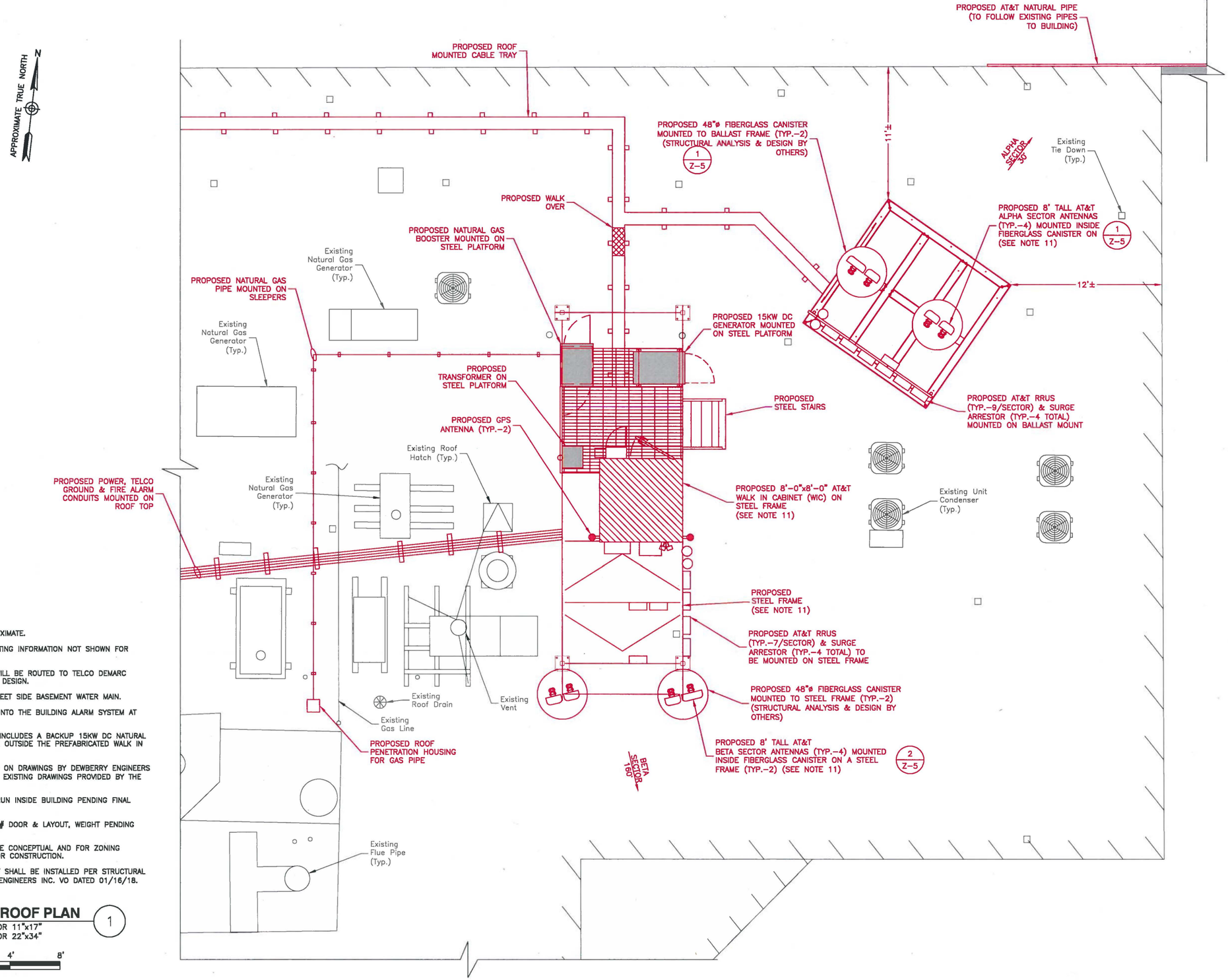
840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

ROOF PLAN

SHEET NUMBER

Z-2



NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. SOME PROPOSED & EXISTING INFORMATION NOT SHOWN FOR CLARITY.
3. (2) 2" TELCO CONDUIT WILL BE ROUTED TO TELCO DEMARC LOCATION PENDING FINAL DESIGN.
4. GROUND WILL BE TO STREET SIDE BASEMENT WATER MAIN.
5. SHELTER IS TO BE TIED INTO THE BUILDING ALARM SYSTEM AT THE CLOSEST POINT.
6. PROPOSED INSTALLATION INCLUDES A BACKUP 15KW DC NATURAL GAS GENERATOR LOCATED OUTSIDE THE PREFABRICATED WALK IN CABINET (WIC).
7. ZONING DRAWINGS BASED ON DRAWINGS BY DEWBERRY ENGINEERS INC. DATED 04/21/14 & EXISTING DRAWINGS PROVIDED BY THE BUILDING OWNER.
8. VERTICAL NATURAL GAS RUN INSIDE BUILDING PENDING FINAL DESIGN.
9. WALK IN CABINET, MODEL# DOOR & LAYOUT, WEIGHT PENDING FINAL DESIGN.
10. PROPOSED LOCATIONS ARE CONCEPTUAL AND FOR ZONING PURPOSES ONLY. NOT FOR CONSTRUCTION.
11. ANTENNA AND EQUIPMENT SHALL BE INSTALLED PER STRUCTURAL ANALYSIS BY DEWBERRY ENGINEERS INC. VO DATED 01/16/18.

DETAILED ROOF PLAN 1

SCALE: 1/8"=1' FOR 11"x17"
1/4"=1' FOR 22"x34"

0' 2' 4' 8'

at&t Mobility
550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS
95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS		
1	01/23/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry®
Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
PHONE: 617.695.3400
617.695.3310

COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

DRAWN BY:	JG
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50093723
JOB NUMBER:	50096257

SITE ADDRESS

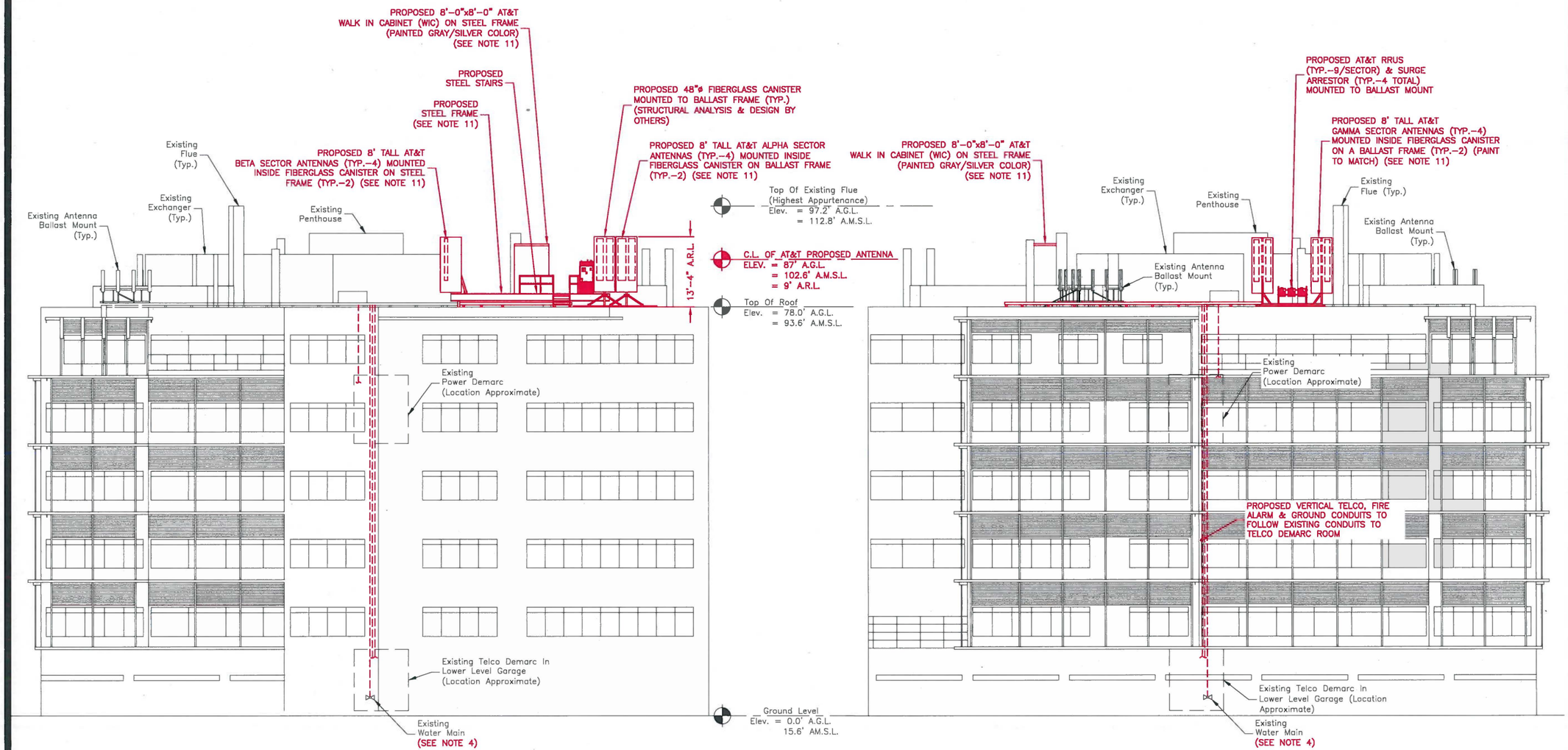
840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

DETAILED ROOF PLAN

SHEET NUMBER

Z-3



EAST ELEVATION (1)

SCALE: 3/64"=1' FOR 11"x17"
3/32"=1' FOR 22"x34"

0' 8' 16' 24'

WEST ELEVATION (2)

SCALE: 3/64"=1' FOR 11"x17"
3/32"=1' FOR 22"x34"

0' 8' 16' 24'

NOTES:

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11. ANTENNA AND EQUIPMENT SHALL BE INSTALLED PER STRUCTURAL ANALYSIS BY DEWBERRY ENGINEERS INC. VO DATED 01/16/18.

C.L. – Centerline
A.G.L. – Above Ground Level
A.M.S.L. – Above Mean Sea Level (NAVD88)
A.R.L. – Above Roof Line
NAVD88 – NORTH AMERICAN VERTICAL DATUM OF 1988

at&t Mobility
550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS
95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS		
1	01/23/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry®
Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
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COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

DRAWN BY:	JG
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50093723
JOB NUMBER:	50096257
SITE ADDRESS	

840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

EAST & WEST ELEVATIONS

SHEET NUMBER

Z-4

NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. SOME PROPOSED & EXISTING INFORMATION NOT SHOWN FOR CLARITY.
3. (2) 2" TELCO CONDUIT WILL BE ROUTED TO TELCO DEMARC LOCATION PENDING FINAL DESIGN.
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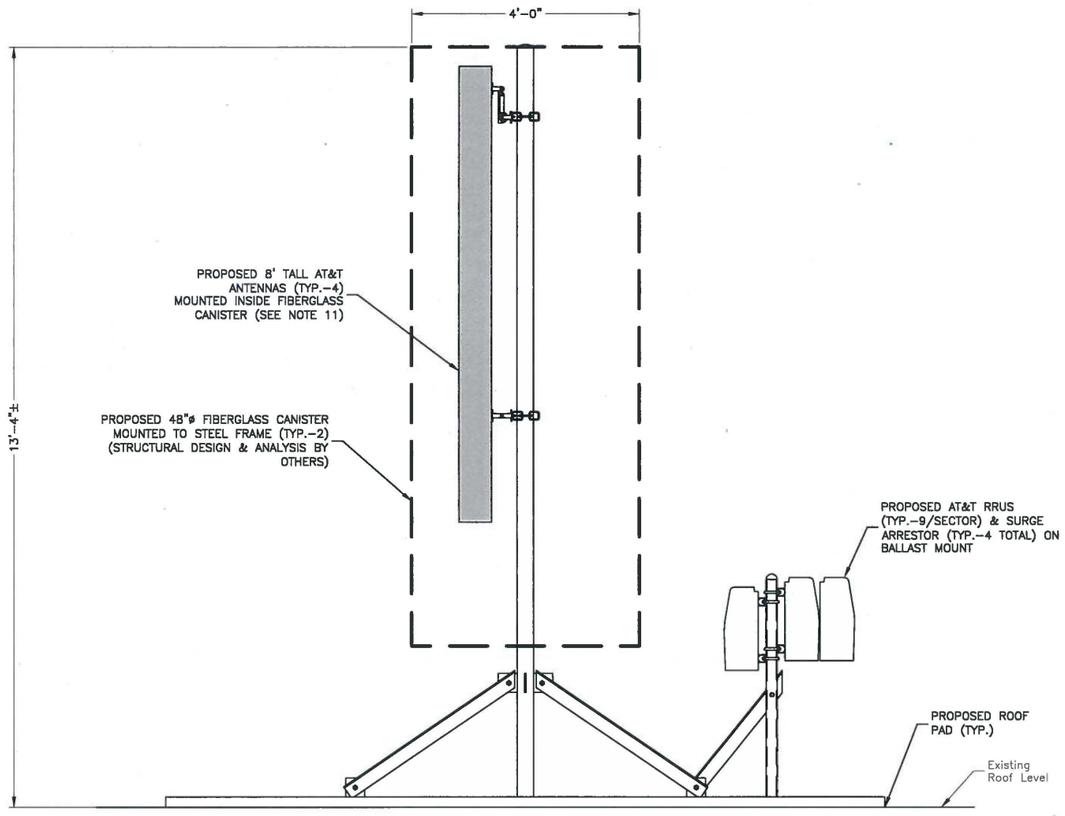
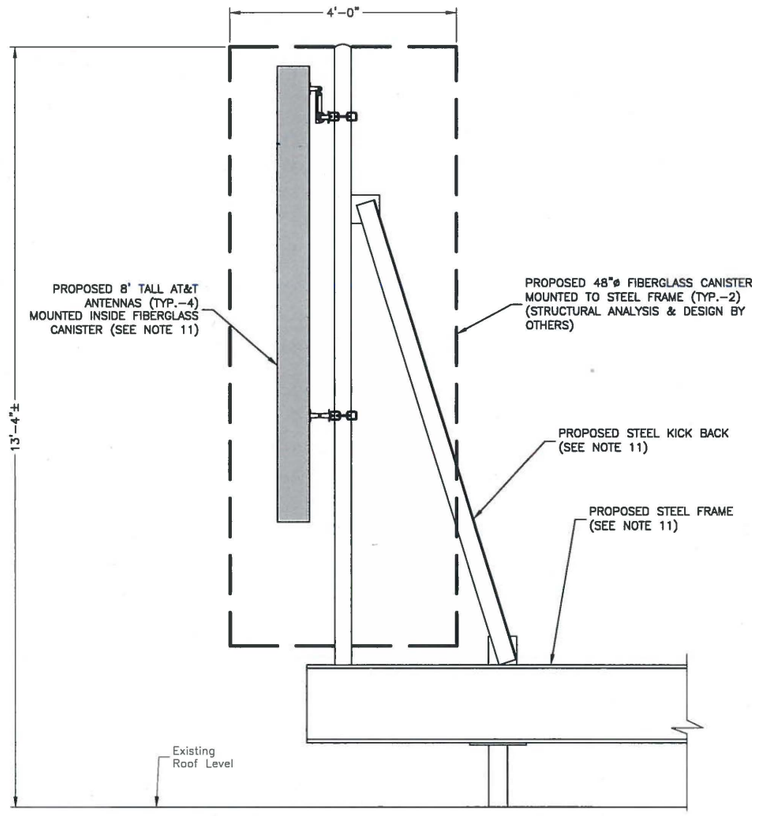


ALPHA & GAMMA SECTORS ANTENNA DETAIL (1)

SCALE: 3/8"=1' FOR 11"x17"
3/4"=1' FOR 22"x34"

0' 1' 2' 3'



BETA SECTOR ANTENNA DETAIL (2)

SCALE: 3/8"=1' FOR 11"x17"
3/4"=1' FOR 22"x34"

0' 1' 2' 3'

at&t Mobility

550 COCHITUATE ROAD
SUITES 13 & 14
FRAMINGHAM, MA 01701

CENTERLINE COMMUNICATIONS

95 RYAN DRIVE, SUITE 1
RAYNHAM, MA 02767

CAMBRIDGE
PUTNAM AVENUE
SITE NO: MA2881

ZONING DRAWINGS		
1	01/23/18	FOR SUBMITTAL
0	11/03/17	FOR SUBMITTAL

Dewberry

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280 SUMMER STREET
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COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
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No. 49220
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DRAWN BY:	JG
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PROJECT NUMBER:	50093723
JOB NUMBER:	50096257
SITE ADDRESS	

840 MEMORIAL DRIVE
CAMBRIDGE, MA 02139

SHEET TITLE

CONCEPTUAL
ANTENNA DETAILS

SHEET NUMBER

Z-5

EXHIBIT 4

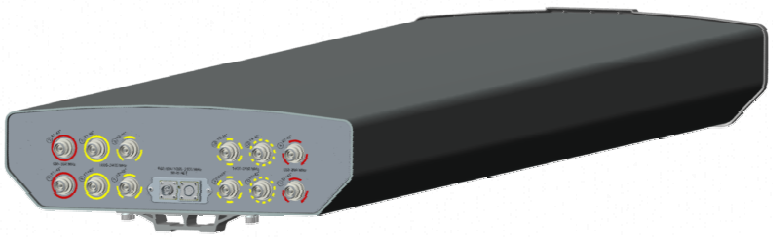
EPBQ-654L8H8-L2

12-Port Multi-Band Antenna / 8' / 65˚

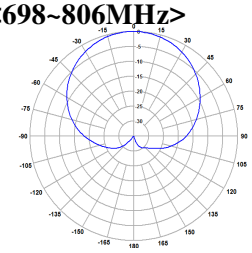
698 ~ 894MHz, XX-pol., H67˚ / V9.3˚, ET:2~12˚
1695 ~ 2400MHz, XXXX-pol., H61˚ / V8.1˚, ET: 2~12˚

Electrical Specification

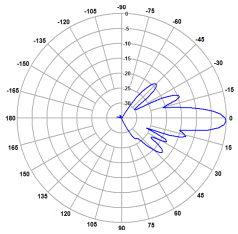
Frequency(MHz)		698~806	806~894	1695~1850	1850~1910	1910~2180	2300~2400
Impedance(Ω)		50	50	50	50	50	50
Polarization		±45˚	±45˚	±45˚	±45˚	±45˚	±45˚
Gain(dBi)		15.9	16.2	16.9	17.3	17.7	17.8
Beam width	**Horizontal**	67˚	66˚	61˚	60˚	60˚	60˚
	Vertical	9.3˚	8.7˚	8.1˚	7.8˚	7.4˚	6.8˚
VSWR		≤1.5:1	≤1.5:1	≤1.5:1	≤1.5:1	≤1.5:1	≤1.5:1
Front-to-Back Ratio(dB)		>25	>25	>25	>25	>25	>25
Electrical Down tilt		2˚ ~ 12˚	2˚ ~ 12˚	2˚ ~ 12˚	2˚ ~ 12˚	2˚ ~ 12˚	2˚ ~ 12˚
Isolation Ports(dB)		≥25	≥25	≥25	≥25	≥25	≥25
Isolation Frequency(dB)		≥30	≥30	≥30	≥30	≥30	≥30
Cross Pole Discrimination		7 dB @ ±60˚ 15.0 dB @ 0˚	7 dB @ ±60˚ 15.0 dB @ 0˚	7 dB @ ±60˚ 15.0 dB @ 0˚	7 dB @ ±60˚ 15.0 dB @ 0˚	7 dB @ ±60˚ 15.0 dB @ 0˚	7 dB @ ±60˚ 15.0 dB @ 0˚
Side Lobe Suppression (Up to 10˚ from Boresight)		> 16dB	> 16dB	> 16dB	> 16dB	> 16dB	> 16dB
PIM (2x20w, dBc)		≤ -150	≤ -150	≤ -150	≤ -150	≤ -150	≤ -150
Input Power(W)		400	400	300	300	300	300



<698~806MHz>

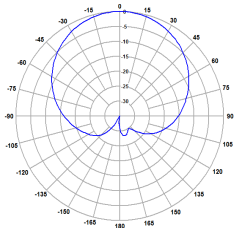


Horizontal Pattern

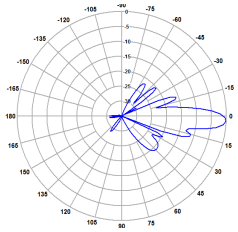


Vertical Pattern (2°)

<806~894MHz>

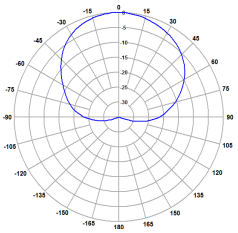


Horizontal Pattern

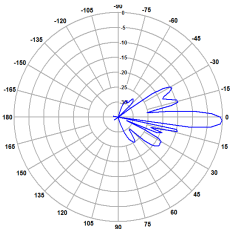


Vertical Pattern (2°)

<1695~2400MHz (Y1,Y2)>

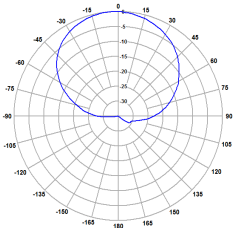


Horizontal Pattern

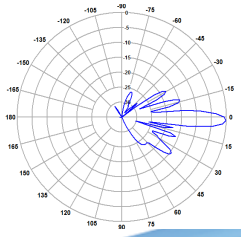


Vertical Pattern (2°)

<1695~2400MHz (Y3,Y4)>



Horizontal Pattern

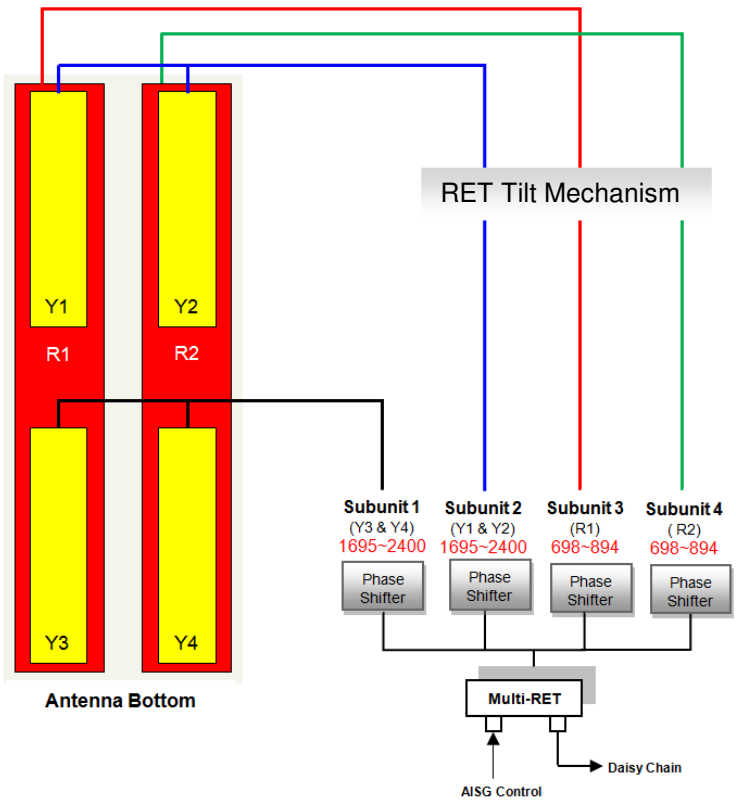


Vertical Pattern (2°)

EPBQ-654L8H8-L2

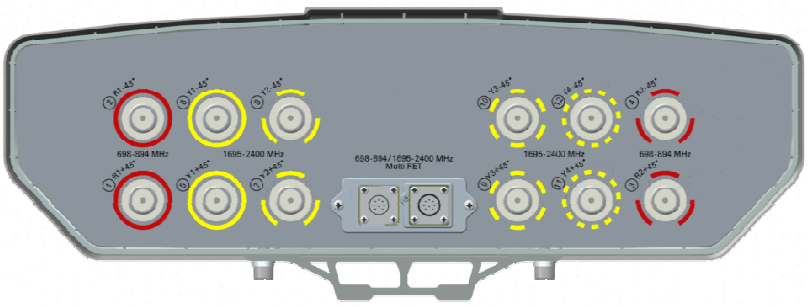
12-Port Multi-Band Antenna / 8' / 65˚

698 ~ 894MHz, XX-pol., H67˚ / V9.3˚, ET:2~12˚
1695 ~ 2400MHz, XXXX-pol., H61˚ / V8.1˚, ET: 2~12˚



Mechanical Specification

Dimension (W×D×H)	21.0×6.3×96.0 inches (533×160×2438 mm)
Weight (Without clamp)	86.0lbs (39.0kg)
Connector	12 x 4.3-10 (Female), Long Neck (4 x 698-894 8 x 1695-2400MHz)
Max Wind Speed	150 mph
WindLoad (@100 mph)	1994N, 598N, 1994N (Front , Side , Rear)



Correlation Table

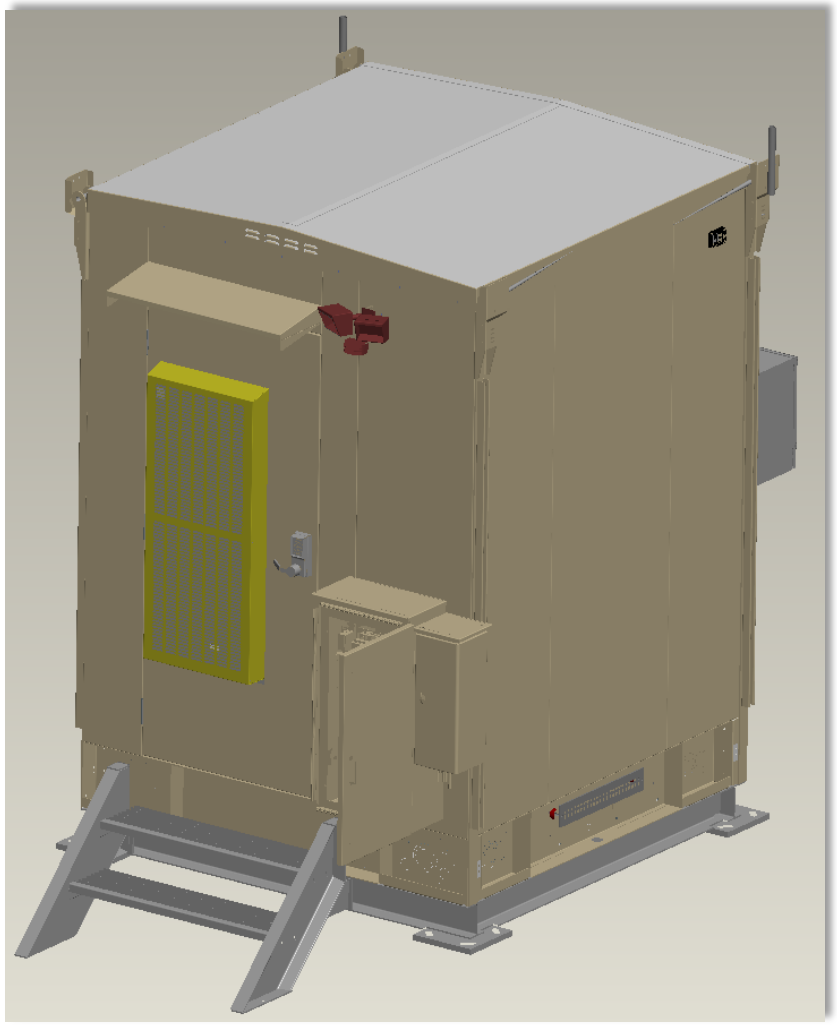
Frequency range	Array	Connector
698-894 MHz	R1	4.3-10 Female
698-894 MHz	R2	4.3-10 Female
1695-2400 MHz	Y1	4.3-10 Female
1695-2400 MHz	Y2	4.3-10 Female
1695-2400 MHz	Y3	4.3-10 Female
1695-2400 MHz	Y4	4.3-10 Female

***Note**

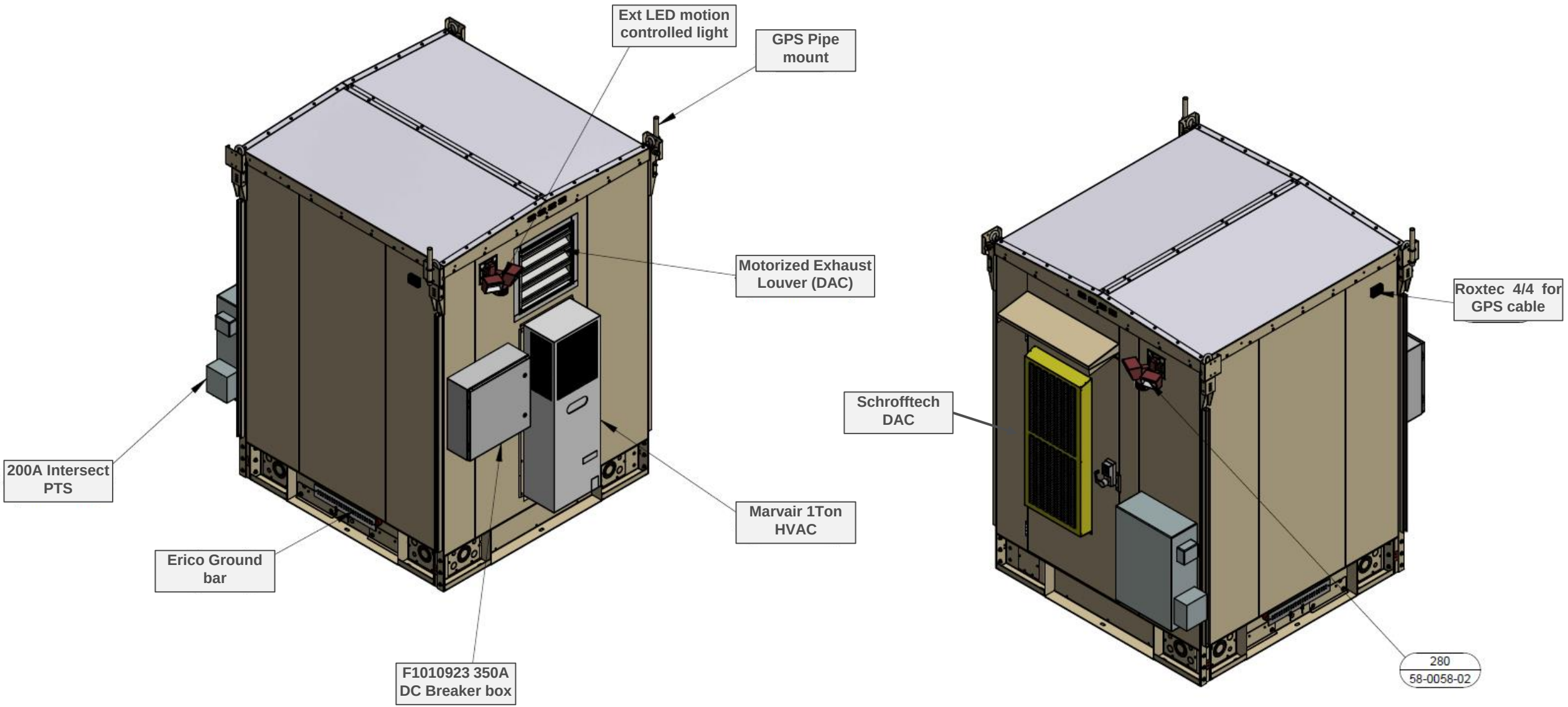
- Gain can vary and the values stated are typical
- Environmental Compliance: IP 65 for Radome & IP 67 for Connectors
- RET Motor Configuration: Field Replaceable RET Electronic Control Module RET Motor is internal to antenna & not field replaceable
- Compliant with AISG: AISG2.0
- Accessory: Standard Mounting Kit is included (Mechanical Down Tilt, KCLDM1B30000 is sold separately)

SMARTMOD UE - PRODUCT CONFIGURATION
6 X 6 WALK IN CABINET

- R13 Insulation, 150MPH wind rated, 300PSF live load rated roof and □one 4 Seismic rated.
  - Wall and floor cable entrance
  - DC Lighting
- NetSure™ 7100 Power System
  - -48 VDC at 1000 amps, □24 VDC at 520 amps,
  - 84□H x 25□W x 23□D, 620 lbs., 3-row cabinet,
  - 12 rectifier-only positions,12 rectifier/converter positions,
  - LVBD/MBD, Ethernet, temp comp, (58) -48 V (20) □24 V CB positions, (3) battery trays with 150A CBs
  - (ships on 7-ft. □one 4 rack)
- 200A PTS with 30 pos load center, surge arrestor □ generator cam lock box
- High efficiency “Direct Air Cooling” system & Back up 1Ton HVAC



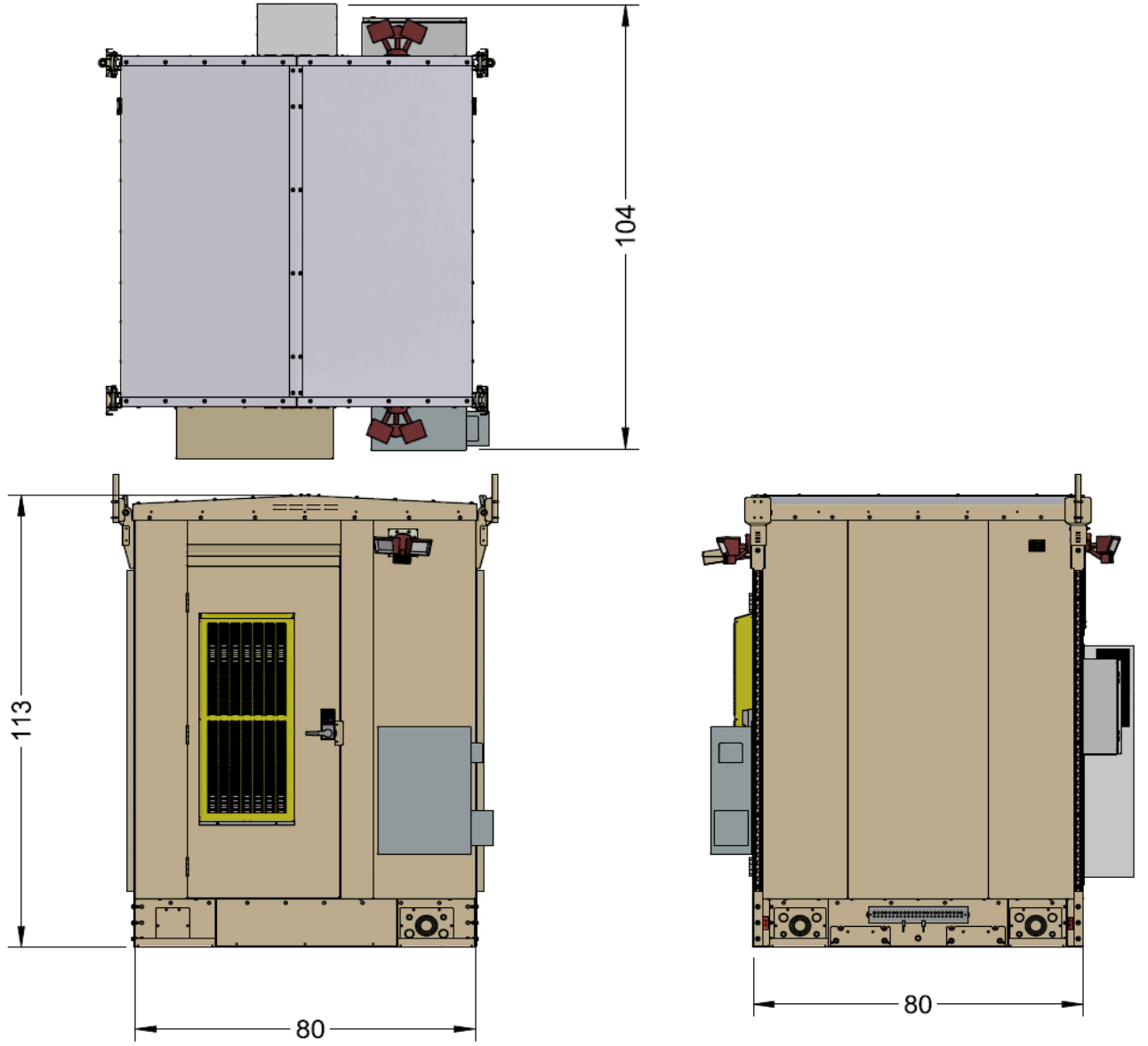
SMARTMOD UE - PRODUCT CONFIGURATION
6 X 6 WALK IN CABINET – ASSEMBLY DRAWING



SMARTMOD UE - PRODUCT CONFIGURATION
6 X 6 WALK IN CABINET – ASSEMBLY DRAWING

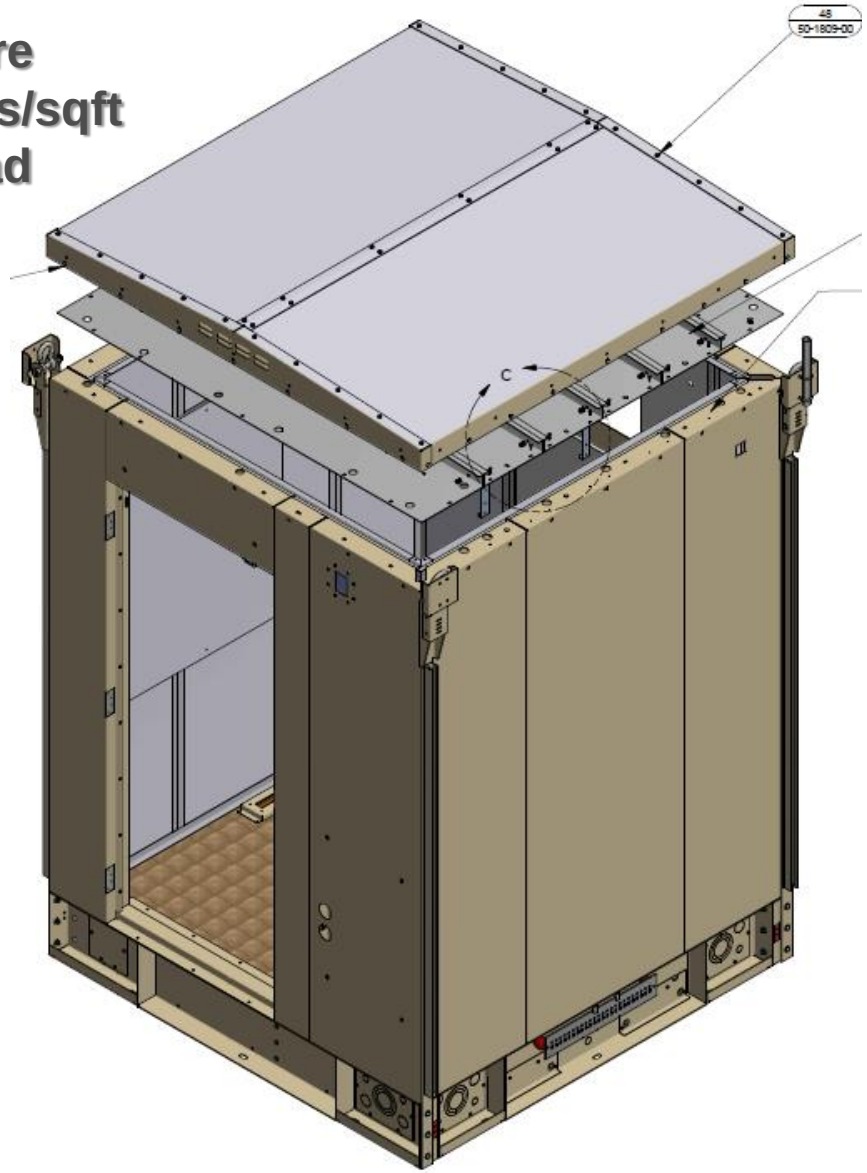
- External Dimensions
  - 80” x 80” x 113”
- Internal Dimensions
  - 72” x 72” x 105”
- NE□ 19737 (includes below)

Component	Description
F2017012-WIC	ATT 6X6 WIC with labor DC power system, Schrofftech DAC, Marvair HVAC Integration
582127000103	NS721,-48V@1KA,+24V@520A,3 BAT TRAYS@STD
PTLC-12200-MTS	120/240, 200A 1PH; MTS; Strikesorb; 42-Pos SqD Panelboard; 40Hx30Wx10D NEMA Type 3R; ICL CamLok Panel and Utility voltage monitor and dry relay contact alarm for 120/240, 200A 1PH MP Series
AF000135	Direct Air Cooling unit - Lead Lag HVAC Controller/with Smoke Detector
PTS3703-WIC-WOF	Rack CommBay-WIC-W/out Fiber Panel
PTS3704-WIC-WF	Rack CommBay-WIC-With Fiber Panel
ECUA12ACA036S-A5-100	1 TON WALL MOUNTED HVAC, supply & return grille and commstat controlller and remote sensor
D1000-0010-0066	WIC Hut Platform Kit - (1) 80" x 80" Platform, (1)2 Step Stair and (4) 6' x 7' Helical Foundation with Leveling Hardware.- Finish: Hot Dip Galvanized

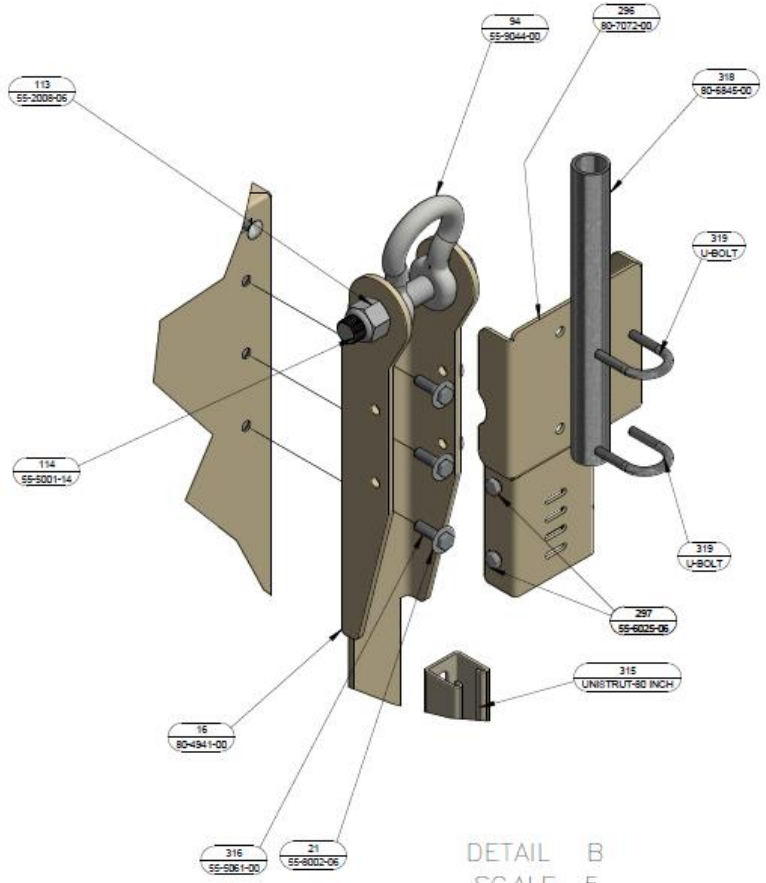


SMARTMOD UE - PRODUCT CONFIGURATION
6 X 6 WALK IN CABINET – SECTIONAL VIEWS

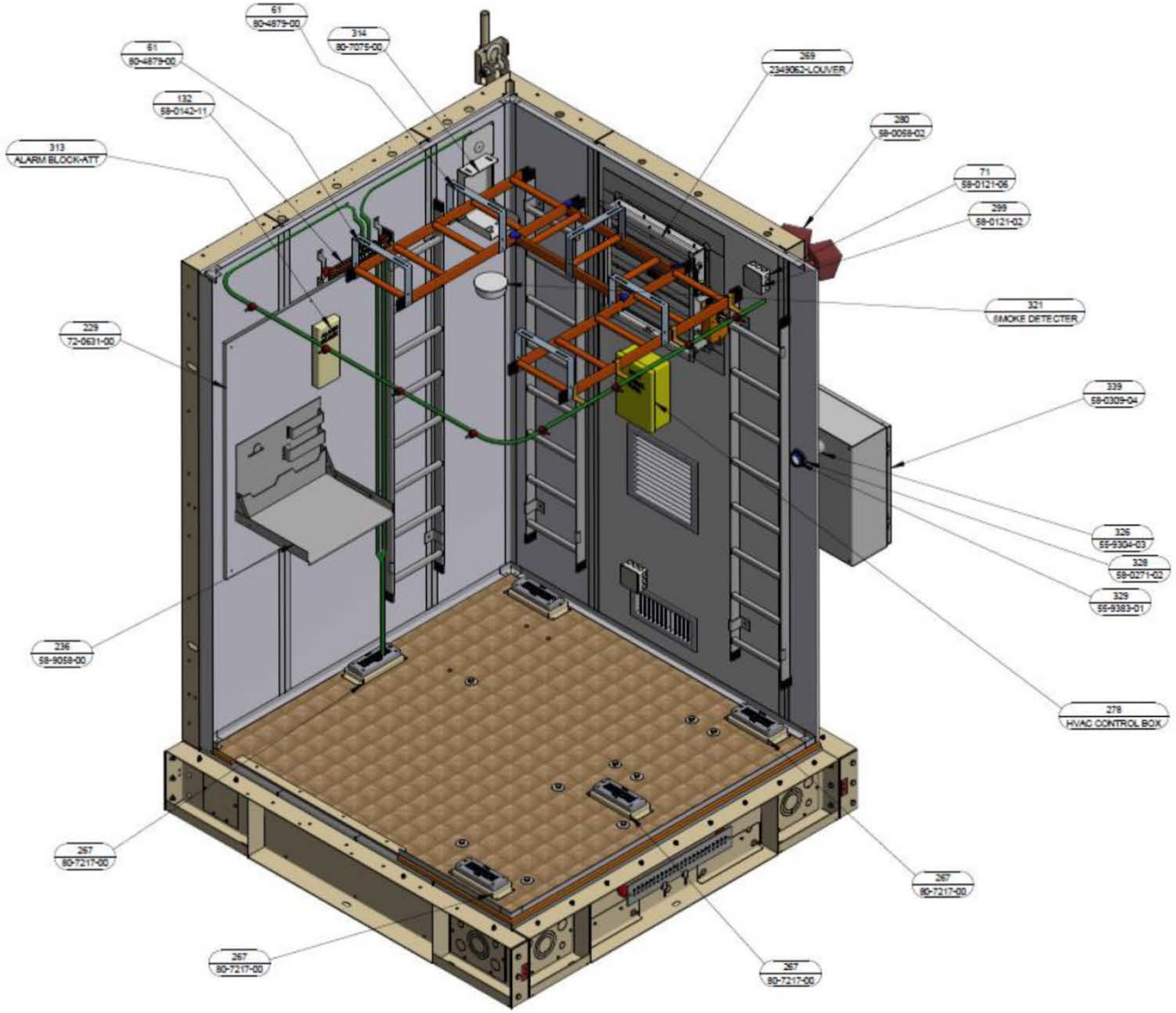
Roof Structure supporting 300lbs/sqft structural load

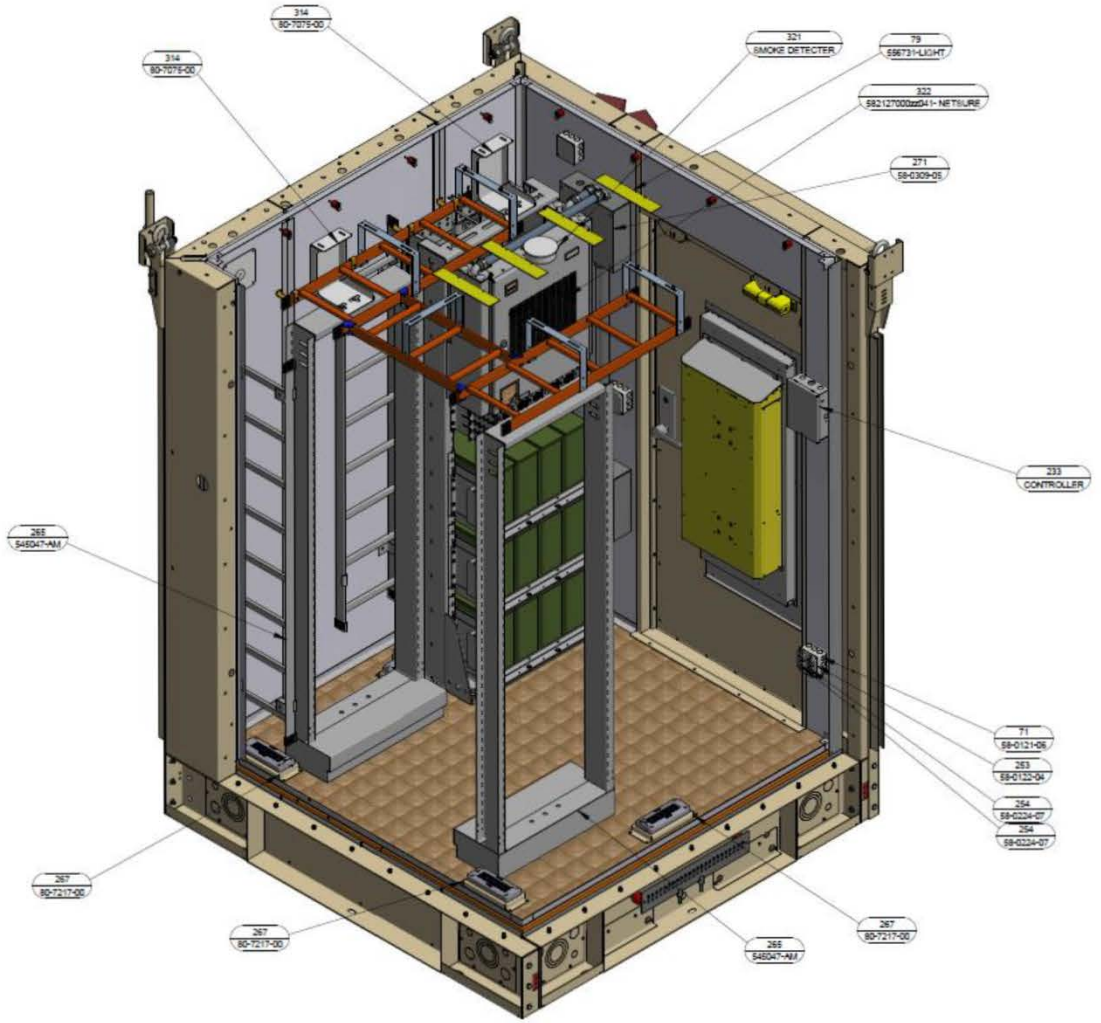


Lifting lug bracket integrated with GPS Antenna holding bracket



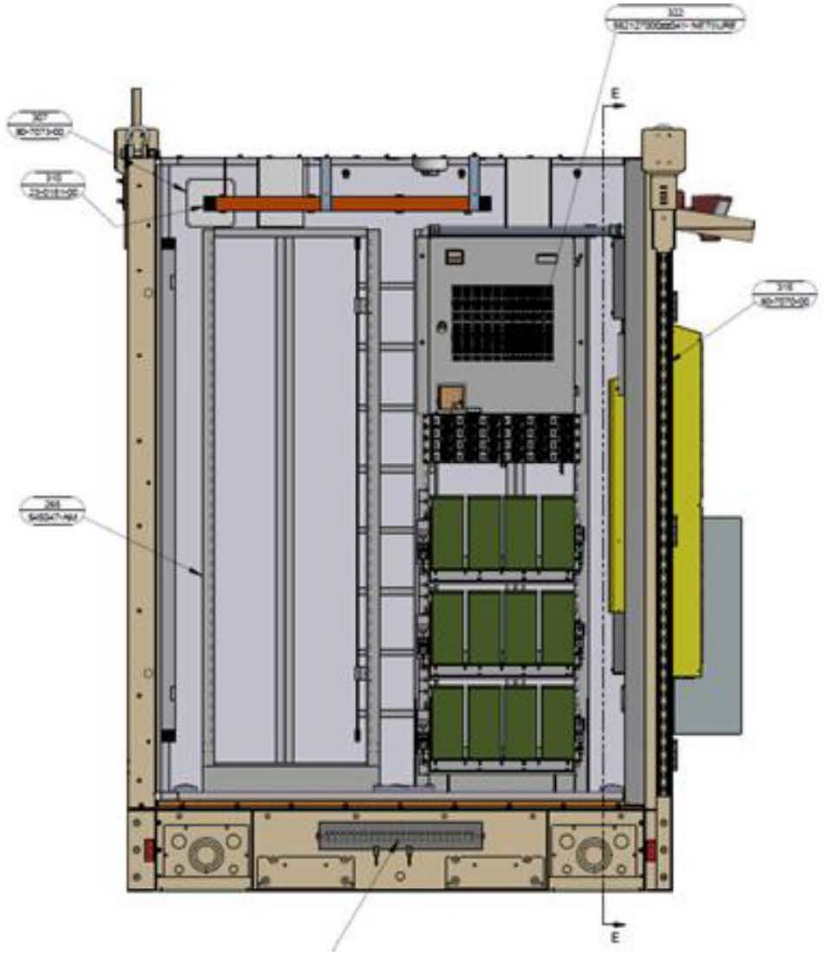
SMARTMOD UE - PRODUCT CONFIGURATION
6 X 6 WALK IN CABINET – SECTIONAL VIEWS



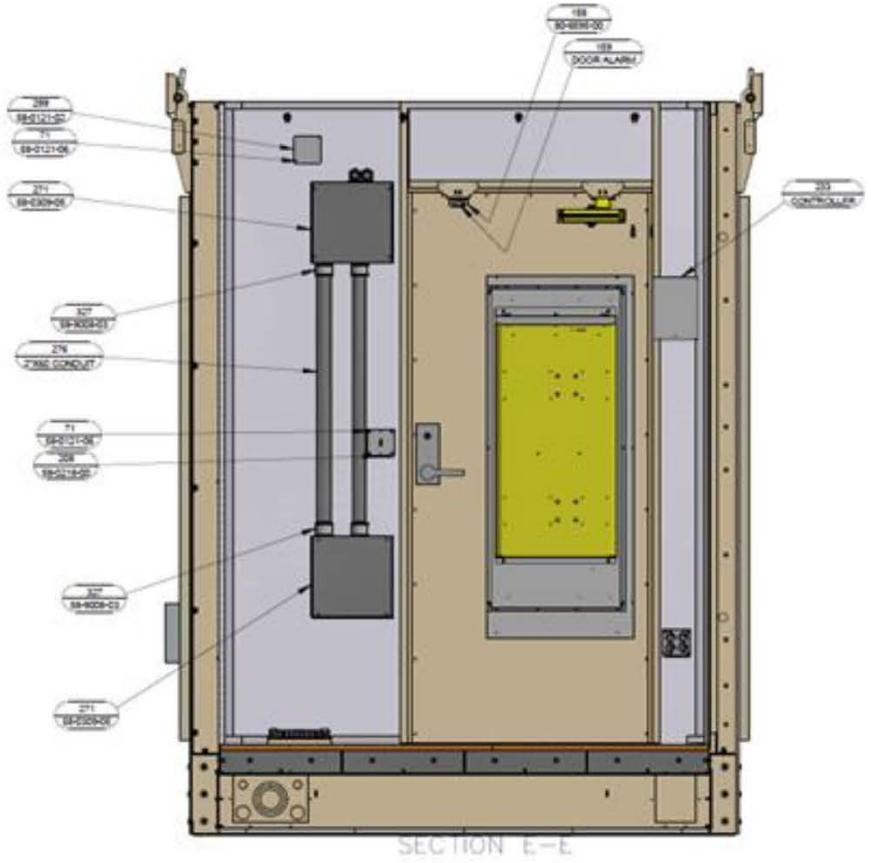


SMARTMOD UE - PRODUCT CONFIGURATION
6 X 6 WALK IN CABINET – SECTIONAL VIEWS

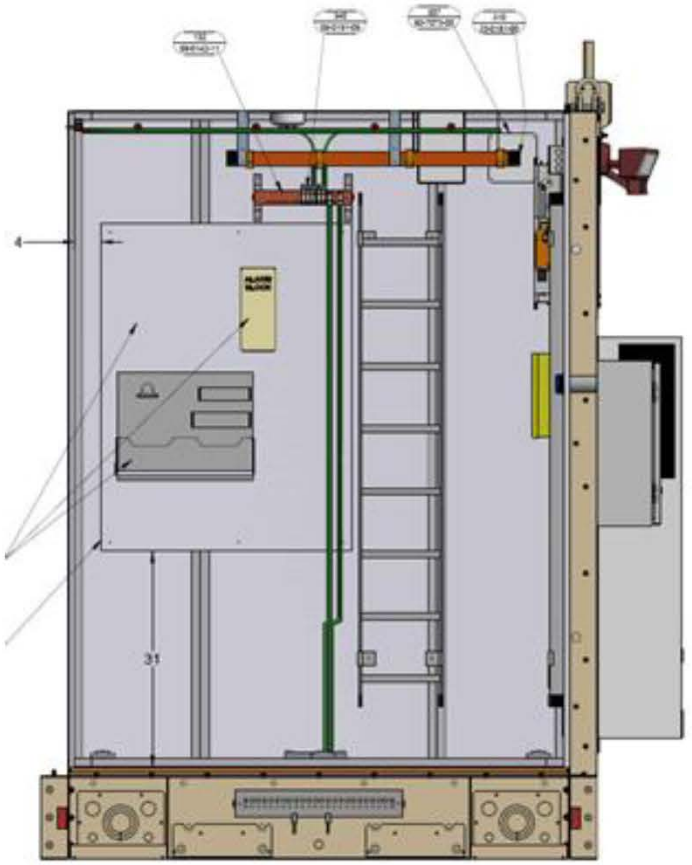
Right Wall Detail



Front Wall Detail

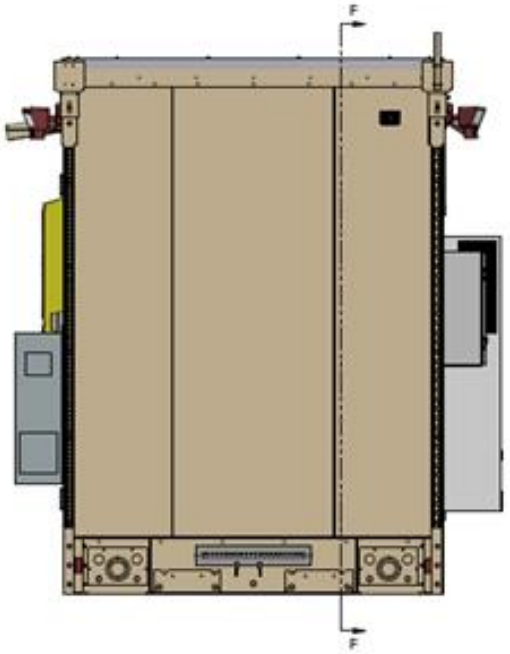


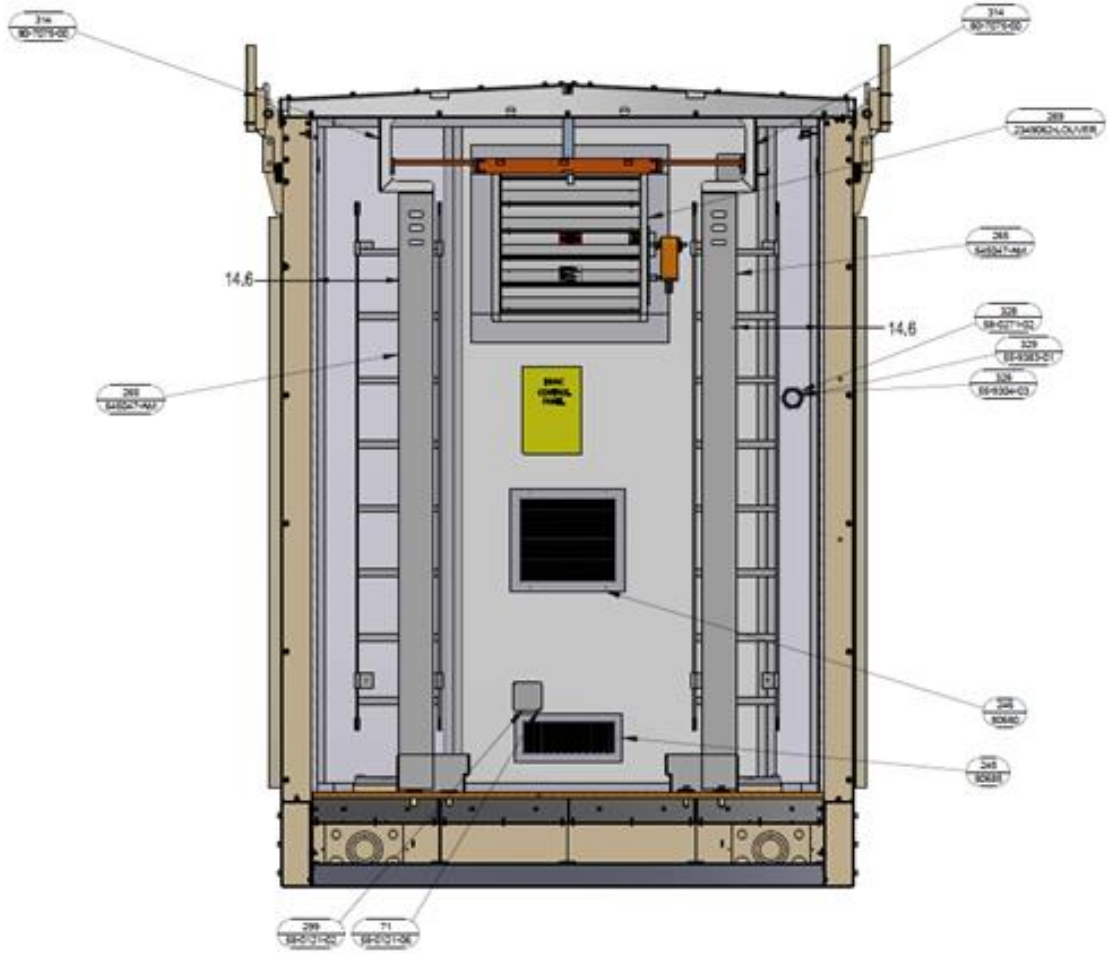
Left Wall Detail



SMARTMOD UE - PRODUCT CONFIGURATION
6 X 6 WALK IN CABINET – SECTIONAL VIEWS

Back Wall Detail

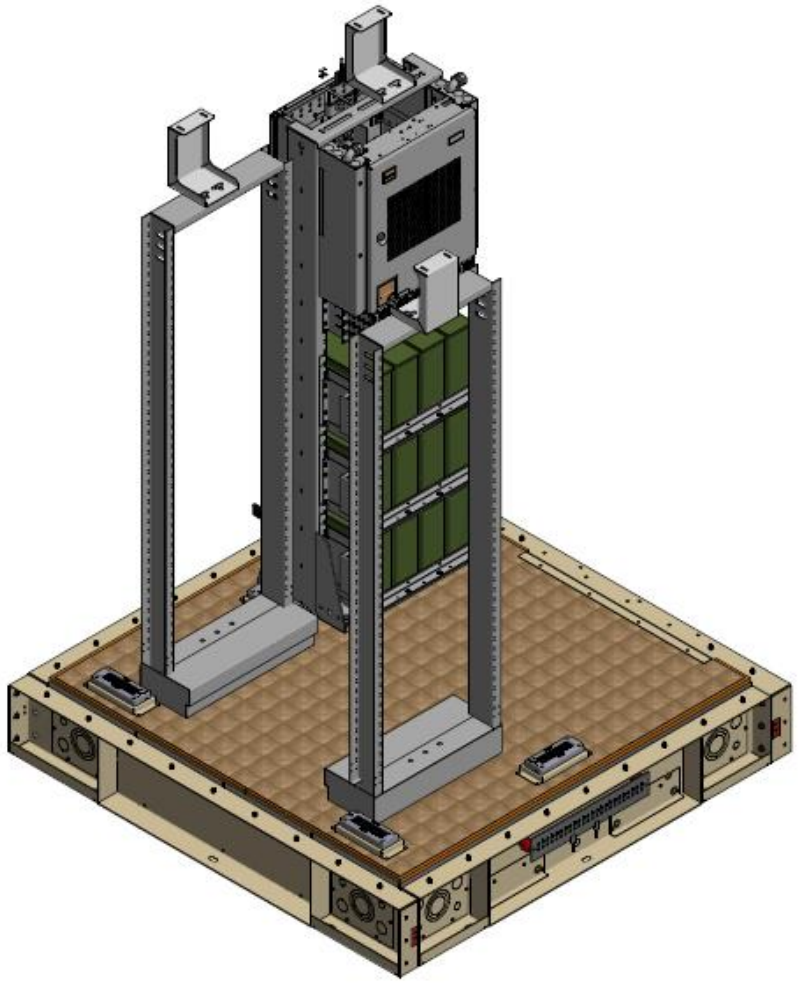




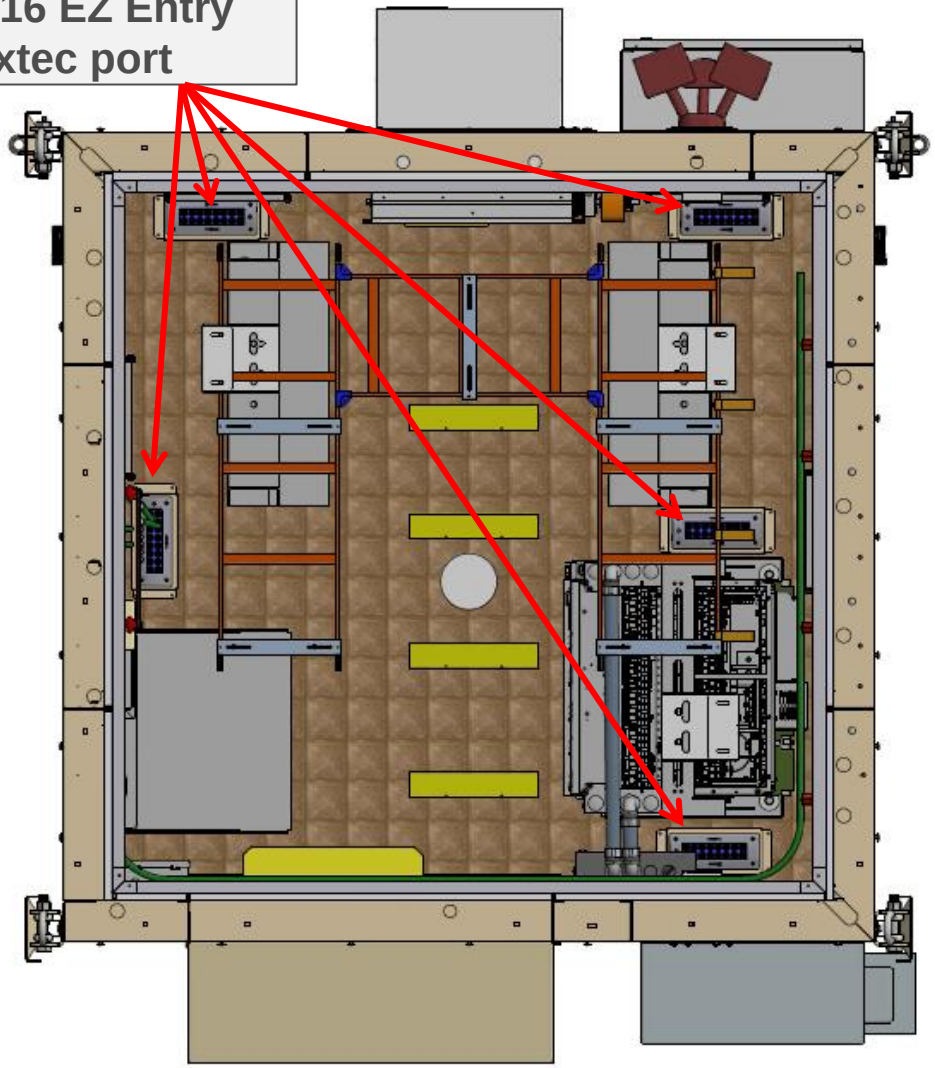
SECTION F–F

SMARTMOD UE - PRODUCT CONFIGURATION
6 X 6 WALK IN CABINET – SECTIONAL VIEWS

Rack Detail



(5) 16.16 EZ Entry
Roxtec port



UL/CSA APPROVAL AS A SYSTEM

CSA Group

Certificate of Compliance

Certificate: 70096774 **Master Contract:** 268244

Project: 70096774 **Date Issued:** 2016-10-10

Issued to: Emerson Network Power,
Energy Systems, North America, Inc
1510 Kansas Avenue
Lorain Products Division
Lorain, OH 44052-2293
USA

Attention: Steve Hillman

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

C US

Issued by: *Heather Sell*
Heather Sell

PRODUCTS
CLASS - C321111 - INDUSTRIAL CONTROL EQUIPMENT-Enclosures for Electrical Equipment-
CLASS - C321191 - INDUSTRIAL CONTROL EQUIPMENT-Enclosures for Electrical Equipment – US Requirements-

Enclosures, Type 3R

Model: SmartMod UE
Dimensions 80" W x 80" D x 113" H

Note: Enclosures are intended for industrial and/or power distribution equipment applications. These components are intended for the installation of industrial electrical equipment and/or power distribution equipment where the complete assembly is approved for installation in non-hazardous locations in accordance with the National Electric Code (NEC), Canadian Electric Code (CEC).

APPLICABLE REQUIREMENTS
CSA C22.2 No, 94.1-07 / UL 50 12th Ed (Harmonized) Enclosures for Electrical Equipment, Non-Environmental Considerations
CSA C22.2 No. 94.2-07 / UL 50E 1st Ed (Harmonized) Enclosures for Electrical Equipment, Environmental Considerations

CSA Group

Supplement to Certificate of Compliance

Certificate: 70096774 **Master Contract:** 268244

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
70096774	2016-10-10	Original certification of Multiple Listee Emerson 268244 with classes 3211-11/91. Report reference 252270-70096780.

Submittor Report	Submittor Model	Listee Model	Listee Project
70096780	F2014034	SmartMod UE	70096774

STANDARDS COMPLIANCE

- National building code 2012
- ASTM A653 - Galvanized steel
- Welding conformance to AWS – D1.2, D1.3 & D1.6
- Zone 2 & 4 Seismic compliance
- GR487 compliant for corrosion, water intrusion, ultraviolet radiation, and impact resistance
- DC power system - NEBS Level 3 certified; UL Listed to UL subject 1801
- PTS – UL891 and UL1008 compliant
- UL Compliant climate and other miscellaneous electrical equipment
- Electrical wiring as per NFPA70(NEC) requirements
- Installation method compliant to GR1275

SMARTMOD UE – PRODUCT FEATURES

- Welded Galvani□ed Steel Construction - Outstanding impact and corrosion resistance.
  - Interlocking steel panels construction
  - Walls, floor and ceiling are made of 14 gage steel; ¼” Thick galvanized steel lifting brackets with hook cover plates/GPS Antenna mounts on each corner
  - Normal Floor Load: 200 pounds PSF minimum (uniform with full-support foundation) and Point Floor Load – 1500lbs PSF to support batteries in DC power system
  - Roof Live □ impact Load: 300PSF
  - Wind Speed: 150 mph
- Protection - powder coat finish (meets 720hrs salt fog test) to meet GR487 Telcordia mechanical and environmental standards for telecom enclosures.
  - protects against rain, sleet, snow, splashing water and damage from external ice formation.
- 2” tall base including plinth with removable steel cover plates on front and back to accommodate cable feeders
  - Fork lift tubes on front and back
- Interior finish
  - Bright white interior steel ceiling panels and walls with ¾” melamine covered white board

SMARTMOD UE – PRODUCT FEATURES

- Insulation
  - Floor: R-13 fiberglass batt in floor cavities
  - Walls: R-13 fiberglass batt with vapor barrier in wall cavities
  - Roof: R-13 fiberglass batt with vapor barrier in cavities between ceiling roof
- Radiant Barrier Roof.
  - Roof -14GA Galv, seams will be taped and rubberi ed roof coating applied (Garna-White) after powder coating.
  - Roof Trusses – 5 trusses design – 12GA Galv - Powder coat finish
  - Integrated with ¼” steel lifting brackets at the top
  - Center Pitched for water run-off.
  - Garna-Thane rubberized coating reflects 80% of the sun’s radiation.
- Common Equipment Kit
  - Motion controlled 70W Outside light; Interior -48VDC lights; door contacts
  - Halo ground, Interior Isolated copper ground bar with ground cables to equipment rack, H taps for ground terminal external isolate ground bar with 2/0 ground cable, Ground entry / exit plate as per ATT Grounding specification.

SMARTMOD UE – PRODUCT FEATURES

- Floor access covers, Floor mat, Door intrusion alarm, 20A GFCI outlets
- 12” cable racking - H Shaped; Telecom board

- Access Doors Hardware
  - Type: 18 gauge Galvani ed steel commercial grade insulated door
  - Size: 31″ x 83″ (3070) outward opening with Kaba combination door handle/latch
  - Frame: 16 gauge Galvani ed steel frame
  - Hinges: (3) Stainless steel with non-removable pin (per door)
  - Weather strip: Adjustable brush weather seal
  - Threshold: Stainless steel with brush sweep
  - Pick plate: Stainless steel latch guard
  - Door holder: Positive engagement latch with rubber bumper stop
  - Closer: Adjustable-hydraulic
  - Drip cap: 6″ aluminum drip cap above doorway
- Miscellaneous
  - Rodent Deterrence – Sheet metal cover sealing the bottom of the base, to protect cabling in the base from rodents.

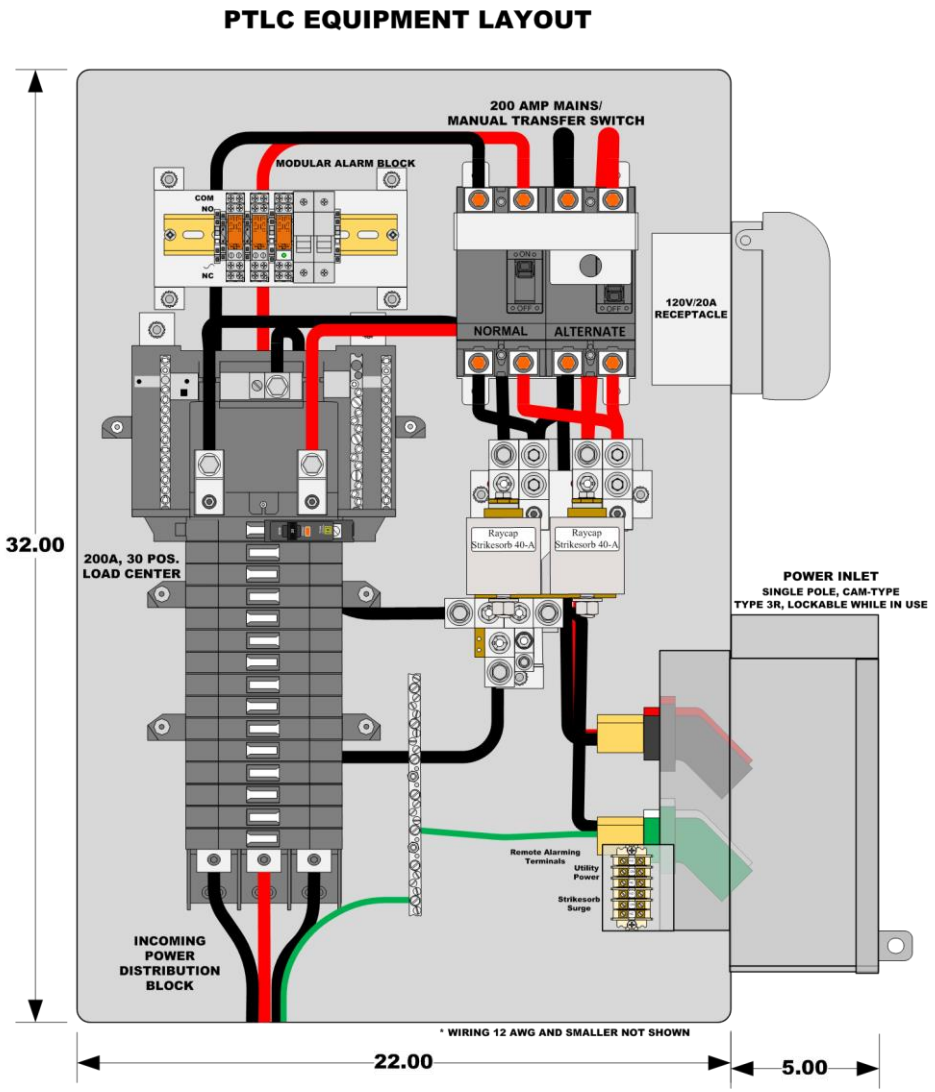
SMARTMOD UE – PRODUCT FEATURES
DC POWER SYSTEM

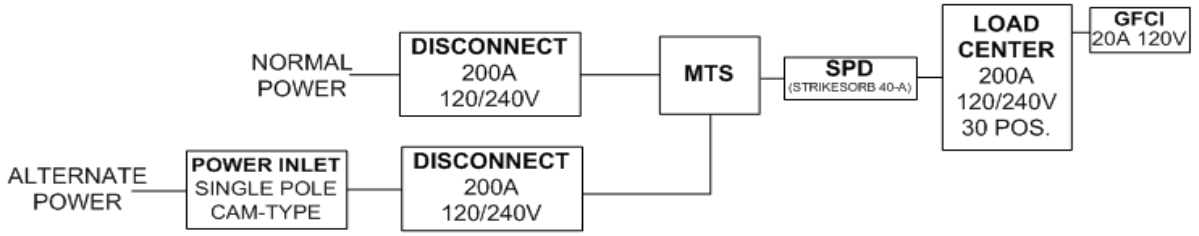
NetSure™ 7100 Power System NEQ.19735

- -48 VDC at 1000 amps, □24 VDC at 520 amps,
- 84□H x 25□W x 23□D, 620 lbs., 3-row cabinet,
- 12 rectifier-only positions,12 rectifier/ converter positions,
- LVBD/MBD, Ethernet, temp comp, (58) -48 V and
- (20) □24 V CB positions,
- (3) battery trays with 150A CBs
- 7-ft. □one 4 rack

SYSTEM FEATURES	
Nominal System Voltage	-48 VDC
Control	Microprocessor (NCU)
RATED OUTPUT CAPACITY – MAXIMUM CONFIGURATION	
System	4000 amps at -48 VDC, 520 amps at +24 VDC
Bay	1500 amps at -48 VDC, 520 amps at +24 VDC
Shelf	250 amps at -48 VDC, 187.5 amps at +24 VDC
Rectifier	2000 watts
Converter	1500 watts
Distribution Panel	600 amps at -48 VDC, 520 amps at +24 VDC
PHYSICAL CHARACTERISTICS	
Framework Type	Relay rack (can be mounted in enclosures)
Mounting Width	23 inches
Mounting Depth	20 inches (single bay), 24 inches (dual bay)
Access	Front access for installation, operation and maintenance
ENVIRONMENTAL	
Operating Temperature	-40 °F to 104 °F (-40 °C to 40 °C) continuous operation
Storage	-40 °F to 185 °F (-40 °C to 85 °C)
Humidity	0% to 95% relative humidity, non-condensing
Ventilation	Rectifiers/converters are fan-cooled front to rear
EMI/RFI Suppression	Conforms to FCC rules Part 15, Subpart B, Class B and EN55022 Class B, radiated and conducted
Safety Compliance	UL Listed to 1801, cUL, NEBS Level 3 Certified

SMARTMOD UE – PRODUCT FEATURES
200A INTERSECT PTS





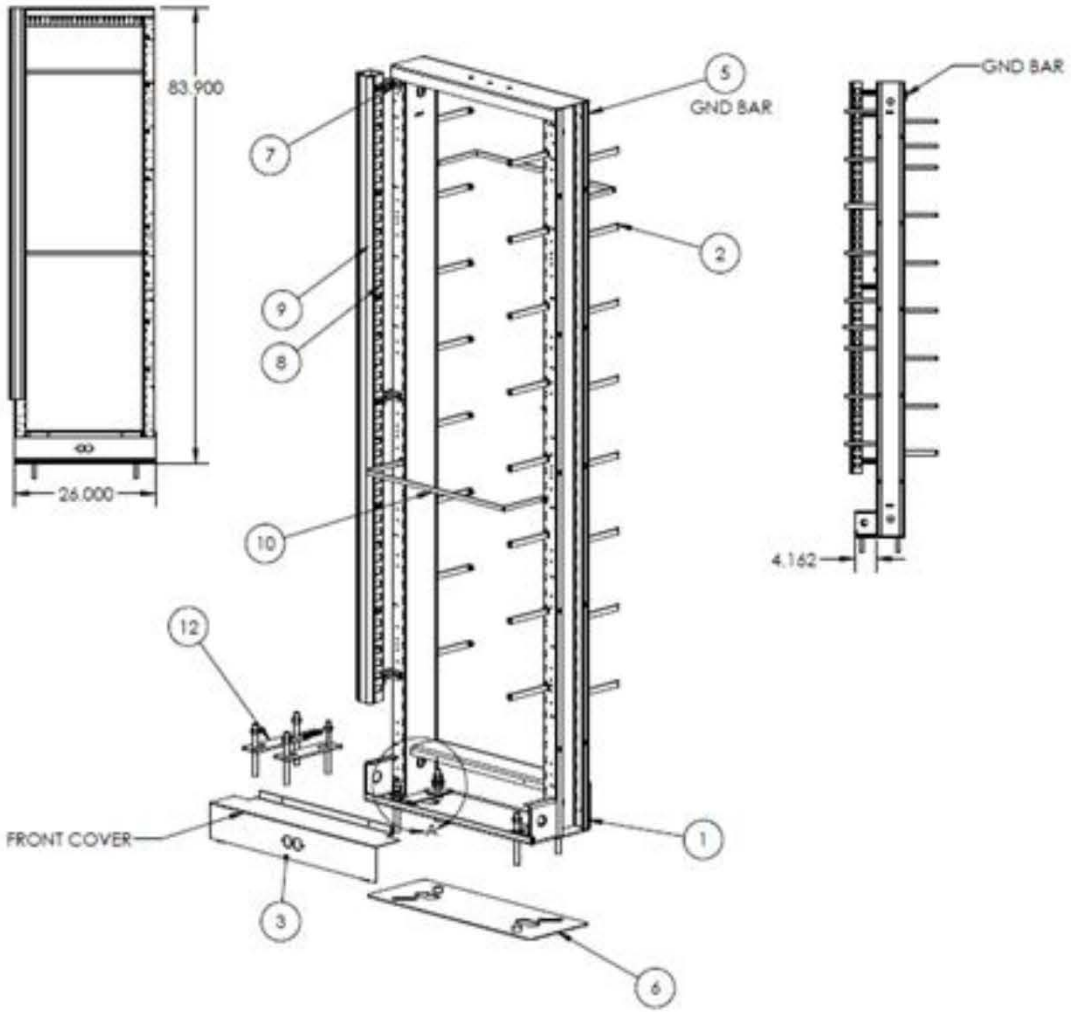
PTLC ELECTRICAL 1-LINE

PTLC-MTS-12200-CL - NE□19706

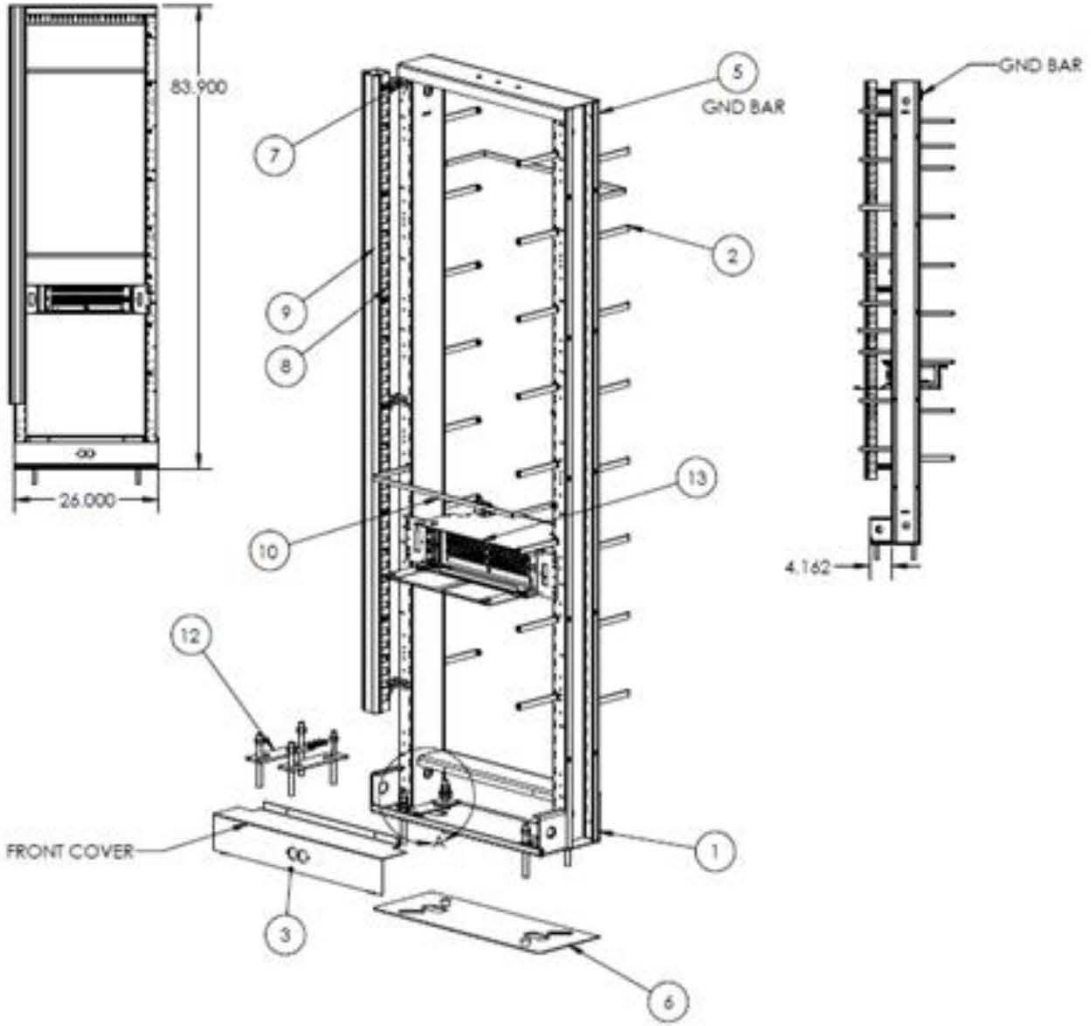
- UL 891 Listed, 32x22□x10 (□27 with CamLok Connector Panel), 240/120, 200A Power Transfer Load Center
- Mechanically interlocked “mains” enabling manual transfer between Utility and an Alternative Power Source connected via CamLok style connectors
- PTLC includes Strikesorb surge protection; 30-position Square D □O panel board and alarm monitor for utility power loss.
- Exterior AC receptacle, NEMA 3R enclosure.

SMARTMOD UE – PRODUCT FEATURES
TWO POST COMMUNICATION BAY - PTS

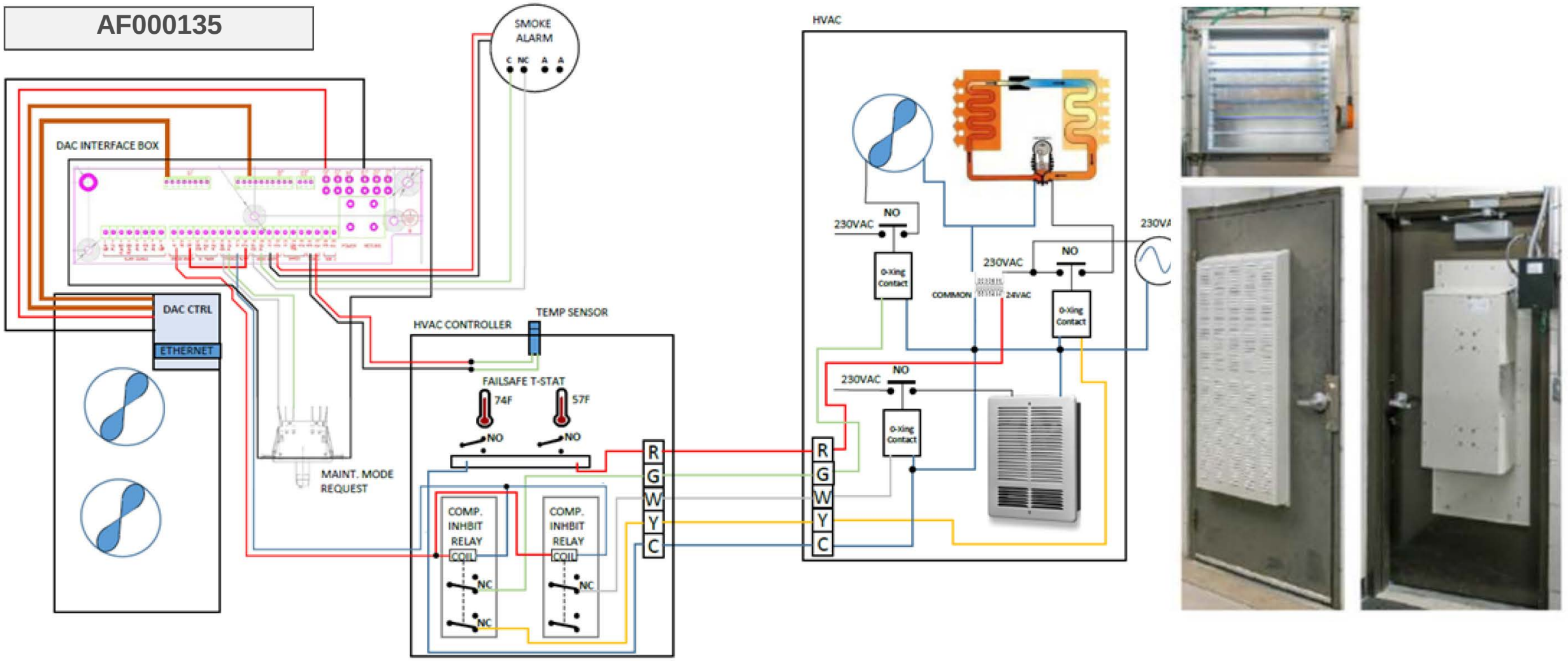
TLA,WIC,COMM-BAY,PTS3703-W/OUT FIB



TLA,WIC,COMM-BAY,PTS3704-WITH FIB



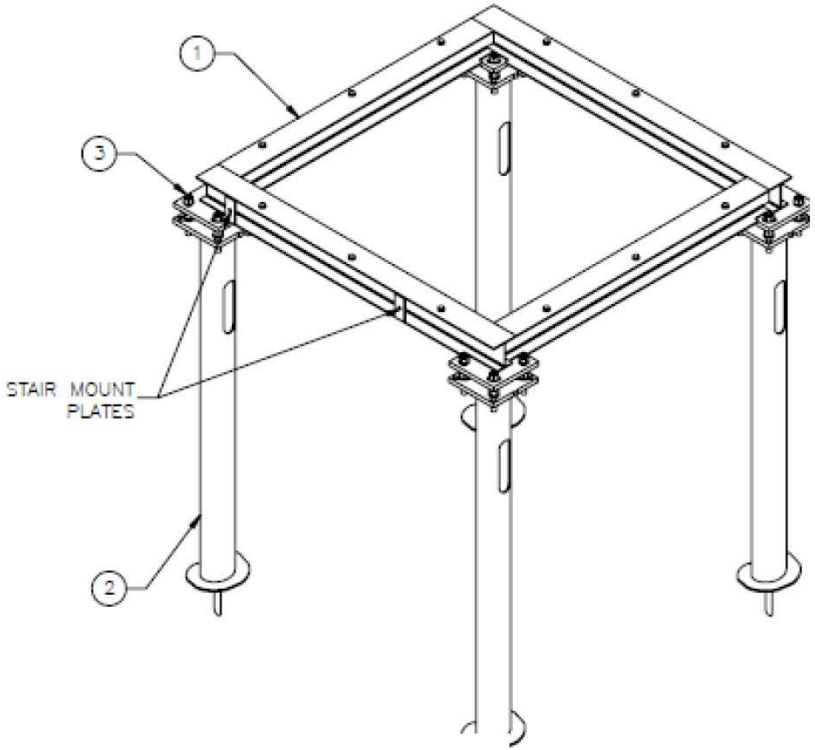
SMARTMOD UE – PRODUCT FEATURES
SCHROFF TECH DIRECT AIR COOLING (DAC)

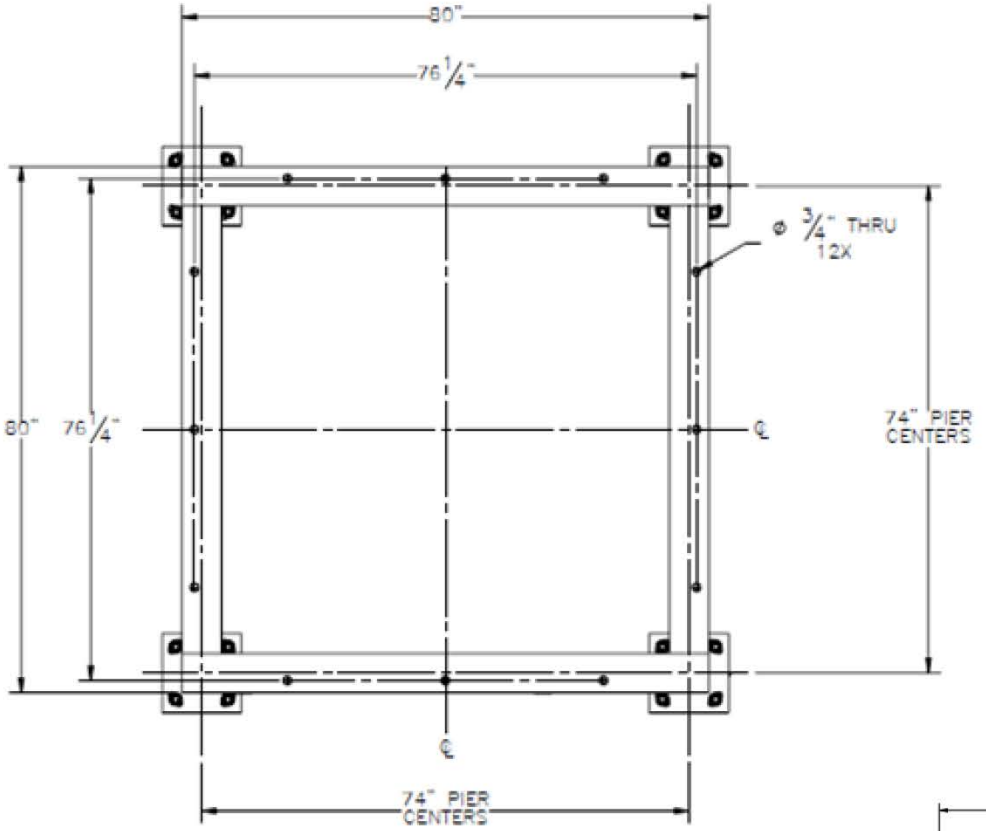


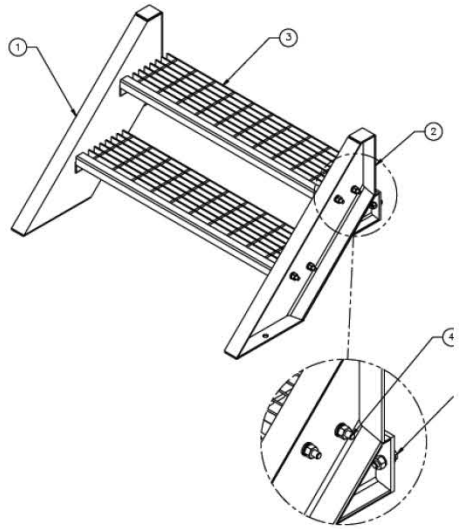
SMARTMOD UE – PRODUCT FEATURES
BACK UP 1 TON WALL MOUNTED COOLING

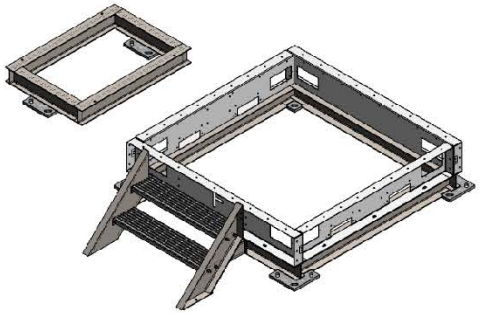
- ECUA12ACA036S-A5-100 - ICE air conditioner designed for operation on a 208/230v. 1□, 60 H□. power supply, with nominal cooling capacity of 12,000 BTUH (1.0 tons) and 3.6 kW of electric heat in a BEIGE cabinet.R-410A refrigerant.
- No OSA
- High pressure switch and low pressure switch with lockout relay,
- Dry contacts for remote alarm or notification when air conditioner locks out
- Timed low pressure bypass
- Compressor time delay
- Operating Temperature Range: 0 F to 120 F
- Supply grille; Return grille
- Thermostat with Remote sensor

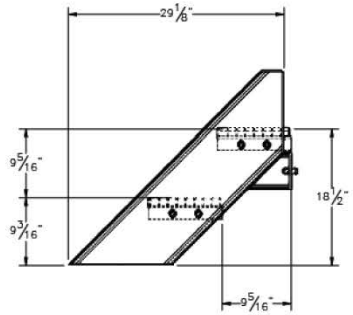
SMARTMOD UE – PRODUCT FEATURES
PLATFORM FOR 6X6 WIC

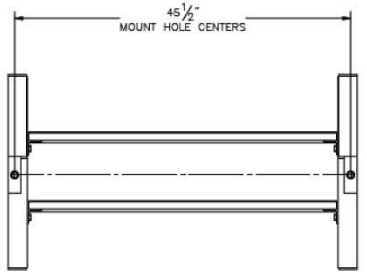




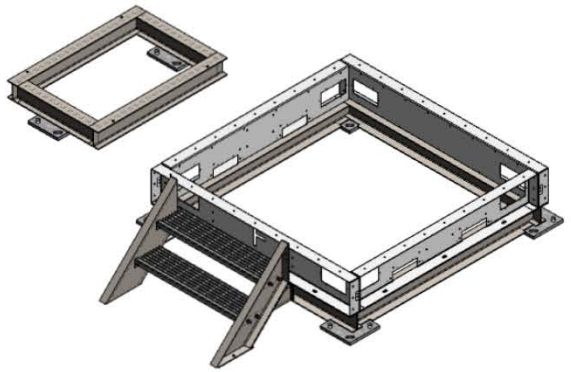


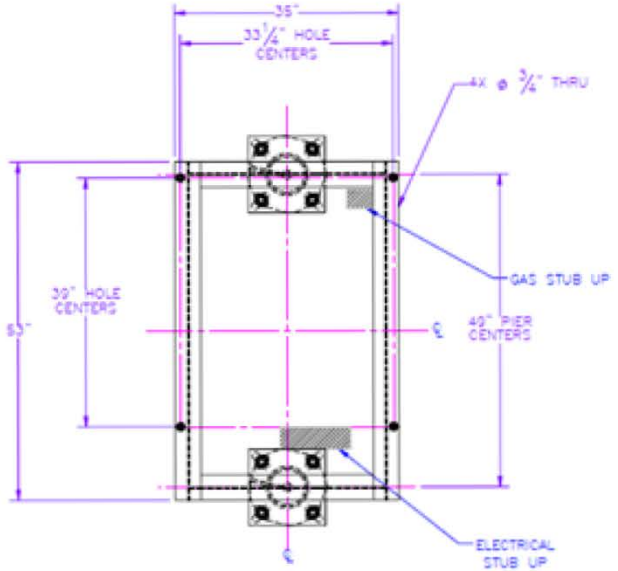




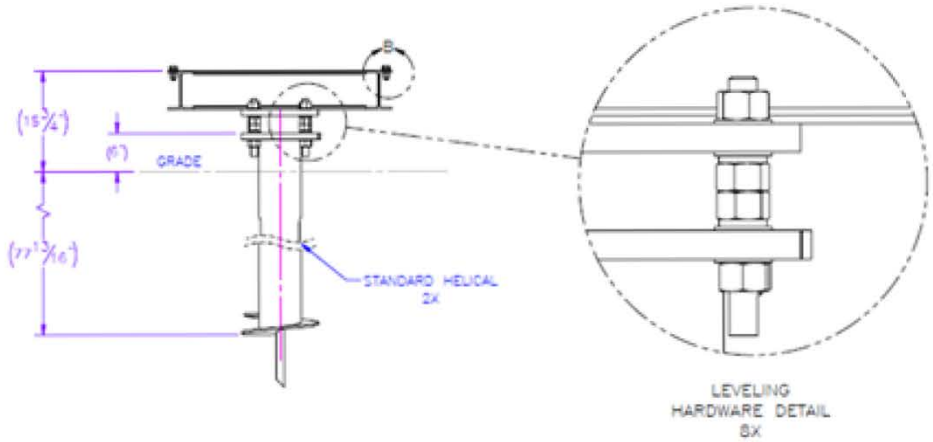


SMARTMOD UE – PRODUCT FEATURES
PLATFORM FOR POLAR DC GENERATOR/FUEL CELLS

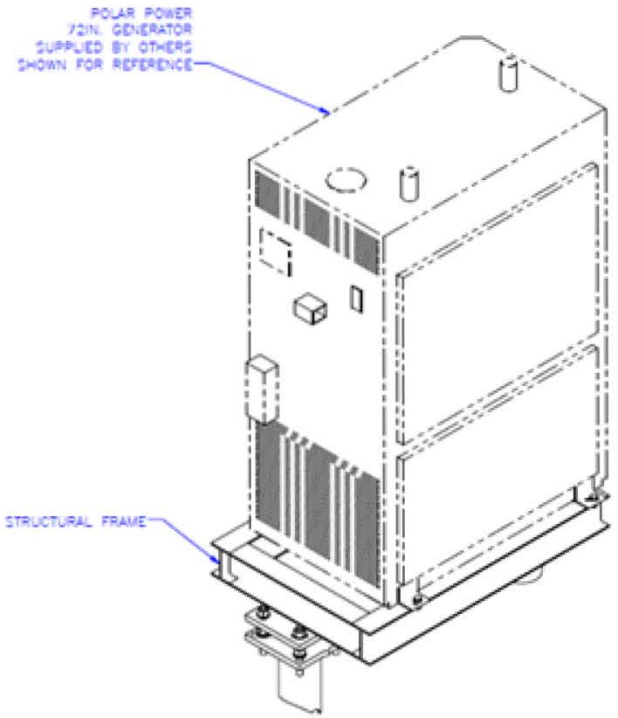




DETAIL B
GENERATOR MOUNTING HARDWARE



LEVELING HARDWARE DETAIL 8X



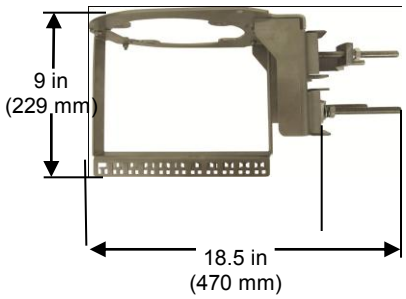
DC6-48-60-18-8F

DC Surge Suppression Solution

The DC6-48-60-18-8F is a dual chambered, DC surge suppression system for use in multi-circuit, Distributed Antenna Systems. The system will protect up to 6 Remote Radio Heads from voltage surges and lightning, and connect up to 18 fiber pairs. The system is enclosed in an IP 68 rated, waterproof enclosure.

FEATURES

- Protects up to 6 Remote Radio Heads, each with its own protection circuit.
- Flexible design allows for installation at the top of a tower for Remote Radio Head protection.
- Includes fiber connections for up to 18 pairs of fiber.
- LED indicators on individual circuits provide visual indication of suppressor status.
- Form 'C' relays allow for remote monitoring of the suppressor status.
- Patented Strikesorb technology provides over 60 kA of surge current capacity per circuit.
- Strikesorb suppression modules are fully recognized to UL 1449-3rd Edition Safety Standard, meeting all intermediate and high current fault requirements to facilitate use in OEM applications.
- Raycap recommends that DC protection system be installed within 2 meters or 6 feet of the radio.
- Dome design is lightweight and aerodynamic providing maximum flexibility for installation on top of towers.
- **Patent pending**



Raycap

US: Phone 208.777.1166 Toll Free 800.890.2569 Fax 208.777.4466
Europe: Tel +30 210 6152 000 Fax +30 210 6196 002
www.raycapsurgeprotection.com

DC6-48-60-18-8F

DC Power Surge Protection

Electrical Specifications	
Model Number	DC6-48-60-18-8F*
Nominal Operating Voltage	48 VDC
Nominal Discharge Current (I_n)	20 kA 8/20 µs
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs
Maximum Continuous Operating Voltage (U_c)	75 VDC
Voltage Protection Rating	400 V

*Module Assembly Part # - DC6-48-60-18-8F-U. Field upgradable, prewired module package for 1 remote radio.

Mechanical Specifications	
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum
Fiber Connection Method	LC-LC Single mode duplex
Environmental Rating	IP 68, 7m 72hrs
Operating Temperature	-40° C to + 80° C
Storage Temperature	-70° C to + 80° C
Cold Temperature Cycling	IEC 61300-2-22e -30° C to + 60° C 200 hrs @ 5 psi
Resistance to Aggressive Materials	CEI IEC 61073-2 including acids and bases
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs

WEIGHT

System: 18.9 lbs (84.07 N)
Mount : 13.9 lbs (57.38 N)
Total: 32.8 lbs (141.45 N)

Stand-alone Module Assembly: 1 lb (4.45 N)

COMBINED WIND LOADING

150mph (sustained) : 105.7 lbs (470 N)
195mph (gust): 213.6 lbs (950 N)

STANDARDS

Strikesorb modules are compliant to the following Surge Protection Device (SPD) Standards:

- ANSI/UL 1449 – 3rd Edition
- IEEE C62.41
- NEMA LS-1, IEC 61643-1:2005 2nd Edition:2005
- IEC 61643-12
- EN 61643-11:2002 (including A11:2007)

GS-07F-0435V

Certified to ISO 9001:2000

TÜV Rheinland of North America

US: Phone 208.777.1166 Toll Free 800.890.2569 Fax 208.777.4466
Europe: Tel +30 210 6152 000 Fax +30 210 6196 002
www.raycapsurgeprotection.com

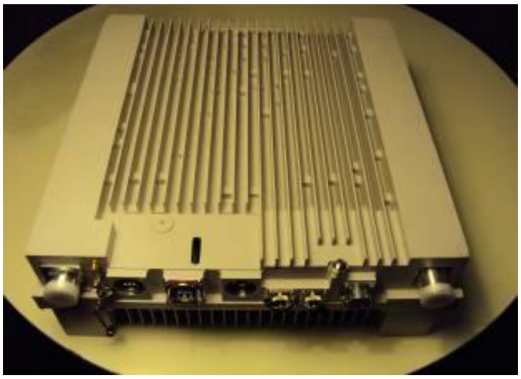
Remote Radio Head – RRUS11

Technical Specifications

Multi-standard support
- ✓ GSM, WCDMA LTE
- ✓ 2x30W MIMO
- ✓ IBW of 20 MH

Size & Weight
- ✓ B2 B4: 44 lbs
- ✓ B12: 50 lbs
- ✓ 15.9 x 16.3 x 5.8 in. excl. sun shield
- ✓ 17.8 x 17.3 x 7.2 in. incl. sun shield

Power
- ✓ Input voltage: -48 VDC or AC



Description	Value
Color	
Gray	

The RRUS 02 size, height, width, and depth with solar shield, is shown in Figure 2.

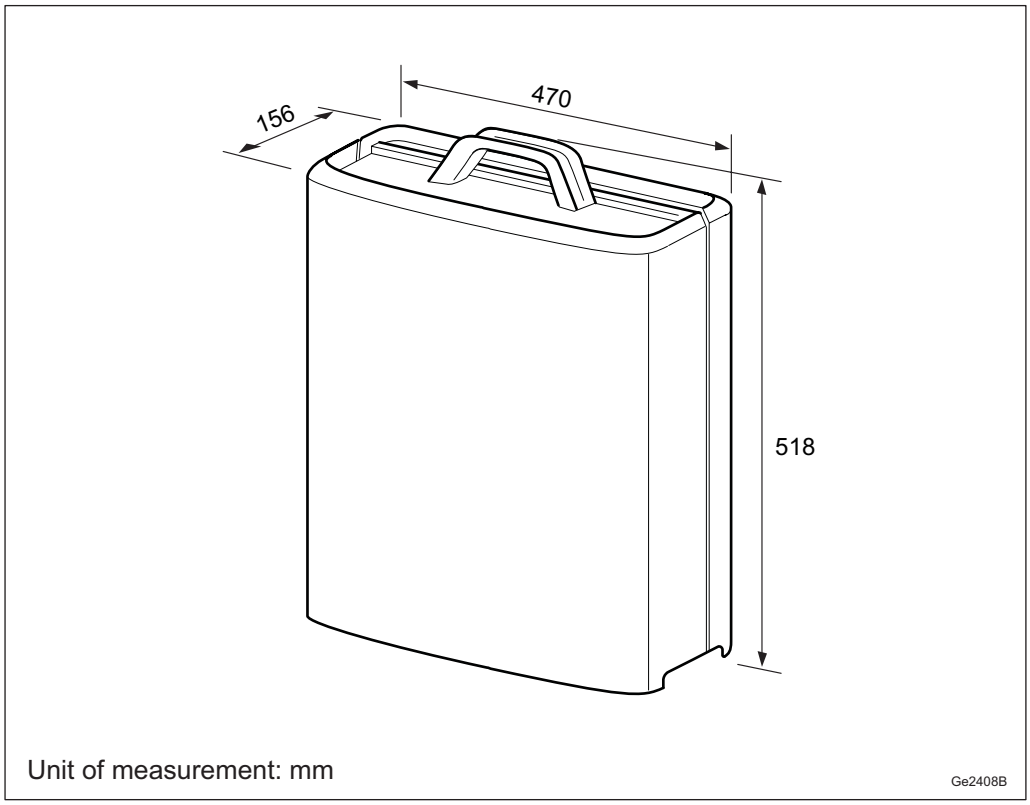


Figure 2 RRUS02 Height, Width, and Depth with Solar Shield

3.1.2 RRUS 12 Dimensions

Table 1 lists the technical data for the RRUS 12.

Table 2 RRUS 12 Technical Data

Description	Value
Maximum nominal output power	2x10 W, 2x20 W, 2x30 W, 2x40 W, 2x50 W, 2x60 W, and 2x60 W (subject for licence handling)
Number of carriers	One to four carriers (subject for licence handling)

Description	Value
Frequency	1,710 to 1,785 MHz uplink 1,805 to 1,880 MHz downlink IBW 25 MHz B3 for WCDMA and LTE (Type B)
Dimensions with Solar Shield and Handle and Feet	
Height	518 mm
Width	470 mm
Depth Type B	187 mm
Dimensions without Solar Shield and without Handle or Feet	
Height	418 mm
Width	458 mm
Depth Type B	159 mm
Weight	
RRUS 12 Type B	26.3 kg
Color	
Gray	

The RRUS 12 size, height, width, and depth with solar shield, is shown in Figure 2.

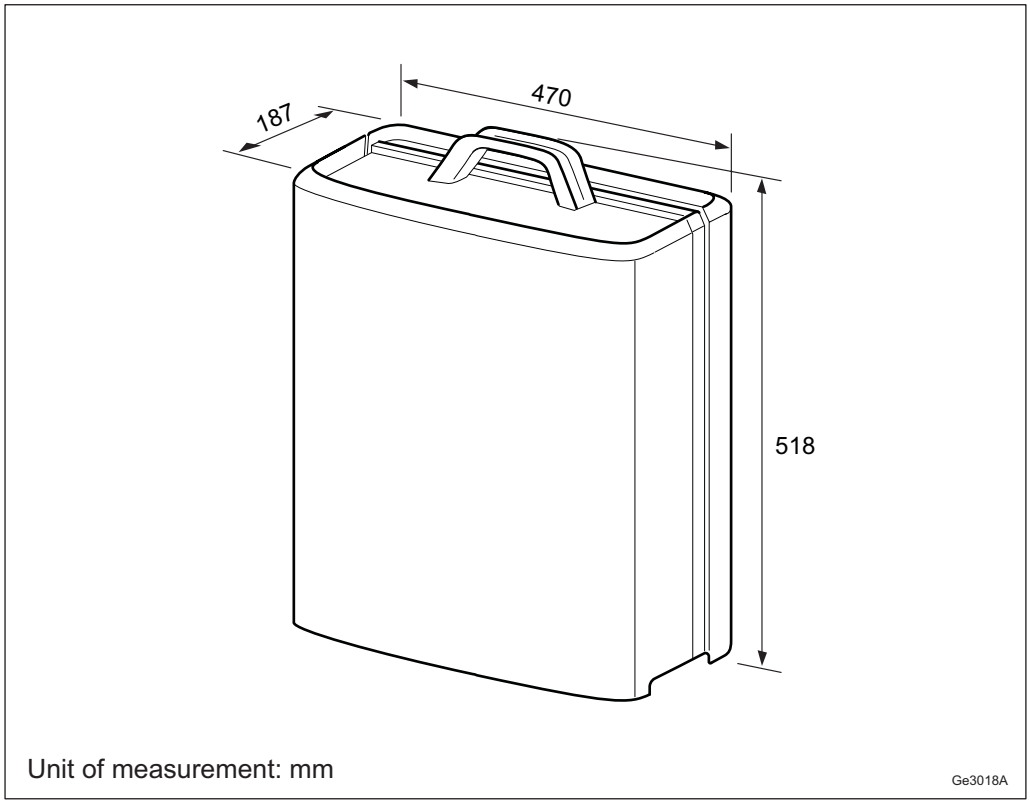


Figure 3 RRUS 12 Height, Width, and Depth with Solar Shield

3.2 Installation recommendations

In order to have a high Mean Time Before Failure (MTBF), reliable operation, and maximum performance, an appropriate installation location must be chosen.

3.2.1 Indoor Locations to Avoid

Despite that the unit is designed for outdoor use, it is recommended to operate in an indoor environment according to ETSI 300 019-1-3 class 3.1 and 3.3. This does not cover installation with heat traps or installation in lofts, where air ventilation does not exist. To ensure smooth performance of the product, it is recommended to ensure that the planned installation site for the unit is not a potential microclimate location. This typically occurs in places such as unventilated lofts, sites with heat traps, or sites where the product is exposed to direct sunlight through windows. Avoid installing the equipment under glass covers or skylight windows without proper ventilation.

ERICSSON

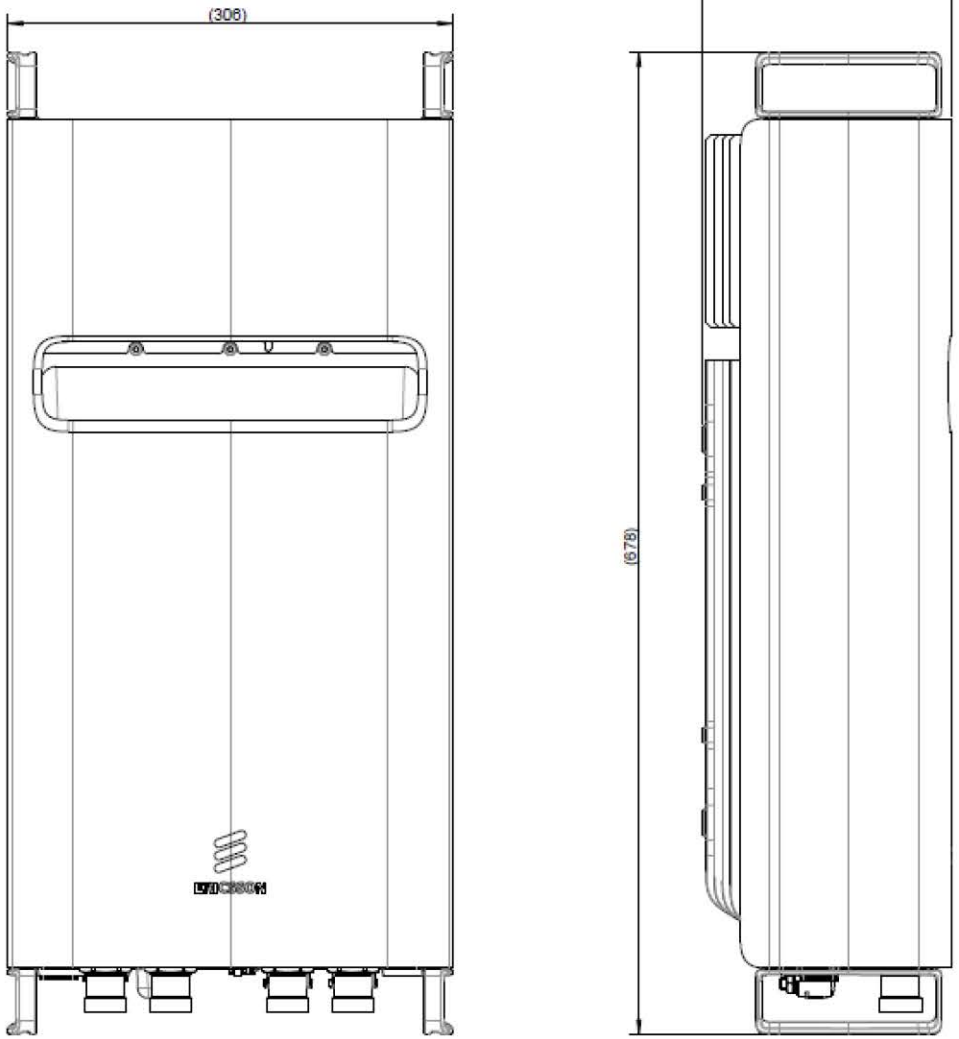
RRUS 32 B30 DATA SHEET

RRUS 32 B30

PRELIMINARY

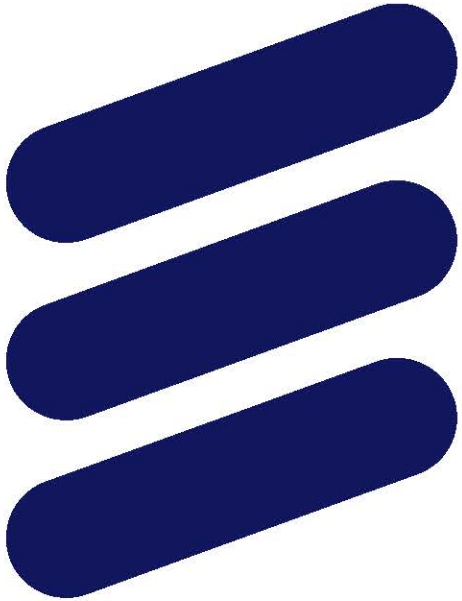
- WCS A□B blocks
  - T□ = 2350 – 2360 MH□
  - R□ = 2305 – 2315 MH□
- CPRI 2 ports x 10 Gbps
- Dimensions (incl. feet and sunshield)
  - Height: 26.7” (678 mm)
  - Width: 12.1” (306 mm)
  - Depth: 6.7” (171 mm)
- Weight, excl. mounting hardware
  - 60 lbs (23 kg)

MECHANICAL OUTLINE



(millimeters)

PRELIMINARY



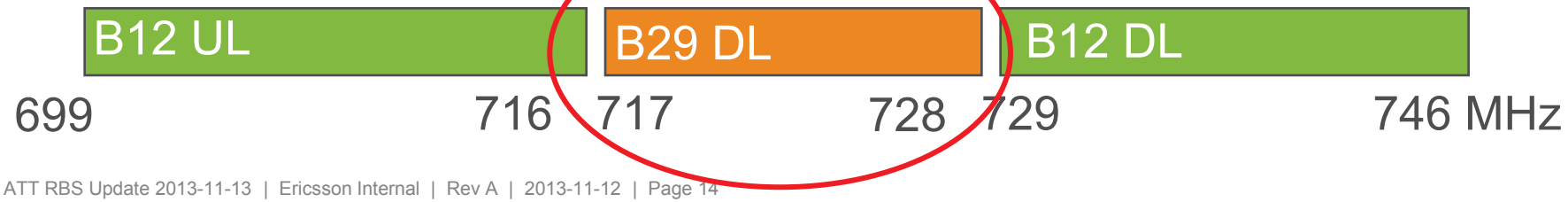
ERICSSON

RRUS E2 B29
OVERVIEW

- Built on RRUS 12 platform
- RF Power 2x40 Watts
- Improved TX filter, to reduce spurious emissions into B17 (12) uplink
- LTE – DL only. Up to 10 MHz
- Type B chassi:
  - HxWxD = 20.4”x18.5”x7.5” (including sun shield and handle)
  - Weight: Less than 60 lbs

PRA: February, 2014

Frequency plan:



Radio Description

Radio 4478

Description

209/1551-LZA 701 6001/3 Uen A

Contents

1 Introduction

This document describes Radio 4478.

1.1 Warranty Seal

The unit is equipped with a warranty seal sticker.

Note: Seals that have been implemented by Ericsson shall not be broken or removed, as it otherwise voids warranty.

2 Product Overview

The radio remotely extends the reach of the Radio System, and is designed to be located near the antenna. The radio is part of a modular radio building concept that enables a variety of installation alternatives that are also easy to expand. Flexible mounting solutions are provided using rails, pole clamps, and brackets. The small size of the radio together with the flexible mounting solutions reduces the site volume. The lower weight also improves the handling of the radio.

An optic cable connects the radio to the Radio System main unit or an expanded macro Radio System. The radios can be connected in a star configuration or in a cascade configuration with optical cable links. An overview of different radio installations is shown in Figure 1.

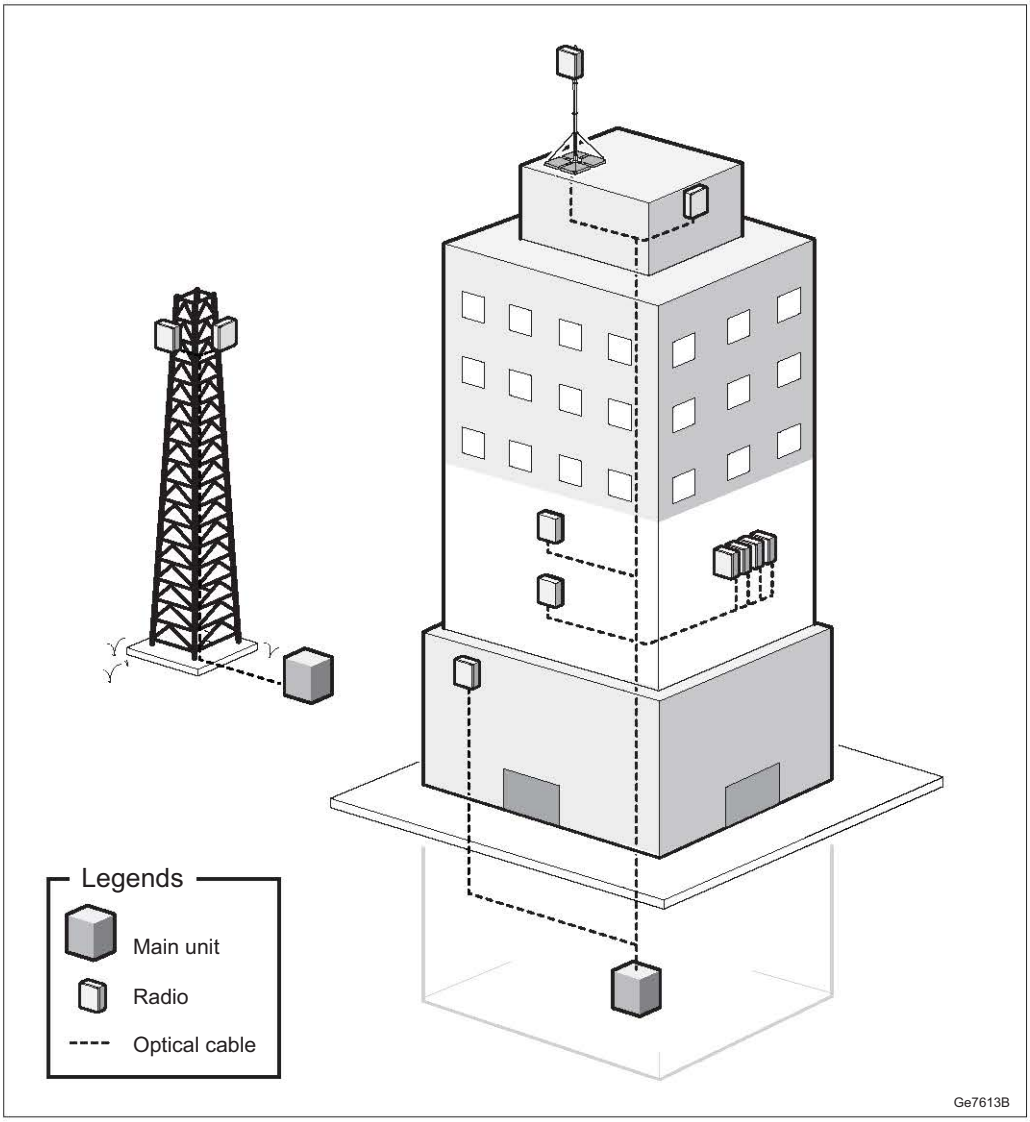


Figure 1 Radio Installations

2.1 Main Features

The following are the main features of the radio:

- Supports 2- and 3-wire power connections. For 2-wire power solutions, a DC adapter is used.
- Supports:
  - Long Term Evolution (LTE).
  - Frequency Division Duplex (FDD).

  - Duplex transmitter/receiver (4TX/4RX) branches.
  - Up to 10.1 Gbit/s CPRI (optical)
- Complies with 3GPP base station classes Medium Range (MR) and Wide Area (WA); relevant standards are listed in *Radio Standards Compliance* on page 32.

2.2 Optional Equipment

Optional equipment for Radio 4478 is the following:

- Fan unit.

3 Technical Data

This section contains the radio physical characteristics, environmental data, and the power information of the Radio System.

3.1 Technical Data Summary

This section contains a technical data summary for Radio 4478.

3.1.1 Radio 4478

The technical data for Radio 4478 is listed in Table 1.

Table 1 Radio 4478 Technical Data

Description	Value
Maximum nominal output power(1) (2)	4×40 W (License key is required for total power over 2×5 W.)
Number of carriers per branch	LTE: Six downlink, 12 uplink
Number of carriers per radio	LTE: 2x6 downlink, 2x12 uplink
Frequency(3)	788–798 MHz uplink 758–768 MHz downlink B14 for LTE
Dimensions without Fan Unit	
Height	420 mm
Width	342 mm
Depth	196 mm
Dimensions with Fan Unit	
Height	420 mm
Width	342 mm
Depth	207 mm
Weight without Fan	
Radio 4478 B14	27.2 kg
Weight with Fan	

Description	Value
Radio 4478 B14	28.7 kg
Color	
Body	NCS S 1002-B
Front	NCS S 6502-B

(1) Detailed information about LTE licences can be found in License Management or Manage Licenses.

(2) Detailed information about output power can be found in applicable Output Power User Guide.

(3) Information about Instantaneous Bandwidth (IBW) can be found in RBS Configurations.

Radio 4478 height, width, and depth without fan unit, are shown in Table 1.

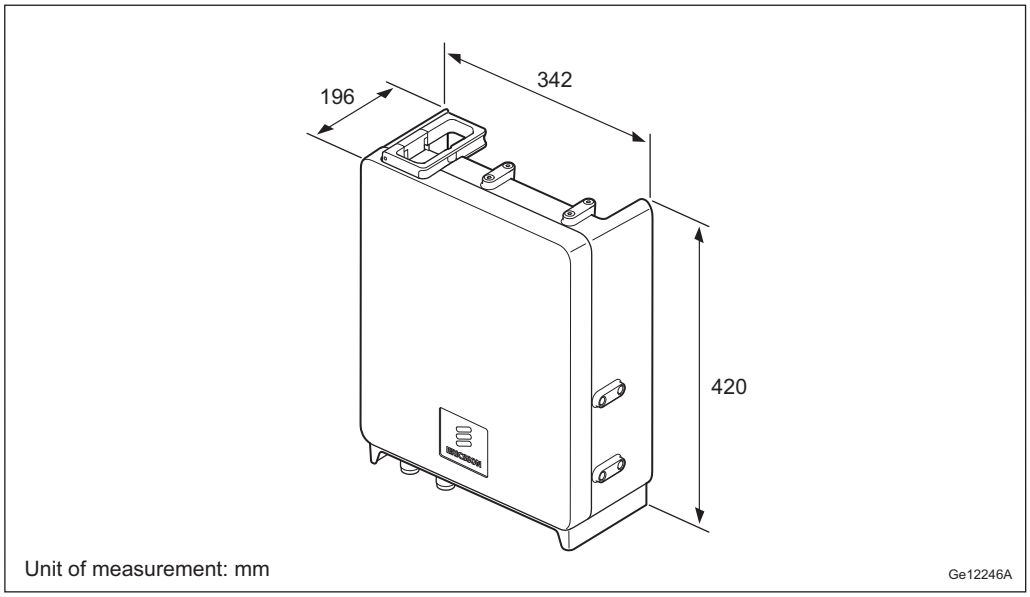


Figure 2 Radio 4478 Height, Width, and Depth without Fan Unit

Radio 4478 height, width, and depth with fan unit, are shown in Table 1.

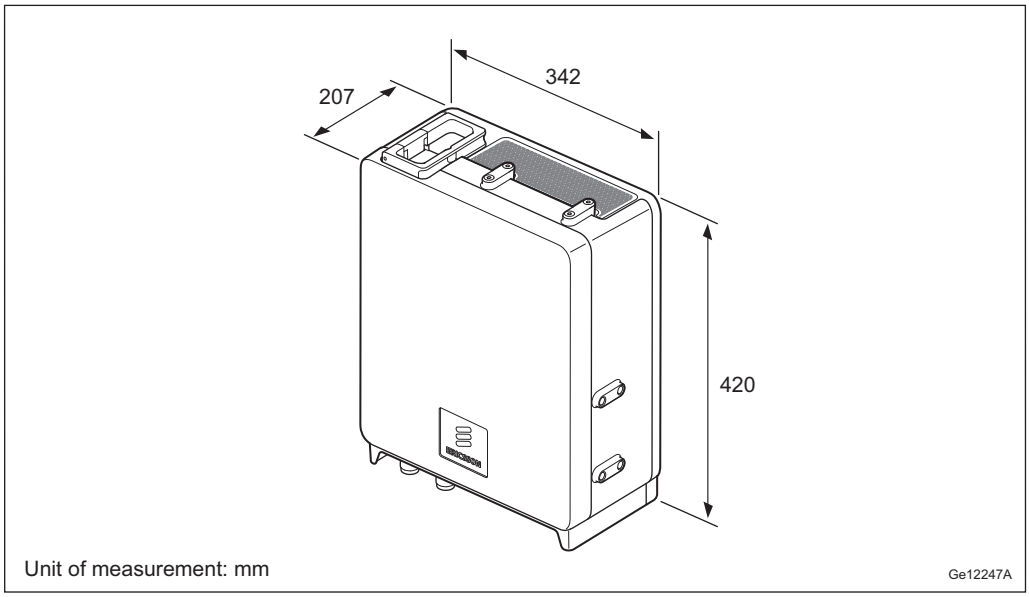


Figure 3 Radio 4478 Height, Width, and Depth with Fan Unit

Radio 4478 to rail measurement is shown in Table 1.

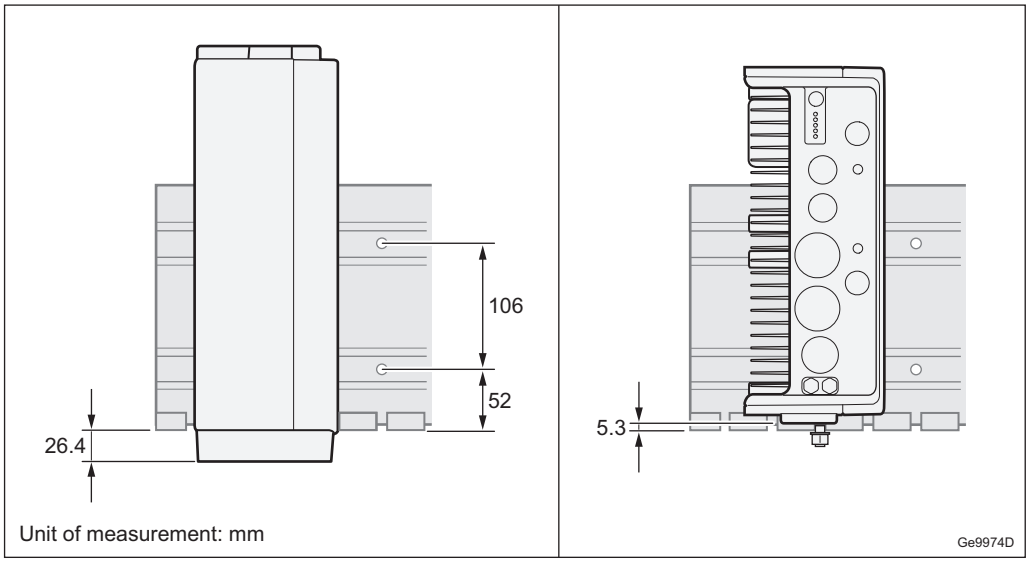


Figure 4 Radio 4478 to rail measurement

The technical data for the fan unit is in *Fan Unit for Radio 4478* on page 7.

3.1.2 Fan Unit for Radio 4478

The technical data for the fan unit for Radio 4478 is listed in Table 2.

Table 2 Fan Unit Technical Data for Radio 4478

Description	Value
Dimensions	
Height	410 mm
Width	335 mm
Depth	87 mm
Weight	
Fan unit	1.5 kg
Color	
Back cover	NCS S 1002-B
Fan box	NCS S 6502-B

The fan unit height, width, and depth for Radio 4478, is shown in Figure 5.

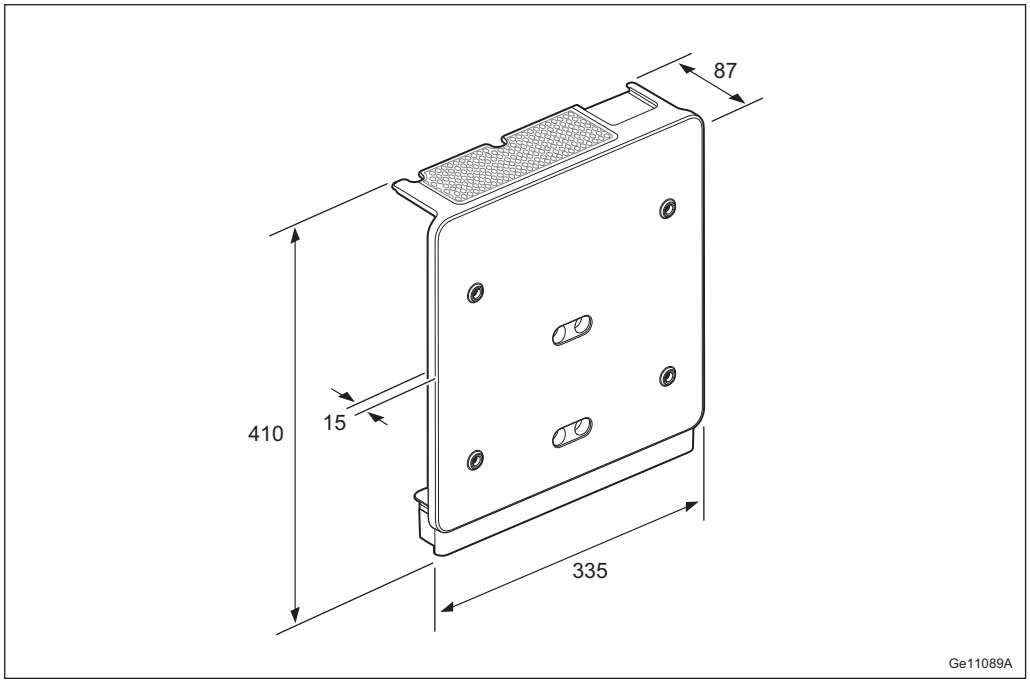


Figure 5 Fan Unit Height, Width, and Depth for Radio 4478

3.2 Installation Recommendations

To achieve reliable operation, and maximum performance, an appropriate installation location must be chosen.

3.2.1 Indoor Locations to Avoid

Although the unit is designed for outdoor use, it can also operate in an indoor environment according to ETSI EN 300 019-1-3 class 3.1, 3.2, 3.3, and 3.6. This does not cover installation with heat traps or installation in lofts, where air ventilation does not exist. To ensure smooth performance of the product, it is recommended to ensure that the planned installation site for the unit is not a potential microclimate location. This typically occurs in places such as unventilated lofts, sites with heat traps, or sites where the product is exposed to direct sunlight through windows. Ensure proper ventilation and avoid installing the equipment under glass covers or skylight windows.

3.2.2 Outdoor Locations to Avoid

Although Ericsson declares this product suitable for most outdoor environments, this does not cover installations where the planned installation site for the unit is a potential microclimate location. Typical examples for these microclimate locations are sites where the products are not only exposed to the actual temperature, but also additional temperature as heat coming from dark-colored planes, for example, reflections from the floor or walls. The additional temperature can generate heat traps with temperatures up to 10° C higher than expected.

Avoid installing equipment in the following locations:

- Near the exhaust of building ventilation system.
- Near the exhaust of the chimney.
- Opposite large surfaces made of glass or new concrete.

3.2.3 Installations that Require Fan Unit

The fan unit must be used in all installation scenarios where the cables from the radio are not pointing directly downwards. The fan unit must also be used in extreme conditions, such as installations with poor ventilation or installations with heat traps.

3.2.4 Painting Limitations

Ericsson does not recommend painting the radio as it may affect radio performance of the unit.

Ericsson will apply limitations to the warranty and service contract if the radio is painted.

3.2.4.1 Technical Limitations

If the radio is painted, be aware of the technical limitations below:

- Sunlight on dark paint may increase the temperature of the radio causing it to shut down.
- The plastic surfaces and the plastic covers are suited for painting with normal commercially available one or two component paints.
- Never use metallic paint or paint containing metallic particles.
- Ensure that ventilation and drainage holes are free from paint.
- Ensure proper adhesion of the paint.

3.2.4.2 Commercial Limitations

If the radio is painted, the commercial limitations below apply:

- Failure modes directly related to overheating due to painting are not valid for repair within the scope of the warranty or standard service contract.
- Product failures related to paint contamination of components of the unit are not valid for repair within the scope of warranty or standard service contract.
- When a painted unit is repaired, it will be restored to the standard color before being returned to the market. It is not possible to guarantee the same unit being sent back to the same place. This is also valid for units repaired under a service contract.
- For repairs within the warranty period or a standard service contract, the customer will be charged the additional costs for replacing all painted parts of the unit or the complete unit.

3.3 Space Requirements

The installation alternatives for the radio are shown in Figure 6 and listed in Table 3.

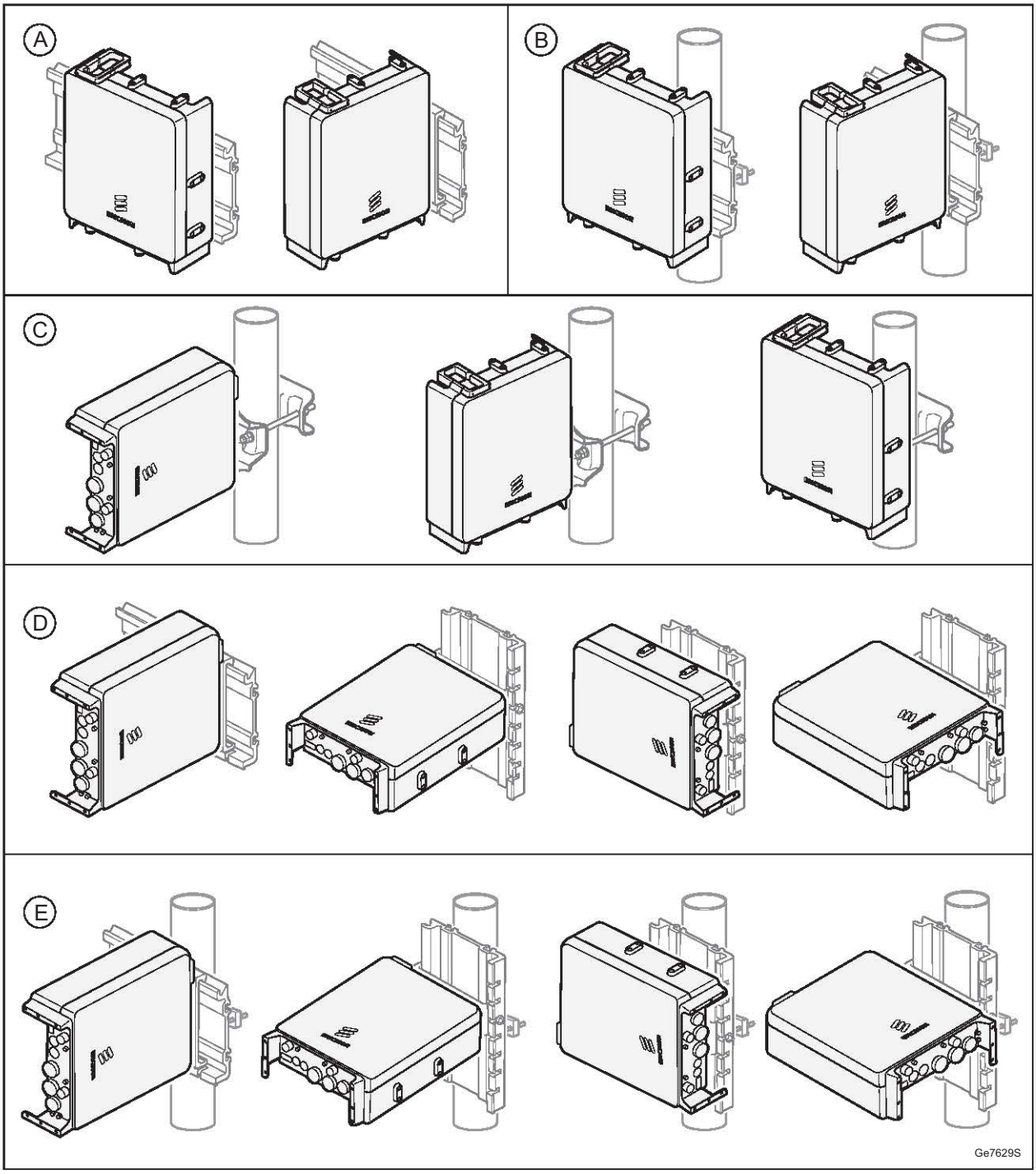


Figure 6 Installation Alternatives

Table 3 Key to Installation Alternatives

Installation Method	Description
A	Wall installation
B	Pole installation
C	Pole installation with single pole clamp
D	Wall installation with fan unit
E	Pole installation with fan unit

3.3.1 Generic Requirements

Parts of the radio can attain high temperatures during normal operation. Therefore the radio must be installed in a classified service access area. Exception applies when the radio is installed at a height that is not reachable from ground level.

Allow a sufficient working space in front of the radio.

It is recommended that the radio is installed below, or behind the antenna. Do not install the radio closer than 25 m from the main lobe of it its own antenna, or antennas belonging to other services or operators using the same site.

3.3.2 Pole or Mast Installation

The installation requirements when installing the radio on a pole or a mast are shown in Figure 7.

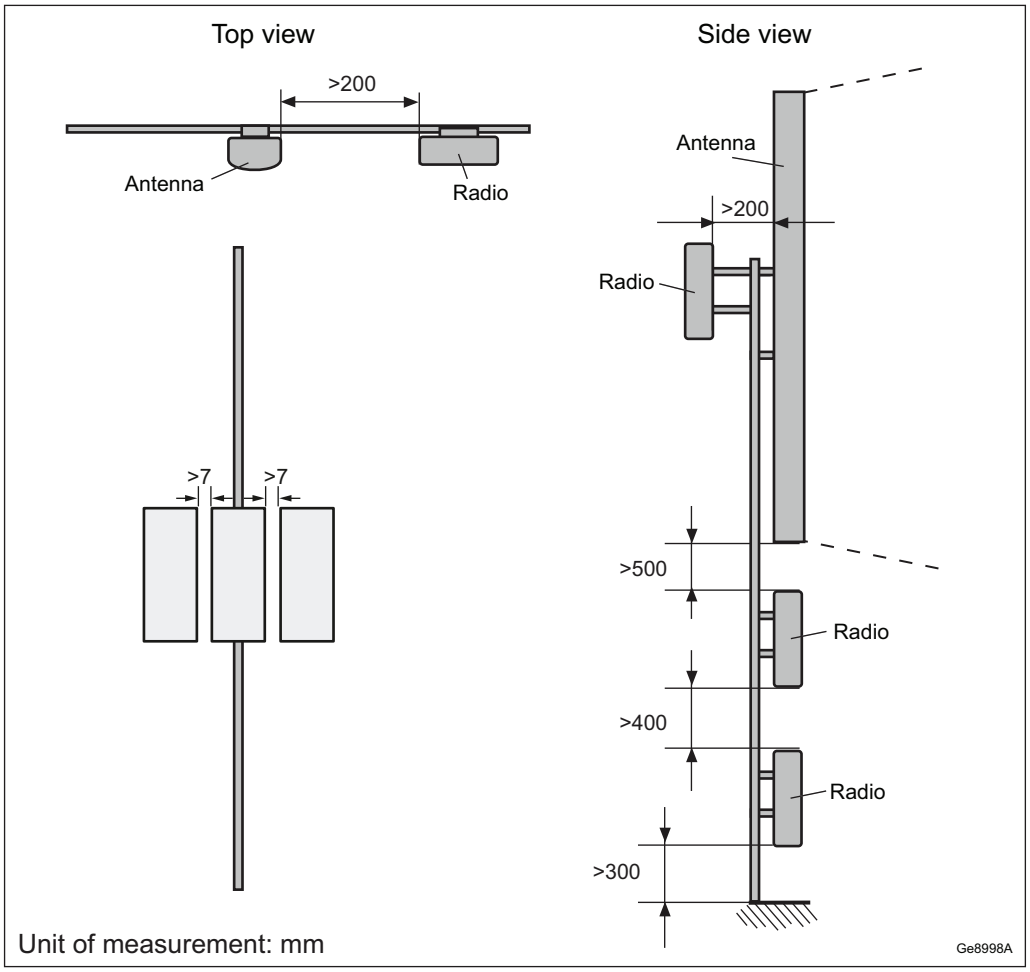


Figure 7 Radio Pole Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal rail on a single pole, or a dual pole installation. Allow a minimum vertical distance of 500 mm between radio and antenna, if installed above or below an antenna. The minimum distance from the bottom of the radio to the floor is 300 mm.

Allow a minimum of 7 mm free space between radios installed side by side on the rail.

Allow for a minimum of 40 mm free space between radios installed side by side on the rail when ambient temperature is expected to be above +45°C.

Note: A radio cannot be installed in the uppermost position of a pole or mast.

3.3.3 Rail Installation on Wall

This section describes the installation requirements when installing the radio on a wall.

3.3.3.1 Radio Installation on Outdoor Wall

The installation requirements if installing the radio outdoor on a wall are shown in Figure 8.

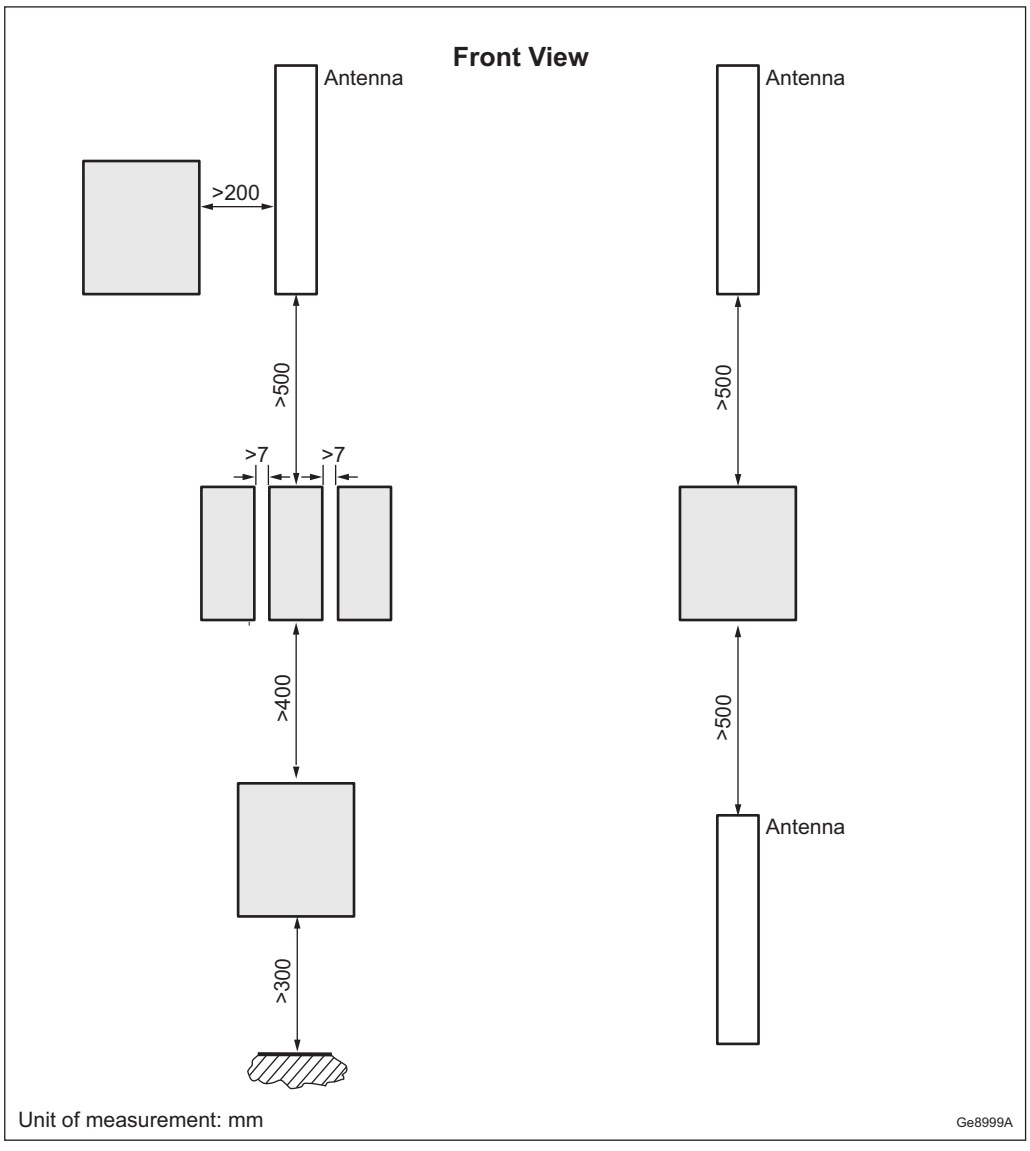


Figure 8 Radio Outdoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal rail on a wall. Allow a minimum vertical distance of 500 mm between radio and antenna, if

installed above or below an antenna. The minimum distance from the bottom of the radio to the floor is 300 mm.

Allow a minimum of 7 mm free space between radios installed side by side on the rail.

Allow for a minimum of 40 mm free space between radios installed side by side on the rail when ambient temperature is expected to be above +45°C.

3.3.3.2 Radio Installation on Indoor Wall

The installation requirements if installing the radio on an indoor wall are shown in Figure 9.

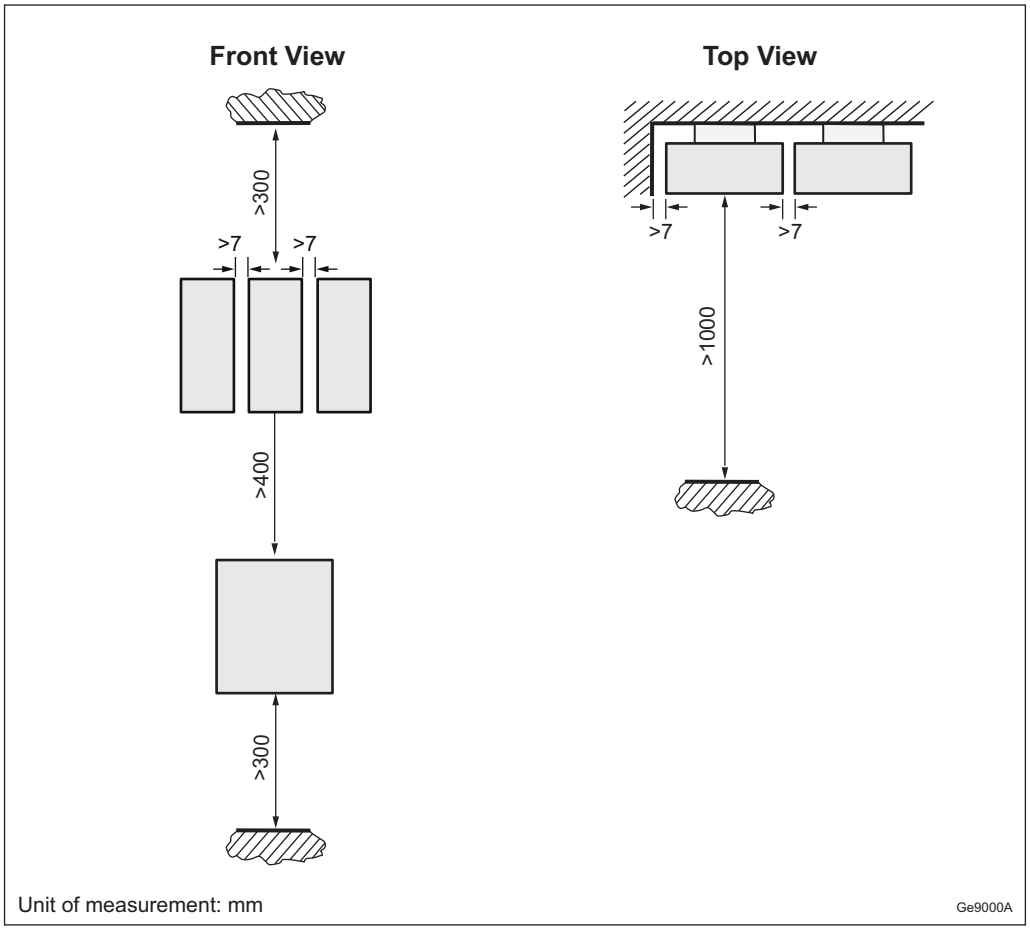


Figure 9 Radio Indoor Wall Installation Requirements

To ensure adequate airflow between the units, allow a minimum of 400 mm free space between radios vertically installed on a horizontal rail on a wall. The minimum distance from the bottom of the radio to the floor is 300 mm.

Allow a minimum of 7 mm free space between radios installed side by side on the rail.

Allow for a minimum of 40 mm free space between radios installed side by side on the rail when ambient temperature is expected to be above +45°C.

3.4 Acoustic Noise

The radio may emit low levels of acoustic noise when operating on low capacity in LTE.

With the Radio 4478 fan unit, the acoustic noise is ambient temperature dependent.

The sound pressure level for Radio 4478 without fan and when operating on low capacity in LTE can be 30 dBA.

The sound pressure level for Radio 4478 with fan is shown in Table 4.

Table 4 Sound Power Level

Temperature (°C)	Radio 4478 Sound Power Level (dBA)
< +25	45
+30	45
+40	53
+45	55
+55	59

3.5 Environmental Characteristics

This section contains operating environment data for the radio.

3.5.1 Operating Environment

The following are the values for the normal operating environment of the radio:

Temperature[1]	−40 to +55 °C
Solar radiation	≤ 1,120 W/m²
Relative humidity	5–100%
Absolute humidity	0.26–40 g/m^3
Maximum temperature change	1.0°C/min
Maximum wind load at 50 m/s (pole installed single case)	260 N (front)

(1) Depending on installation scenario, traffic load, and configuration, the product might in the highest 10 °C temperature range, temporary reduce the output power. This depends on the durations of the high ambient temperature.

3.5.2 Heat Dissipation

The radio is convection cooled and designed for outdoor installation. Table 5 shows the radio output power and maximum heat dissipation. Indoor installation in a room without adequate ventilation and cooling must be avoided.

Table 5 Radio Heat Dissipation

Unit	Output Power (W)	Maximum Heat Dissipation (kW)
Radio 4478 B14	4 x 40	0.51

3.5.3 Vibration

This section describes the radio tolerance to vibrations. The radio operates reliably during seismic activity as specified by test method IEC 60068-2-57 Ff.

Maximum level of Required Response Spectrum (RRS)	50 m/s^2 within 2–5 Hz for DR=2%
Frequency range	1–35 Hz
Time history signal	Verteq II

The radio operates reliably during random vibration as specified by test method IEC 60068-2-64 Fh

Random vibration, normal operation	0.3 m^2/s^3

3.5.4 Materials

This section contains information about materials.

All Ericsson products fulfill the legal and market requirements regarding the following:

- Material declaration
- Materials' fire resistance, components, wires, and cables
- Recycling
- Restricted and banned material use

3.6 Power Characteristics

This section describes the power supply requirements, power consumption, and fuse and circuit breaker recommendations for the radio.

Different power systems can supply power for multiple radios, if necessary.

3.6.1 DC Power Characteristics

The power supply voltage for the radio is −48 V DC. The power supply requirements are shown in Table 6.

Table 6 Radio DC Power Supply Requirements

Conditions	Values and Ranges
Nominal voltage	−48 V DC
Operating voltage range(1)	−36.0 to −58.5 V DC
Non-destructive range	0 to −60 V DC

(1) The operating voltage range refers to the voltage at the radio power input port.

The radio is designed for 3-wire power connections. For 2-wire power solutions, a DC adapter is used.

Fuse and Circuit Breaker Recommendations

The external fuse and circuit breaker recommendation for the radio are shown in Table 7.

The recommendations given in this section are based on peak power consumption and give no information on power consumption during normal operation.

The recommended melting fuse type is gG-gL-gD in accordance with IEC 60269-1. Circuit breakers must comply with at least Curve 3 tripping characteristics, in accordance with IEC 60934.

The radio has a built-in Class 1 (Type 1) Surge Protection Device (SPD) to protect the equipment in case of lightning and network transients. The recommended fuse or circuit breaker rating is therefore dimensioned not to trip the fuse or circuit breaker in case of most SPD operation. The minimum fuse rating could be taken into account only if it is accepted that fuses or circuit breakers trip in such situations.

Table 7 External Radio Fuse and Circuit Breaker Recommendations

Unit (DC Powered)	Output Power (W)	Minimum Fuse Rating (1) (A)	Fuse Rating Recommended for Reliable Operation (2) (A)	Maximum Allowed Fuse Rating(3) (A)
Radio 4478 B14	4 x 40 W	20 A	25 A	32 A

(1) These fuse ratings can only be used if it is acceptable that fuses trip because of lightning or network transients.

(2) The recommended fuse rating takes into account that external fuses are not to trip because of lightning or network transients.

(3) The absolute maximum fuse class in accordance with radio design restrictions.

Note: If a fuse or circuit breaker rating above minimum fuse rating is selected, cable dimensioning rules in *Position G, −48 V DC Power Supply Interface* on page 28 are to be reconsidered to make sure that the fuse or circuit breaker tripping criteria are met.

3.6.2 AC Power Characteristics

The radio installation accepts 100–250 V AC when used together with an optional PSU. For more information about the PSU, refer to *PSU Description*.

3.6.3 Power Consumption

For information about power consumption, refer to *Power Consumption Guideline for RBS 6000*.

3.7 System Characteristics

This section describes the system characteristics of the Radio System.

3.7.1 RF Electromagnetic Exposure

General information on RF Electromagnetic Fields (EMF) for radios connected to a Radio System from the 6000 family can be found in *Radio Frequency Electromagnetic Fields*.

Information about radio access specific compliance boundaries for electromagnetic exposure can be found in *Radio Frequency Electromagnetic Exposure*.

3.7.2 Software

Information on software dependencies can be found in *Compatibilities for Hardware and Software*.

3.7.3 Radio Configurations

For information about available radio configurations, refer to *RBS Configurations*.

4 Hardware Architecture

This section describes the radio hardware structure regardless of configuration or frequency. The DC adapter and radio components are shown in Figure 10 and listed in Table 8.

For a description of the supported radio configurations, refer to *RBS Configurations*.

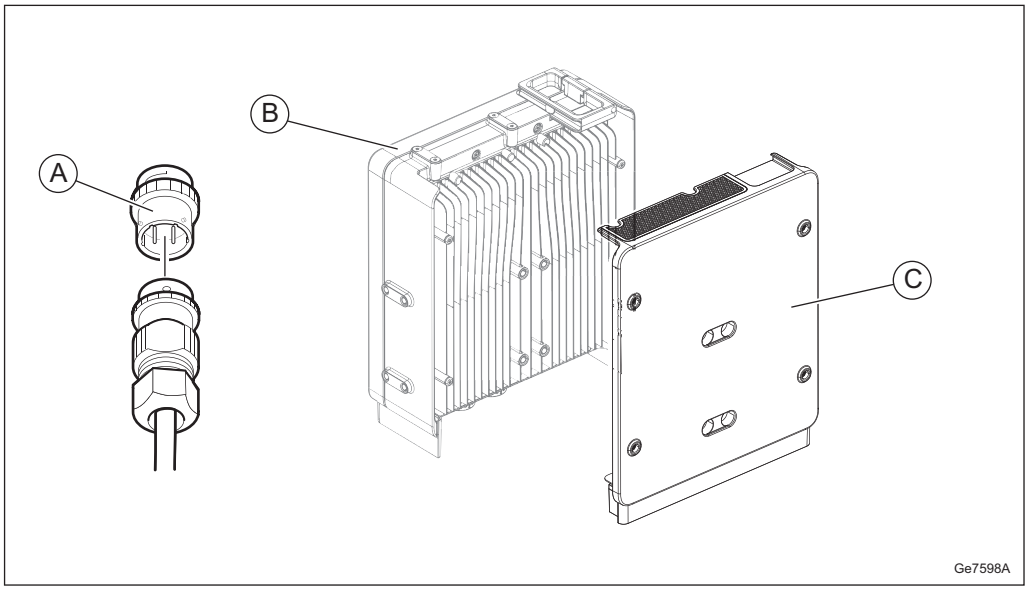


Figure 10 DC Adapter and Radio Components

Table 8 Key to DC Adapter and Radio Components

Position	Component
A	DC adapter for 2-wire connector
B	Radio
C	Fan unit

4.1 Radio Overview

The radio contains most of the radio processing hardware. The following sections describe the components inside the radio.

4.1.1 TRX

The Transmitter and Receiver (TRX) provides the following:

- Analog/Digital (A/D), Digital/Analog (D/A) conversion
- Channel filtering
- Delay and gain adjustment
- Digital predistortion
- RF modulation and demodulation
- Optical cable interface termination
- Two Eight receivers for RX diversity
- RET modem (the antenna system communication link)

4.1.2 PA

The Multi Carrier Power Amplifier (MCPA) is the linear power amplifier for the RF carriers. The radio has two MCPAs, one for each branch.

4.1.3 FU

The Filter Unit (FU) consists of low-noise amplifiers and band-pass filters.

In the radio, the FU also provides the following:

- Power and supervision for the TMA, or the RIU
- Voltage Standing Wave Ratio (VSWR) supervision

4.1.4 DC SPD

The DC SPD board protects the DC power input from lightning currents.

4.1.5 ALD (RET) SPD

An SPD provides overvoltage or overcurrent protection for the ALD (RET) port.

4.1.6 External Alarm SPD

An SPD provides overvoltage or overcurrent protection for the external alarm ports.

4.2 Fan Unit (Optional)

The Radio 4478 fan is DC-powered (24 V DC) and controlled via the radio external alarm port.

4.3 Optical Indicators and Buttons

The radio is equipped with optical indicators that show system status. The radio optical indicators are located under the maintenance cover. The radio optical indicators are shown in Figure 11, and explained in Table 9. The fan unit optical indicators are located under a cover and are shown in Figure 12, and explained in Table 10.

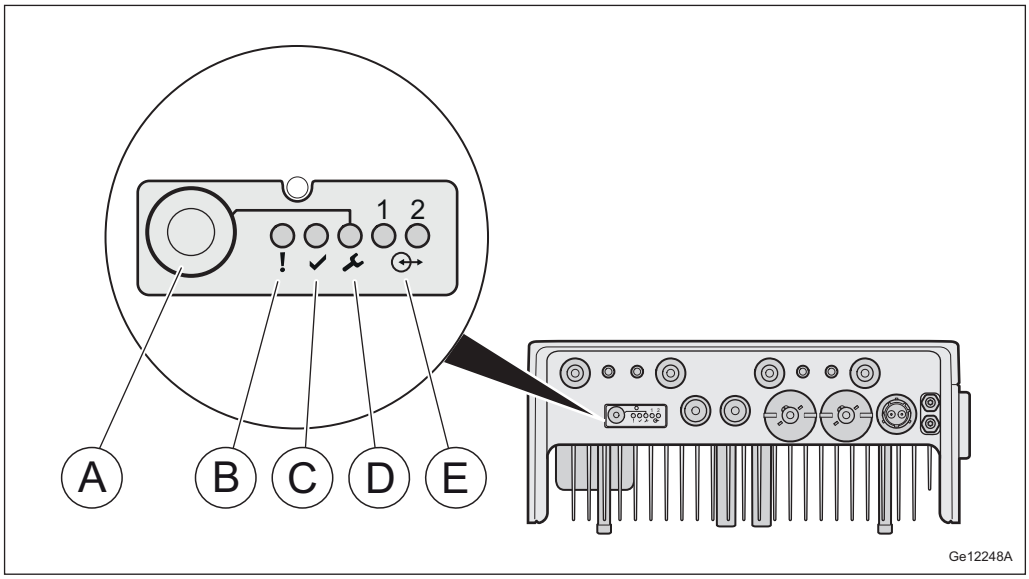


Figure 11 Radio Optical Indicators and Buttons for Radio 4478

Table 9 Description of Radio Optical Indicators and Buttons

Position	Name	Marking
A	Maintenance button	–
B	Fault	!
C	Operational	✔
D	Maintenance	🔧
E	Interface 1 Interface 2	⊕→

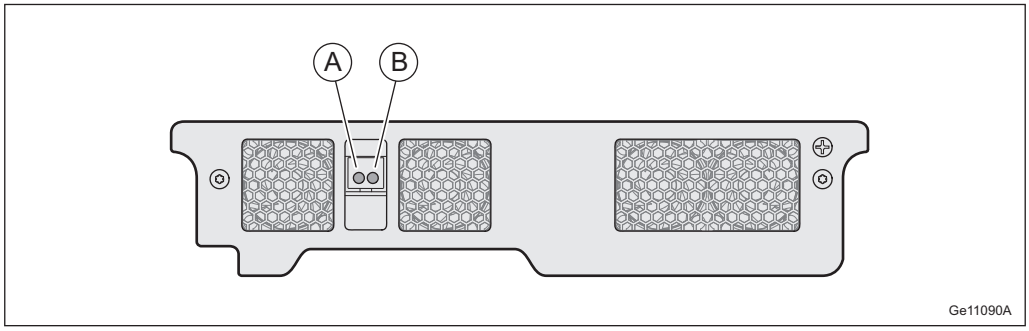


Figure 12 Fan Unit Optical Indicators

Table 10 Description of Fan Unit Optical Indicators

Position	Name	Marking
A	Fault	!
B	Operational	✔

For more information about the behavior of the optical indicators and the maintenance button, refer to *Indicators, Buttons, and Switches*.

5 Connection Interfaces

This section contains information about the radio and fan unit connection interfaces. The radio connection interfaces are shown in Figure 13, and listed in Table 11, and the fan unit connection interface is shown in Figure 14 and listed in Table 12.

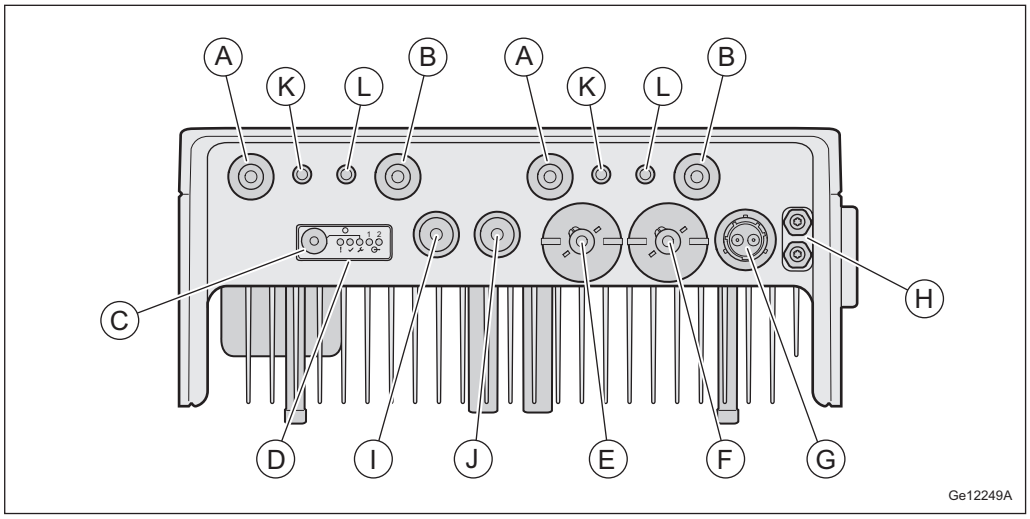
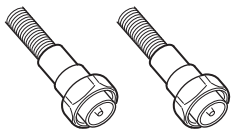
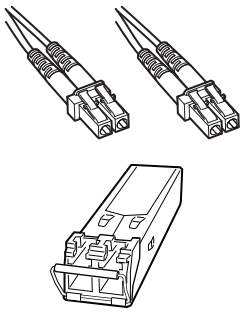
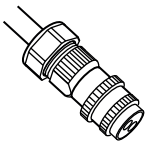
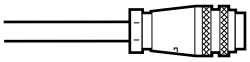
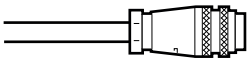
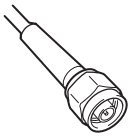


Figure 13 Radio 4478 Connection Interfaces

Table 11 Radio Connection Interfaces

Position	Description	Marking	Connector Types	Cable Types
A	Antenna A	A	4.3-10 connector	
B	Antenna B	B		
C	Maintenance button	–	–	–
D	Optical indicators	!, ✓, 🔧 1, 2	–	–
E	Optical cable 1	1	LC (On SFP) with support for FullAXS	
F	Optical cable 2	2		

Position	Description	Marking	Connector Types	Cable Types
G	−48 V DC power supply	POWER	Power connector	
H	Grounding	⏚	2 x M6 bolt	
I	External alarm and fan unit power supply and control		Mini-DIN connector, 14 pin	
J	ALD (used for a RET unit for example)	ALD	Mini-DIN connector, 8 pin	
K(1)	TX monitor A	A	SMA connector	
L(1)	TX monitor B	B		

(1) Optional for B8.

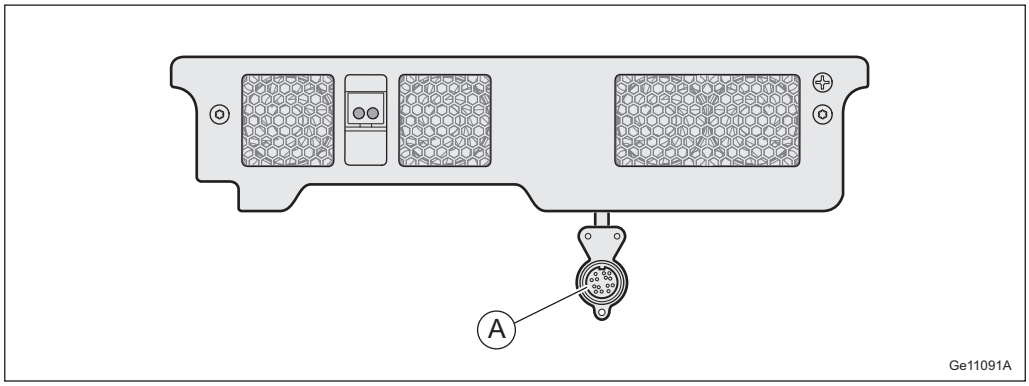


Figure 14 Fan Unit Connection Interface

Table 12 Description of Fan Unit Connection Interface

Position	Description	Marking
A	External alarm	

5.1 Position A and B, Antenna Interface

The antenna interfaces provide connections for the radio to antennas. RF cables connect the radio to the antenna.

The antenna connection interface characteristics of these cables are described in Table 13.

Table 13 Radio Antenna Connection Interface Characteristics

Connector Type	RF Cable Type	Cable Connector Type
4.3-10, insert-receiver type	50 Ω coaxial	4.3-10 type

Table 14 shows how to connect the antenna cables.

Table 14 Radio Antenna Cable Connectors

Radio Connectors	Antenna Connectors
A (Antenna A)	TX/RX
B (Antenna B)	TX/RX

5.2 Position C, Maintenance Button

The maintenance button is at the left of the ! symbol.

More information about the maintenance button can be found in *Indicators, Buttons, and Switches*.

5.3 Position D, Optical Indicators

Optical indicators show the system status. More information about the optical indicators can be found in *Indicators, Buttons, and Switches*.

5.4 Position E and F, Interface for Optical Cable to Main Unit

The 1 and 2 interfaces provide connections to optical cables for traffic and timing signals between the radio and the main unit. A Small Form-factor Pluggable (SFP)+ is used to connect the optical cable to the radio.

Note: The radio uses SFP+ modules for optical transmission and optical radio interfaces on Data 1 (optical cable 1 in) and Data 2 (optical cable 2 out).

Only use SFP+ modules approved and supplied by Ericsson. These modules fulfill the following:

- Compliance with Class 1 laser product safety requirements defined in standard IEC 60825-1.
- Certification according to general safety requirements defined in standard IEC 60950-1.
- Functional and performance verified to comply with Radio System specifications.

Recommended SFP+ modules are obtained from the product packages for the Radio System and the Main Remote Installation products. For more information about SFP modules, refer to *SFP Module Selector Guide* and *Main-Remote Installation Products Overview* for more information.

5.5 Position G, −48 V DC Power Supply Interface

The -48 V DC power connector for incoming power accepts cables with various cross-sectional areas, depending on the cable length and the radio maximum power consumption. For more information on -48 V DC power cable dimensions, see *Main-Remote Installation Products Overview*.

The power cable conductor has a wire for the 0 V DC conductor, and a wire for the -48 V DC conductor. The color codes are market-dependent for both wires.

All cables must be shielded. The shielding must be properly connected both to the power connector and to the grounding interface in the power supply equipment, otherwise the radio overvoltage and lightning protection does not function properly.

5.6 Position H, Grounding Interface

The radio must be grounded to protect it from overvoltage and lightning strikes. The grounding interface on the radio accepts an M6 dual cable lug on a coated cable.

For more information about grounding principles, refer to *Grounding Guidelines for RBS Sites*.

5.7 Position I, Ext Alarm Interface

Two external alarms can be connected to the radio external alarm port.

5.8 Position J, ALD Ctrl Interface

The ALD control (ALD Ctrl) connects an ALD (RET) cable to the radio for antenna system communication.

5.9 Position K and L, TX Monitor Interface (Optional)

The TX monitor interfaces provide the monitoring for the output power and are shown in Table 15.

Table 15 TX Monitor Cable Connectors

Radio Connectors	TX Monitor Connectors
TX Monitor A	SMA Connector
TX Monitor B	SMA Connector

5.10 Optional Equipment Interfaces

The equipment presented in this section is optional and can be ordered separately.

5.10.1 Fan Unit

The fan unit consists of a replaceable fan tray.

6 Standards and Regulations

This section presents a brief overview of standards, regulatory product approval, and declaration of conformity for Radio 4415.

Declaration of Conformity

"Hereby, Ericsson AB, declares that this RBS is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and 2011/65/EU."

6.1 Regulatory Approval

The Radio System complies with the following market requirements:

- European Community (EC) market requirements, R&TTE Directive 1999/5/EC

  CE 0168 ! Alert Mark (Class 2 equipment). Restrictions to use the apparatus may apply in some countries or geographic areas. Individual license to use the specific radio equipment may be required.

  The apparatus may include radio Transceivers with support for frequency bands not allowed or not harmonized within the EC.

- Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2011/65/EU).
- Products containing radio Equipment outside North America and in countries not recognizing the CE-mark may be labeled according to national requirements or standards.

6.1.1 Environmental Standards Compliance

The Radio System complies with the following environmental standard:

Europe

- EN 50 581 (RoHS)

6.1.2 Safety Standards Compliance

In accordance with market requirements, the Radio System complies with the following product safety standards and directives:

International

- IEC 60215
- IEC 60950-1

Europe

- EN 50 385
- EN 60 215
- EN 60 950-1

North America

- Health Canada Safety Code 6
- UL 60 950-1
- CSA-C22.2 No. 60 950-1-07

6.1.2.1 Outdoor specific requirements

The Radio complies with the following outdoor specific requirements:

International

- IEC 60 529 (IP65)
- IEC 60 950-22

Europe

- EN 60 529 (IP65)
- EN 60 950-22

North America

- CSA-C22.2 No. 60950-22-07

- UL 50E
- UL 60950-22

6.1.3 EMC Standards Compliance

The Radio System complies with the following Electromagnetic Compatibility (EMC) standards:

International

- 3GPP TS36.113
- 3GPP TS37.113

Europe

- ETSI EN 301 489-1
- ETSI EN 301 489-23
- ETSI EN 301 489-50

North America

- FCC CFR 47 Part 15 B
- IC ICES-003 B

6.1.4 Radio Standards Compliance

The Radio System complies with the following radio standards:

International

- 3GPP TS36.141
- 3GPP TS37.141

Europe

- ETSI EN 301 908-1
- ETSI EN 301 908-14

- ETSI EN 301 908-18

North America

- IC RSS-199 (Canada frequency dependent)
- IC RSS-Gen (Canada)

6.1.5 Marking

To show compliance with legal requirements, the product is marked with the following labels:

Europe

- CE mark

North America

- usETL/cETL
- FCC CFR 47 Part 15 Statement
- IC ICES-003 Statement
- IC ID

6.2 Other Standards and Regulations

The standards and regulations in this section are not regulatory requirements.

6.2.1 Spare Parts

This radio complies with the Ericsson Serviceability and Spare Parts Strategy.

6.2.2 Surface Quality

The surface quality of the radio is in accordance with Ericsson standard class A3.

6.2.3 Vandal Resistance

Unauthorized access is not possible without damaging the unit.

RADIO 4478

The macro Radio 4478 is a 4T/4R radio supporting low bands with 4x40W output power. As part of the Ericsson Radio System portfolio Radio 4478 has best in class design when it comes to radio performance and power efficiency for wide area 3GPP radio products.

Radio 4478 has by use of its small and smart dimensions support for a wide range of mounting scenarios and provides a pioneering flexibility within its product segment with the One-bolt Installation. With Radio 4478 Ericsson evolves the macro radio part of the portfolio to become even more flexible and making it easier than ever to make small and efficient single and multi-band macro radio installations.

The Radio 4478 should preferably be located near the antenna and can be located up to 40 km from the baseband unit. A fiber optic cable can be used to connect the Radio 4478 to the baseband unit and several radio units can be connected in a cascade or star configuration.

Radio 4478 provides support for AISG TMA and RET towards the antenna system. LTE is supported with up to 6 carriers in MIMO. Four duplex (TX/RX) branches provide in-built support for MIMO, antenna calibration and TX/RX diversity.

Optional installation equipment for wall and pole mount is available. To support AC installations there will be optional Power Supply Units (PSU).

Technical specification for Radio 4478

FREQUENCY BANDS	
Bands:	3GPP FDD low bands (600-900 MHz)
HW CAPACITY	
Carrier capacity LTE:	Up to 6 carriers in MIMO
IBW:	Full band IBW
MIMO:	Yes, 4T4R
Output power:	Up to 4 x 40 W
INTERFACE SPECIFICATIONS	
Antenna ports:	4 x 4.3-10 (f)
External Antenna Line Device:	RET 2.0, using DIN 8 or over the antenna port. AISG TMA & RET support
CPRI:	2 x 2.5/4.9/9.8/10.1 Gbps (exchangeable SFP modules)
Optical indicators:	5
Maintenance button:	1
External alarms:	2 (using DIN 14) or optional fan unit
Field ground:	Dual lug
MECHANICAL SPECIFICATIONS	
Weight:	27 kg
Volume:	24 liter
Mounting:	Rail, wall and pole mount Fans needed when mounted in non-vertical direction
ELECTRICAL SPECIFICATIONS	
Power Supply:	-48 VDC (3-wire)
ENVIRONMENTAL SPECIFICATIONS	
Normal operating temp.:	-40 °C to +55 °C (cold start at -40 °C)
Environment:	Outdoor class with IP65

Telefonaktiebolaget LM Ericsson
SE-164 80 Stockholm, Sweden
www.ericsson.com

28701-FGC 101 3398 Rev A

ERICSSON

ERICSSON RADIO SYSTEM

RADIO 4415 B2/B66A (INCLUDING R5) AND RADIO 4426

INFORMATION

11/22-2017

RADIO 4415

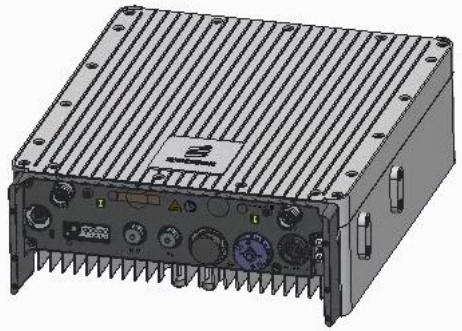
- 4TX/4RX
- Up to 4x40W
- Up to 65 MHz IBW
  - 20 MHz IBW for GSM or LTE1.4/3MHz carriers
- Up to 12 carriers GSM
- Up to 8 carriers WCDMA
- Up to 6 carriers LTE in MIMO
- 2x 2.5/4.9/9.8/10.1 Gbps CPRI
- 17 liter 21 kg
- -48 VDC 3-wire (2-wire with adapter)
- AISG TMA & RET support via RS-485 or RF connectors
- 2 external alarm
- Optional fan for increased site flexibility
- IP 65, -40 to +55℃

Optional FAN

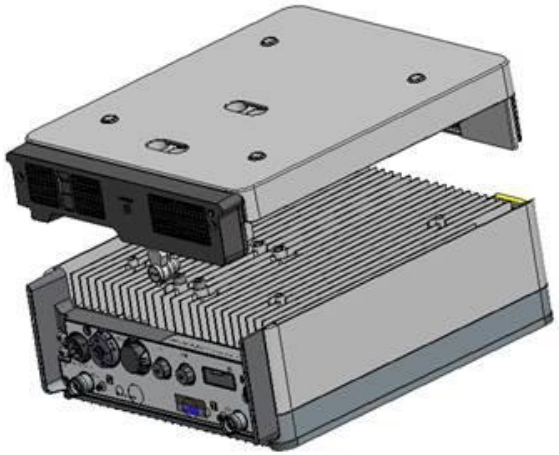
RADIO 4415 R5

IMPROVEMENT IN SIZE/WEIGHT

- 4TX/4RX
- 4x40W
- Up to 65 MHz IBW
  - 20 MHz IBW for GSM or LTE1.4/3MHz carriers
- Up to 12 carriers GSM
- Up to 8 carriers WCDMA
- Up to 6 carriers LTE in MIMO
- 2x 2.5/4.9/9.8/10.1 Gbps CPRI
- 15 liter, TBD kg
- -48 VDC 3-wire (2-wire with adapter)
- AISG TMA & RET support via RS-485 or RF connectors
- 2 external alarm
- Optional fan for increased site flexibility
- IP 65, -40 to +55℃



Optional fan



Release timing in 2018, exact dates TBD

KEY CHARACTERISTICS
RADIO 4415

Bands	Supported Standards	Output Power (W)	DL IBW (MHz)	UL IBW (MHz)	Planned Certification	Note
B2/B25	GWL	4x 40	60(65)/40/20	60 (65)	FCC	
B66A	WL	4x 40	70	70	FCC	• 1.4MHz/3MHz LTE carrier not supported

R5 revision

Bands	Supported Standards	Output Power (W)	DL IBW (MHz)	UL IBW (MHz)	Planned Certification	Note
B2/B25	GWL	4x 40	60(65)/60(65)/20	60 (65)	FCC	
B66A	WL	4x 40	70	70	FCC	• 1.4MHz/3MHz LTE carrier not supported

PHYSICAL DIMENSIONS
RADIO 4415

Radio 4415	Dimension (mm)	Notes
without protruding & wo. Fan	380H x 335W x 137D (change for R5) (~17 liter/~15 liter för R5)	• H (Handle, connectors and protruding are excluded) • W (Protruding for rail mounting is excluded) • D (Distance plug and higher fin/wall are excluded)
w. protruding but wo. Fan	420H x 342W x 149D	
wo. protruding but w. Fan	380H x 335W x 157D (~20 liter)	• H (Handle, connectors and protruding are excluded) • W (Protruding for rail mounting is excluded) • D (Distance plug is excluded)
w. protruding & Fan	420H x 342W x 160D	

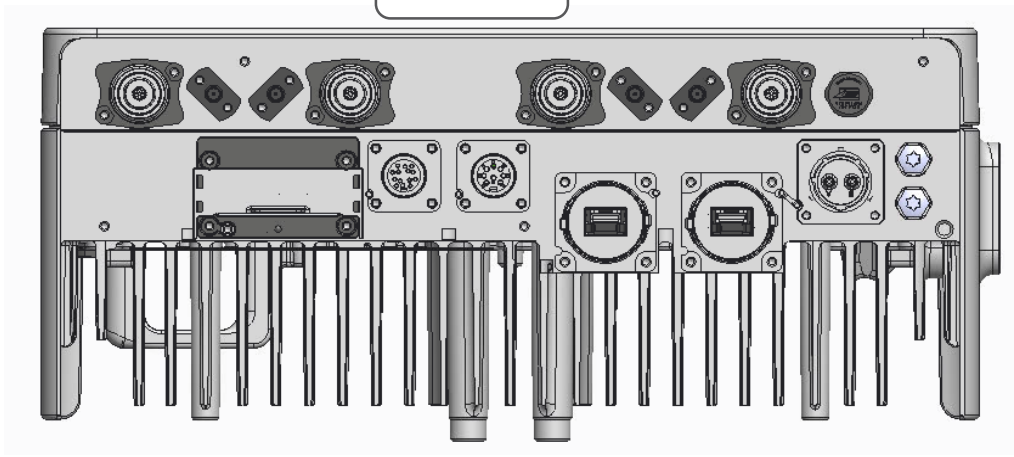
Note: The fan for R5 will be new, but also work for earlier 4415 revisions

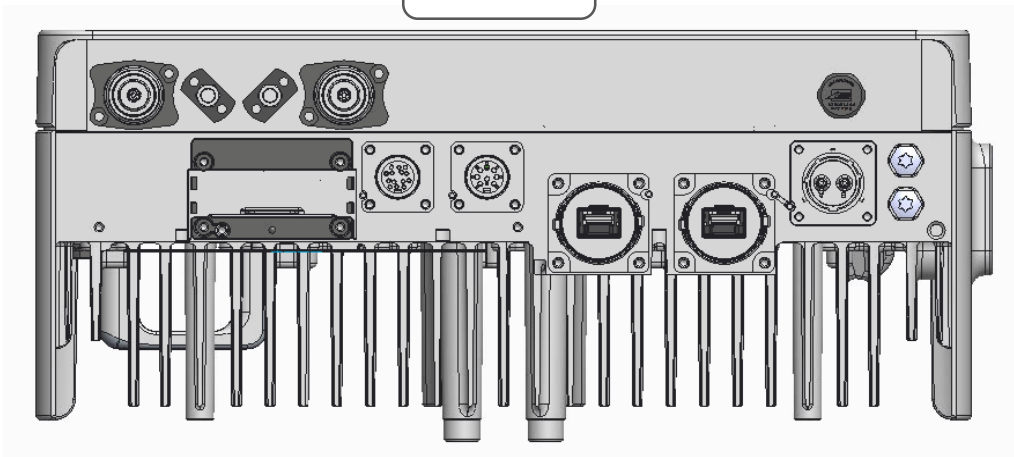
FRONT PANEL CHANGES WITH R5

4T4R

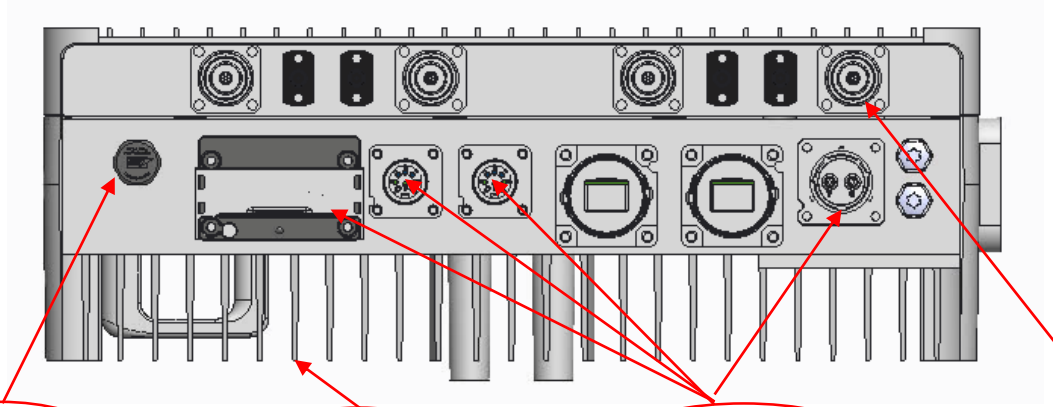
2T2R

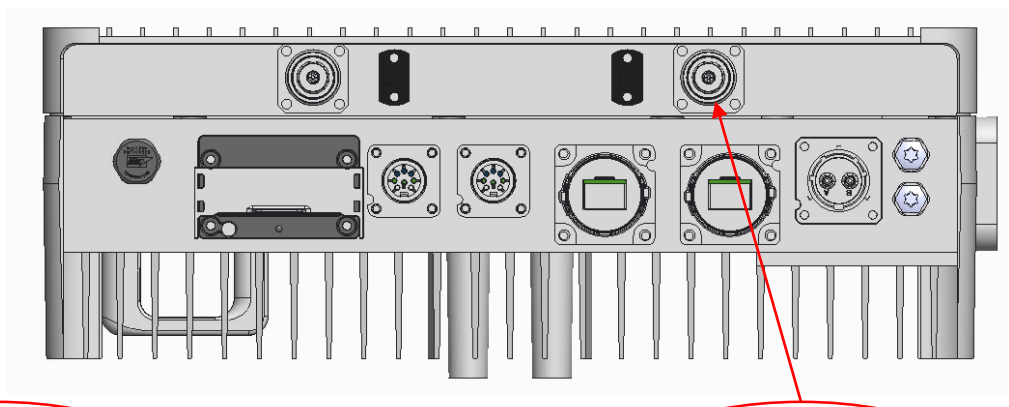
G2





R5





Vent hole moved down

-5mm Fin height

Connectors move down

Connectors position moved

Connectors position moved

WEIGHT
RADIO 4415 AND RADIO 4478

Units	Weight	Note
Radio 4415	21 kg (1-2 kg less for R5)	Without optional fan
Fan unit	1.5 kg	

POWER CONSUMPTION

- Site fuse dimensioning
  - Radio (incl. FAN & TMA & RET): 720W, 20A

- Power consumption according to ETSI TS 102 706 Version 1.3.1
  - Estimated “Typical” power consumption at room temperature & mid-band

Power Consumption (W)	Low Load (~6%)	Busy hour Load (~52%)	Max Load (100%)
Radio 4415	230 ~ 340	400 ~ 450	570 ~ 660

CARRIER CONFIGURATION CAPABILITY

- Maximum carrier capacity per radio unit
  - Maximum 12 GSM carriers
  - Maximum 8 WCDMA carriers
  - Maximum 6 LTE carriers (MIMO)
  - Maximum 12 carriers in MSMM and single standard rule also applies

- Maximum carrier capacity per radio antenna port
  - Maximum 6 DL carriers per radio antenna port
    - Maximum 4 carriers GSM
    - Maximum 4 carriers WCDMA
    - Maximum 6 LTE carriers
    - Maximum 6 DL carriers in MSMM and single standard rule also applies
  - Maximum 6 UL carriers per radio antenna port

CPRI CAPABILITY

- Each radio supports two CPRI ports supporting 2.5/4.9/9.8/10.1Gbps data rate

- One 10.1Gbps CPRI can support
  - Up to 65% CPRI compression
  - Up to 480 MHz total carrier bandwidth
  - Depended on LTE RAN release

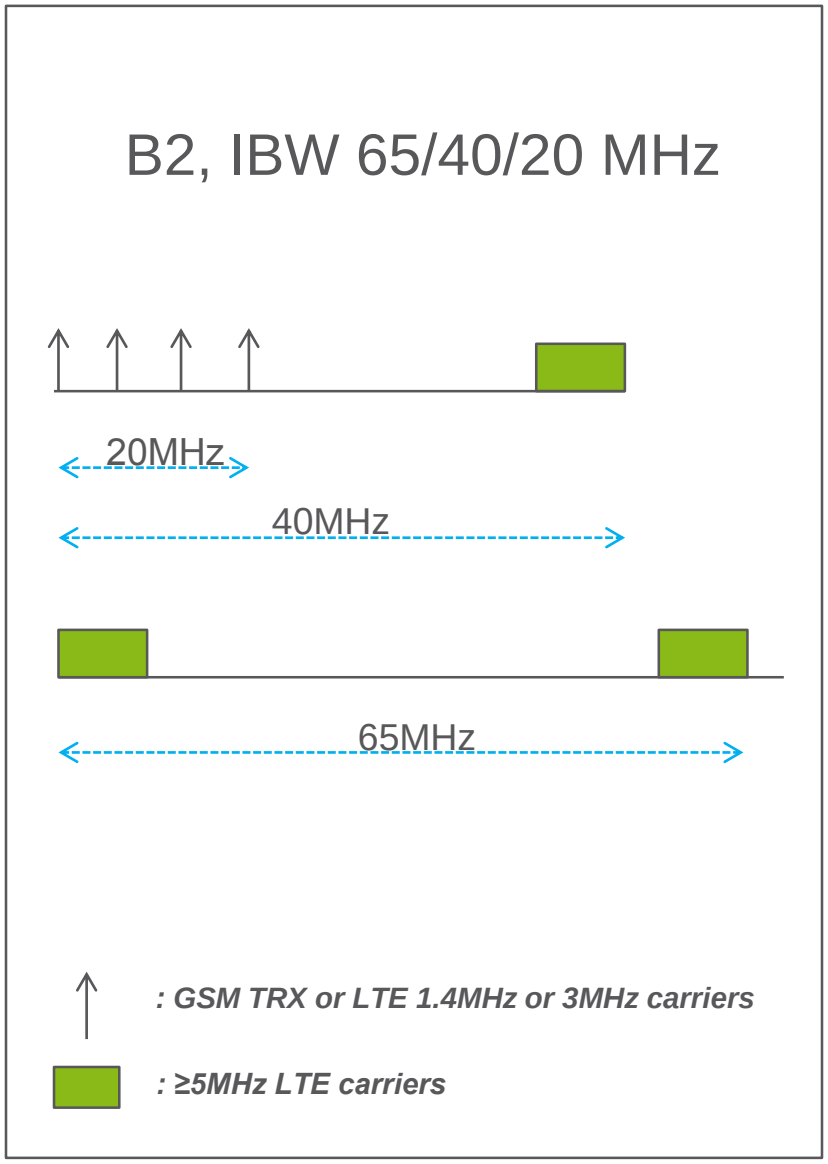
- One 9.8Gbps CPRI can support
  - Up to 50% CPRI compression
  - Up to 320 MHz total carrier bandwidth
  - Depended on LTE RAN release

OUTPUT POWER FOR GSM
RADIO 4415

- GSM
  - Support Single-RAT GSM according to MSR or MSMM but with different IBW capabilities
  - Maximum output power per GSM TRX is 20W
  - Virtual IBW is supported
    - Support only baseband hopping when the radio two antenna groups (2 ports per group) configured with different IBW window i.e. Virtual IBW

DL IBW
RADIO 4415

- DL IBW: A/B/C
  - Abbreviation
    - Wide Carrier: ≥5MHz LTE
    - Narrow Carrier: <5MHz LTE or GSM carrier
  - A: IBW when configured with only Wide Carriers
  - B: IBW when configured with mixed Wide Carriers and Narrow Carriers
  - C: IBW when configured with only Narrow Carriers

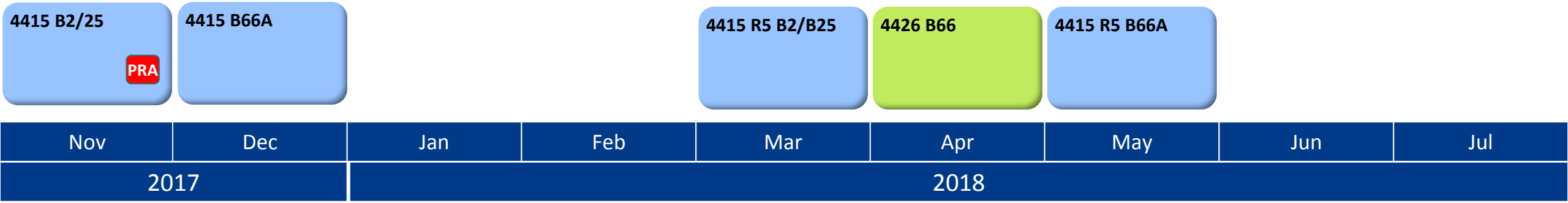


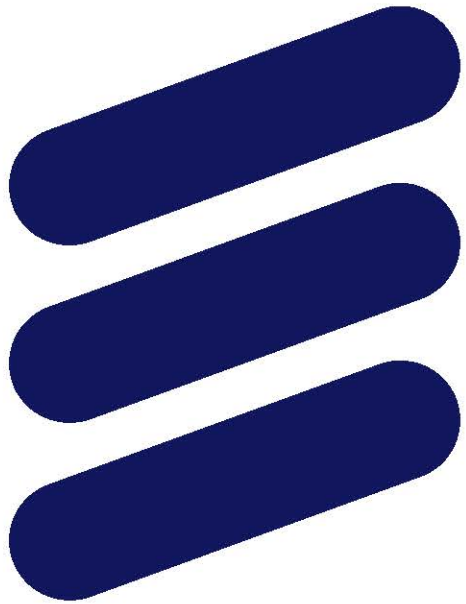
RADIO 4426 B66

- 4TX/4RX
- Up to 4x60W
- 70 MHz IBW
- Up to 8 carriers WCDMA
- Up to 6 carriers LTE in MIMO
- 2x 2.5/4.9/9.8/10.1 Gbps CPRI
- 19 liter, 22 kg
  - HxWxD: 380x335x147.4 mm
- -48 VDC
- AISG TMA & RET support
- 2 external alarm
- Optional fan for increased site flexibility
- IP 65, -40 to +55℃
- Smaller and more efficient multi band configurations

Optional FAN

TARGET PRA DATES





ERICSSON

RADIO 4426

- 4TX/4RX
- Up to 4x60W
- Up to 90 MHz IBW
  - 20 MHz IBW for LTE1.4/3MHz carriers
- Up to 8 carriers WCDMA
- Up to 6 carriers LTE in MIMO
- 2x 2.5/4.9/9.8/10.1 Gbps CPRI
- 19 liter, 22 kg
  - HxWxD: 380x335x147.4 mm
- -48 VDC
- AISG TMA & RET support
- 2 external alarm
- Optional fan for increased site flexibility
- IP 65, -40 to +55˚C
- Smaller and more efficient multi band configurations

Optional FAN

DATA SHEET

OctoPort Multi-Band Antenna

OPA65R-BU8B

- Eight foot (2.4 m) multiband, eight port antenna with a 65° azimuth beamwidth covering 698-798, 824-896 MHz and 1695-2400 MHz frequencies
- Four wide high band ports covering 1695-2400 MHz and four frequency specific low band ports covering 698-798 MHz and 824-896 MHz (over a distributed diplexers) in a single antenna
- New enclosure with <12" (305 mm) width, narrowest enclosure in the industry
- Full Spectrum Compliance for WCS and AWS-3 frequencies and upcoming Band 14 Operations
- LTE Optimized FBR and SPR performance, providing for an efficient use of valuable radio capacity
- LTE Optimized Boresight and Sector XPD and USL performance, essential for LTE Performance
- Exceeds minimum PIM performance requirements
- Equipped with new 4.3-10 connector, which is 40% smaller than traditional 7/16 DIN connector

Overview

The CCI OctoPort multiband array is an eight port antenna, with four wide high band ports covering 1695-2400 MHz and four frequency specific low band ports covering 698-798 MHz and 824-896 MHz. The antenna provides the capability to deploy 4x4 Multiple-input Multiple-output (MIMO) in the high band and 2x2 Multiple-input Multiple-output (MIMO) across each of the paired low band ports.

The CCI OctoPort allows independent tilt control between the low band ports and high band ports, in a three RET Controller (Type 1 External) configuration. The 1st RET is dedicated for the 700 MHz Low Band ports and the 2nd RET is dedicated for the 850 MHz Low Band ports. The 3rd RET is dedicated for the High Band ports. With the use of a single RET in the High Band, equal tilt is achieved across all four High Band ports, which ensures optimal 4x4 MIMO performance.

CCI antennas are designed and produced to ISO 9001:2008 certification standards for reliability and quality in our state-of-the-art manufacturing facilities.

Applications

- 4x4 MIMO for the high band and 2x2 MIMO for the low band
- Ready for Network Standardization on 4.3-10 DIN connectors
- With CCI's multiband antennas, wireless providers can connect multiple platforms to a single antenna, reducing tower load, lease expense, deployment time and installation costs

MultiPort Series

SPECIFICATIONS

OctoPort Multi-Band Antenna

OPA65R-BU8B

Electrical

Ports	2 x Low Band Ports for 698-798 MHz	2 x Low Band Ports for 824-896 MHz
Frequency Range	698-798 MHz	824-896 MHz
Gain[1]	15.3 dBi	15.8 dBi
Gain (Average)[2]	14.8 dBi	15.2 dBi
Azimuth Beamwidth (-3dB)	67°	66°
Elevation Beamwidth (-3dB)	9.7°	8.1°
Electrical Downtilt	0° to 10°	0° to 10°
Elevation Sidelobes (1st Upper)	<-18 dB	<-20 dB
Front-to-Back Ratio @180°	> 35 dB	> 35 dB
Cross-Polar Discrimination at Peak	> 25 dB	> 25 dB
Cross-Polar Discrimination at Sector[2]	> 13 dB	> 14 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB
Voltage Standing Wave Ratio (VSWR)	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150 dBc	≤ -150 dBc
Input Power Continuous Wave (CW)	500 watts	500 watts
Polarization	Dual Linear 45°	Dual Linear 45°
Input Impedance	50 ohms	50 ohms
Lightning Protection	DC Ground	DC Ground

[1]Peak gain across sub-bands.
[2]Electrical specifications follow document "Recommendation on Base Station Antenna Standards" (BASTA) V9.6.

Ports	4 x High Band Ports for 1695-2400 MHz			
Frequency Range	1695-1880 MHz	1850-1990 MHz	1920-2180 MHz	2300-2400 MHz
Gain[1]	18.0 dBi	18.2 dBi	18.4 dBi	18.0 dBi
Gain (Average)[2]	17.1 dBi	17.5 dBi	17.7 dBi	17.2 dBi
Azimuth Beamwidth (-3dB)	62°	62°	62°	59°
Elevation Beamwidth (-3dB)	5.6°	5.1°	4.7°	4.0°
Electrical Downtilt	0° to 8°	0° to 8°	0° to 8°	0° to 8°
Elevation Sidelobes (1st Upper)	<-18 dB	<-19 dB	<-18 dB	<-16 dB
Front-to-Back Ratio @180°	> 35 dB	> 35 dB	> 35 dB	> 35 dB
Cross-Polar Discrimination at Peak	> 18 dB	> 17 dB	> 18 dB	> 17 dB
Cross-Polar Discrimination at Sector[2]	> 11 dB	> 9 dB	> 9 dB	> 7 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Voltage Standing Wave Ratio (VSWR)	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc
Input Power Continuous Wave (CW)	300 watts	300 watts	300 watts	300 watts
Polarization	Dual Linear 45°	Dual Linear 45°	Dual Linear 45°	Dual Linear 45°
Input Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Lightning Protection	DC Ground	DC Ground	DC Ground	DC Ground

[1]Peak gain across sub-bands.
[2]Electrical specifications follow document "Recommendation on Base Station Antenna Standards" (BASTA) V9.6.

SPECIFICATIONS

OctoPort Multi-Band Antenna

OPA65R-BU8B

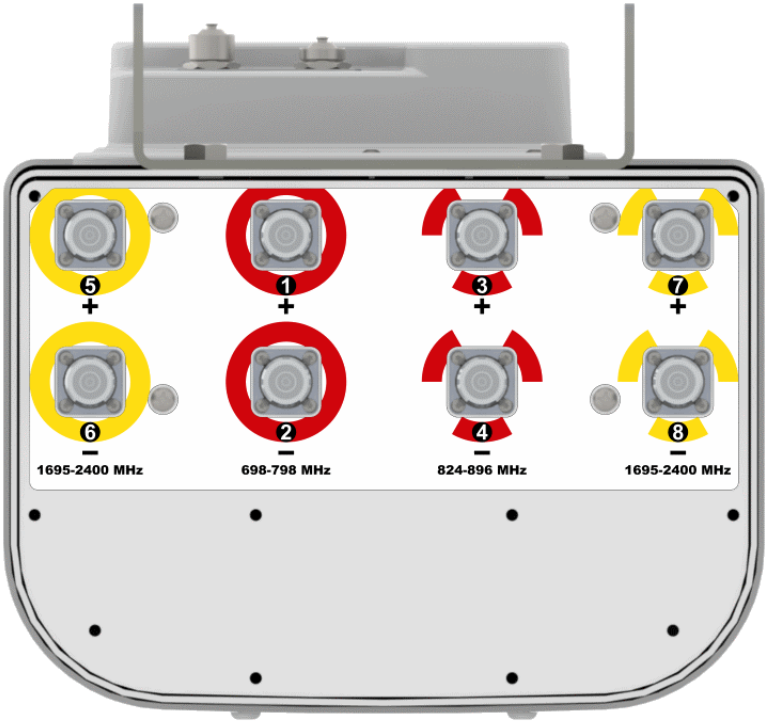
Mechanical

Dimensions (LxWxD)	95.9x11.7x8.4 in (2437x297x214 mm)
Survival Wind Speed	> 150 mph (> 241 kph)
Front Wind Load	287 lbs (1278 N) @ 100 mph (161 kph)
Side Wind Load	229 lbs (1018 N) @ 100 mph (161 kph)
Equivalent Flat Plate Area	11.2 ft^2 (1.0 m^2)
Weight *	69.0 lbs (31.3 kg)
RET Weight	5.0 lbs (2.3 kg)
Connector	8 x 4.3-10 female
Mounting Pole	2 to 5 in (5 to 12 cm)

** Weight excludes mounting and RET*

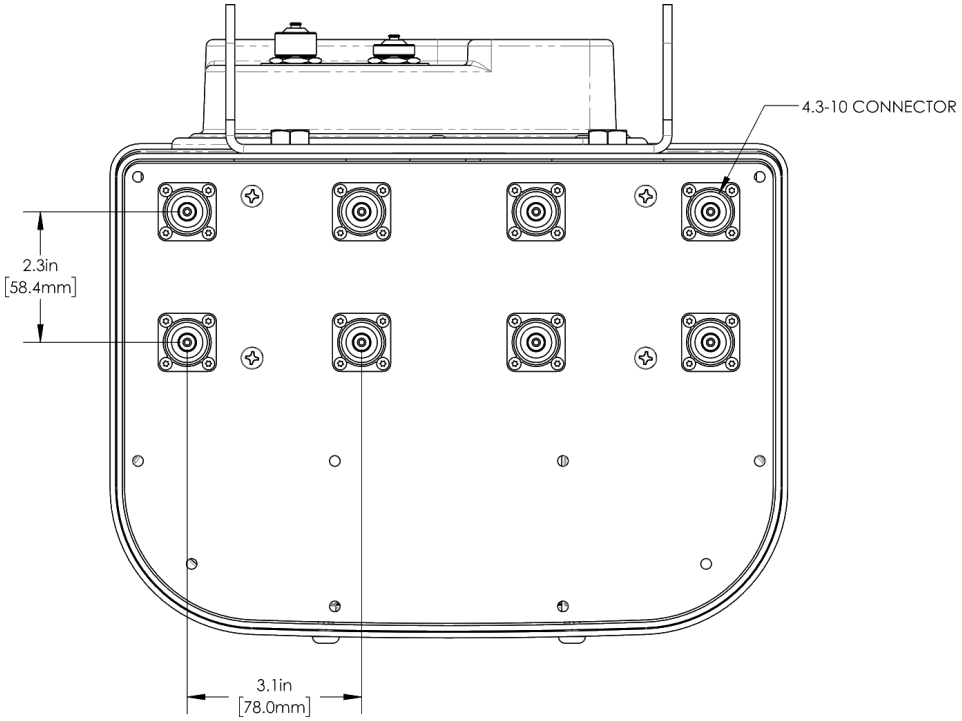
Bottom View

OPA65R-BU8B



Connection Spacing Diagram

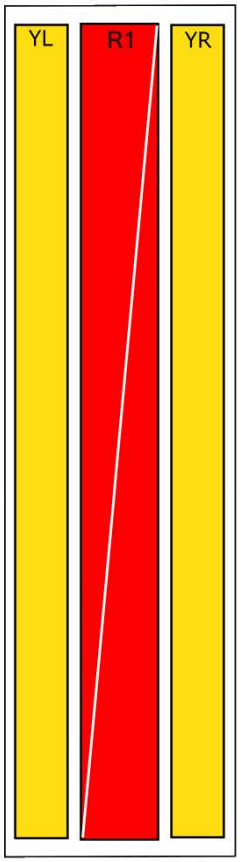
OPA65R-BU8B



RET to Element Configuration

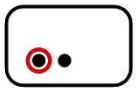
OPA65R-BU8BA Element and RET configuration

Element arrays as viewed from rear of antenna



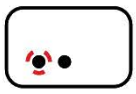
RET placement as viewed from rear of antenna

Top of antenna



698-798
Ports 1 & 2
(R1)

1695-2400
Ports 5, 6, 7 & 8
(YL & YR)

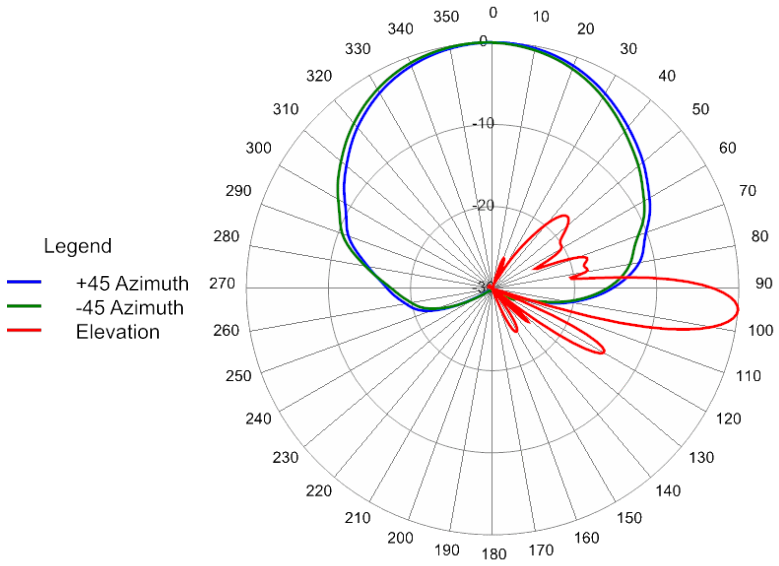


824-896
Ports 3 & 4
(R1)

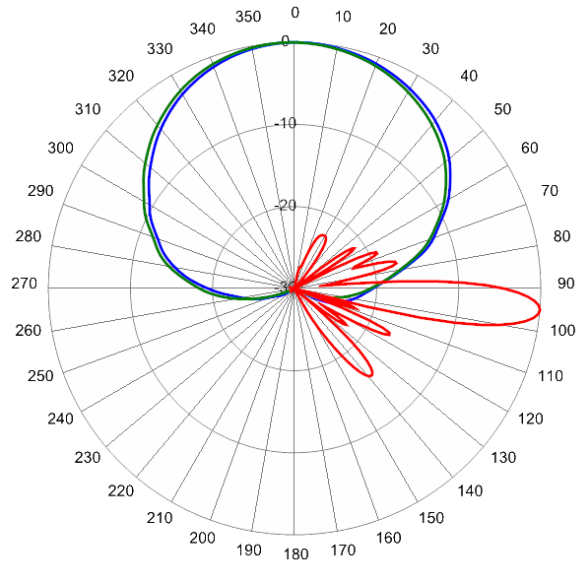
Array	Ports	Freq (MHz)	Ports controlled by common RET
R1	1, 2	698-798	1, 2
R1	3, 4	824-896	3, 4
YL	5, 6	1695-2400	5, 6, 7, 8
YR	7, 8	1695-2400	

Typical Antenna Patterns

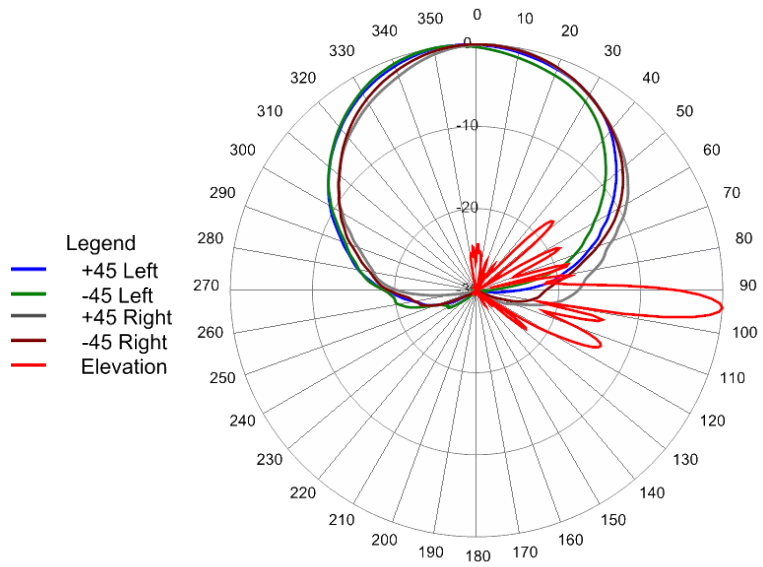
For detailed information on additional antenna patterns, contact customer support at support@cciproducts.com



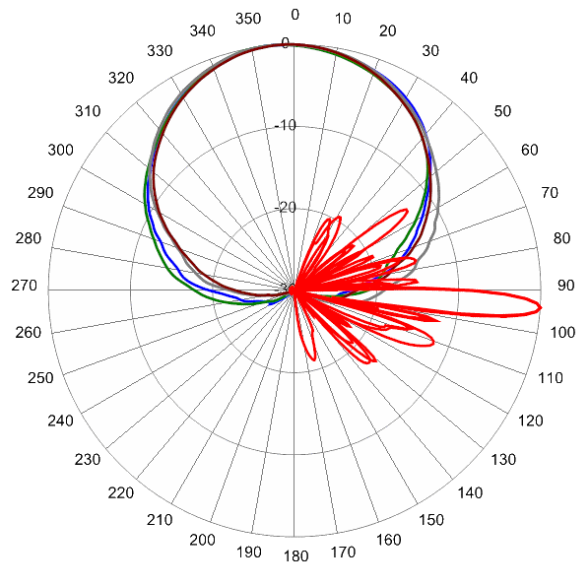
704 MHz Azimuth with Elevation 5°



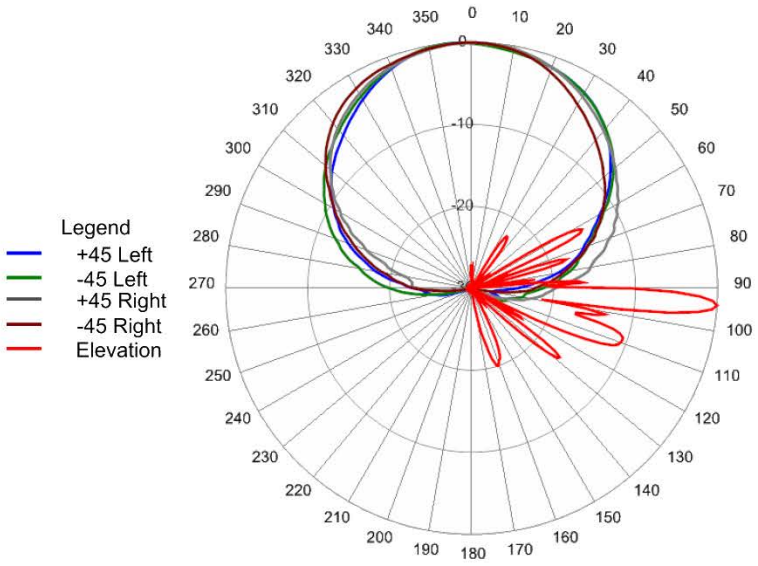
840 MHz Azimuth with Elevation 5°



1740 MHz Azimuth with Elevation 4°



1970 MHz Azimuth with Elevation 4°



2155 MHz Azimuth with Elevation 4°

Parts & Accessories

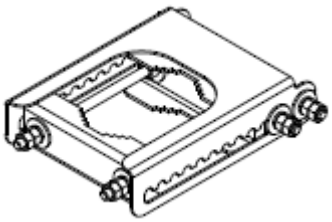
OPA65R-BU8BA-K	Eight foot (2.4 m) OctoPort antenna with 65° azimuth beamwidth, 4.3-10 female connectors, three factory installed BSA-RET200 RET actuators (Type 1 external) and MBK-01 mounting bracket
OPA65R-BU8BB-K	(Future Development) Eight foot (2.4 m) OctoPort antenna with 65° azimuth beamwidth, 4.3-10 female connectors, three factory installed BSA-RET400 RET actuators (Type 17 internal) and MBK-02 mounting bracket
MBK-01	Mounting bracket kit (top and bottom) with 0° to 10° mechanical tilt adjustment
BSA-RET200	Remote electrical tilt actuator
HPA-CBK-AG-RRU	RRU AISG cable kit for three RET antenna
HPA-CBK-RA-AG-RRU	RRU AISG right angle cable kit for three RET antenna

Mounting Bracket Kit

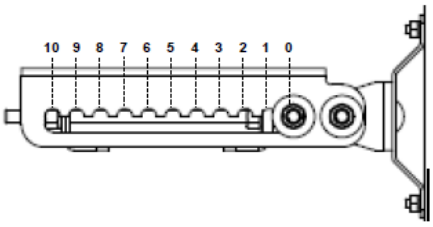
MBK-01

Mechanical

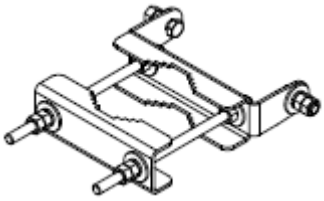
Weight	12.6 lbs (5.7 kg)
Hinge Pitch	47.25 in (1200 mm)
Mounting Pole Dimension	2 to 5 in (5 to 12 cm)
Fastener Size	M12
Installation Torque	40 ft·lb (54 Nm)
Mechanical Tilt Adjustment	0° - 10°



MBK-01 Top Adjustable Bracket



MBK-01 Top Adjustable Bracket Side View



MBK-01 Bottom Fixed Bracket

Remote Electrical Tilt Actuator (RET)

General Specifications

Part Number	BSA-RET200
Protocols	AISG 2.0
RET Type	Type 1
Adjustment Cycles	>10,000 cycles
Tilt Accuracy	±0.1°
Temperature Range	-40° C to 70° C

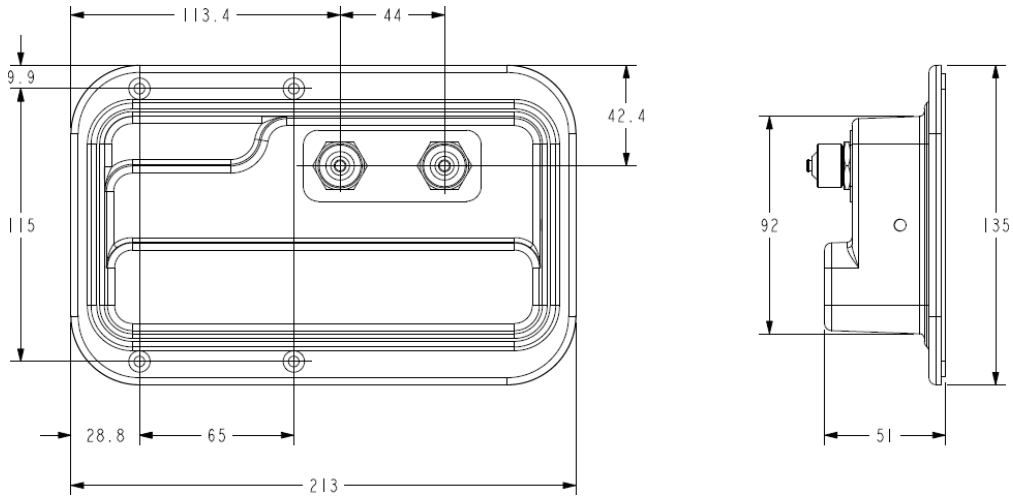
Electrical

Data Interface Signal	DC
Input Voltage	10-30 Vdc
Current Consumption Tilt	120 mA at V_{in}=24
Current Consumption Idle	55 mA at V_{in}=24
Hardware Interface	AISG-RS 485 A/B
Input Connector	Male 1 x 8 pin Daisy Chain
Output Connector	Female 1 x 8 pin Daisy Chain

Mechanical

Dimensions (LxWxD)	8.0x5.0x2.0 in. (213x135x51 mm)
Housing	ASA/ABS/Aluminum
Weight	1.7 lbs (0.75 kg)

ASA= Acrylic Styrene Acrylonitrile
ABS=Acrylanitrile Butadiene Styrene



MultiPort Series

AISG Cable Kit

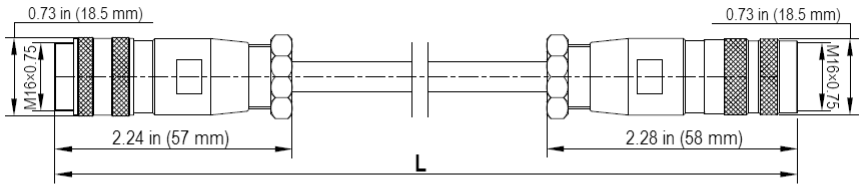
HPA-CBK-AG-RRU

Electrical Specifications

Individual Cable Part Number	AISGC-M-F-18	AISGC-M-F-10FT
Cable style	UL2464	UL2464
Protocol	AISG 1.1 and AISG 2.0	AISG 1.1 and AISG 2.0
Maximum voltage	300 V	300 V
Rated current	5 A at 104° F (40° C)	5 A at 104° F (40° C)

Mechanical Specifications

Individual Cable Part Number	AISGC-M-F-18	AISGC-M-F-10FT
Cables per kit	2	2
Connectors	2 x 8 pin IEC 60130-9 Straight male/straight female	2 x 8 pin IEC 60130-9 Straight male/straight female
Tightening torque	Hand tighten only ≈ 1.84 ft-lbs (2.5 Nm)	Hand tighten only ≈ 1.84 ft-lbs (2.5 Nm)
Construction	Shielded (Tinned Copper Braid)	Shielded (Tinned Copper Braid)
Braid coverage	85%	85%
Jacket Material	Matte Polyurethane (Black)	Matte Polyurethane (Black)
Conductors	1 twisted pair - 24 AWG 3 conductors - 19 AWG AWM style 2464	1 twisted pair - 24 AWG 3 conductors - 19 AWG AWM style 2464
Cable Diameter	0.307 in (7.8 mm)	0.307 in (7.8 mm)
Length	18 - 20 in (457 - 508 mm)	120 in (3048 mm)
Weight	0.27 lbs (0.12 kg)	0.69 lbs (.31 kg)
Minimum bend radius	3.9 in (100 mm)	3.9 in (100 mm)



AISG 2.0 Pin Assignments	AISG Standard
1	+12 V DC nominal (optional)
2	No conductor
3	RS485 B
4	RS 485 Ground
5	RS485 A
6	10 - 30 V DC
7	DC Return (not DC power ground)
8	No conductor

AISG-Male to AISG-Female Jumper Cable

Environmental Specifications

Individual Cable Part Number	AISGC-M-F-18	AISGC-M-F-10FT
Temperature Range	-40° to 80° C	-40° to 80° C
Flammability	UL 1581 VW-1	UL 1581 VW-1
Ingress Protection	IEC 60529:2001, IP67	IEC 60529:2001, IP67

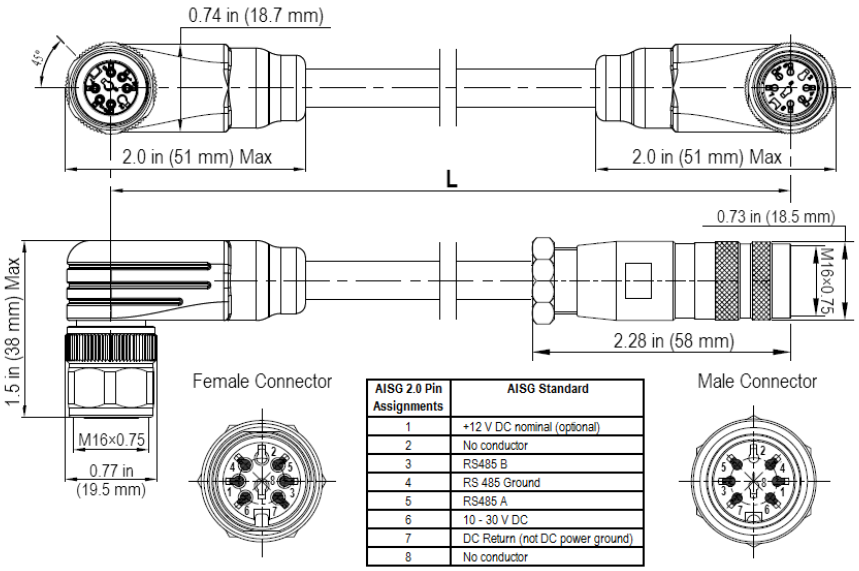
AISG Cable Kit

HPA-CBK-RA-AG-RRU

Electrical/Mechanical/Environmental Specifications

	RET to RET Cables	RRU to Antenna Cables
Individual Cable Part Number	AISGC-MRA-FRA-20	AISGC-M-FRA-10FT
Cable style	UL2464	
Protocol	AISG 1.1 and AISG 2.0	
Maximum voltage	300 V	
Rated current	5 A at 104° F (40° C)	
Temperature Range	-40° to 80° C	
Flammability	UL 1581 VW-1	
Ingress Protection	IEC 60529:2001, IP67	
Tightening torque	Hand tighten only ≈ 1.84 ft-lbs (2.5& Nm)	
Construction	Shielded (Tinned Copper Braid)	
Braid coverage	85%	
Jacket Material	Matte Polyurethane (Black)	
Conductors	1 twisted pair - 24 AWG 3 conductors - 19 AWG AWM style 2464	
Cable Diameter	0.307 in (7.8 mm)	
Minimum bend radius	3.9 in (100 mm)	
Connectors	2 x 8 pin IEC 60130-9 Right angle male/right angle female	2 x 8 pin IEC 60130-9 Straight male/right angle female
Length	20 in (508 mm)	120 in (3048 mm)
Weight	0.23 lbs (0.10 kg)	0.77 lbs (0.35 kg)
Cables per kit	2	2

Mechanical Specifications



AISG 2.0 Pin Assignments	AISG Standard
1	+12 V DC nominal (optional)
2	No conductor
3	RS485 B
4	RS 485 Ground
5	RS485 A
6	10 - 30 V DC
7	DC Return (not DC power ground)
8	No conductor

Right Angle to Right Angle and Right Angle to Straight Jumper Cable

Standards & Compliance

Safety	EN 60950-1, UL 60950-1
Emission	EN 55022
Immunity	EN 55024
Environmental	IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-5, IEC 60068-2-6, IEC-60068-2-11, IEC 60068-2-14, IEC 60068-2-18, IEC 60068-2-27, IEC 60068-2-29, IEC 60068-02-30, IEC 60068-2-52, IEC 60068-2-64, GR-63-CORE 4.3.1, EN 60529, IP 24

Certifications

Antenna Interface Standards Group (AISG), Federal Communication Commission (FCC) Part 15 Class B, CE, CSA US, ISO 9001:2008

Antennas

MultiPort Series

DATA SHEET

HexPort Multi-Band Antenna

HPA65R-BU8A

- Eight foot (2.4 m) multiband, six port antenna with a 65° azimuth beamwidth covering 698-896 MHz and 1695-2400 MHz frequencies
- Four wide high band ports covering 1695-2400 MHz and two wide low band ports covering 698-896 MHz in a single antenna
- New enclosure with <12" (305 mm) width, narrowest enclosure in the industry
- Full Spectrum Compliance for WCS and AWS-3 frequencies and upcoming Band 14 Operations
- LTE Optimized FBR and SPR performance, providing for an efficient use of valuable radio capacity
- LTE Optimized Boresight and Sector XPD and USL performance, essential for LTE Performance
- Exceeds minimum PIM performance requirements
- Equipped with new 4.3-10 connector, which is 40% smaller than traditional 7/16 DIN connector
- Ordering options for 2 or 3 field replaceable, integrated AISG 2.0 compliant Remote Electrical Tilt (RET) Controllers (Type 1 External)

Overview

The CCI HexPort multiband array is a six port antenna, with four wide high band ports covering 1695-2400 MHz and two wide low band ports covering 698-896 MHz. The CCI HexPort provides the capability to deploy 4x4 Multiple-input Multiple-output (MIMO) in the high band and 2x2 Multiple-input Multiple-output in the low band. The CCI HexPort allows separate tilt control between the low band ports and high band ports. With the use of three RET controllers, the paired high band ports can be tilted independently, enabling maximum flexibility in network deployment.

CCI antennas are designed and produced to ISO 9001:2008 certification standards for reliability and quality in our state-of-the-art manufacturing facilities.

Applications

- 4x4 MIMO for the high band and 2x2 MIMO for the low band
- Ready for Network Standardization on 4.3-10 DIN connectors
- With CCI's multiband antennas, wireless providers can connect multiple platforms to a single antenna, reducing tower load, lease expense, deployment time and installation costs

SPECIFICATIONS

HexPort Multi-Band Antenna

HPA65R-BU8A

Electrical

Ports	2 x Low Band Ports for 698-896 MHz	
Frequency Range	698-806 MHz	824-896 MHz
Gain[1]	15.5 dBi	15.9 dBi
Gain (Average)[2]	15.0 dBi	15.4 dBi
Azimuth Beamwidth (-3dB)	67°	67°
Elevation Beamwidth (-3dB)	9.7°	8.1°
Electrical Downtilt	0° to 10°	0° to 10°
Elevation Sidelobes (1st Upper)	<-17 dB	<-21 dB
Front-to-Back Ratio @180°	> 35 dB	> 35 dB
Cross-Polar Discrimination at Peak	> 25 dB	> 25 dB
Cross-Polar Discrimination at Sector[2]	> 12 dB	> 14 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB
Voltage Standing Wave Ratio (VSWR)	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150 dBc	≤ -150 dBc
Input Power Continuous Wave (CW)	500 watts	500 watts
Polarization	Dual Linear 45°	Dual Linear 45°
Input Impedance	50 ohms	50 ohms
Lightning Protection	DC Ground	DC Ground

[1]Peak gain across sub-bands.
[2]Electrical specifications follow document "Recommendation on Base Station Antenna Standards" (BASTA) V9.6.

Ports	4 x High Band Ports for 1695-2400 MHz			
Frequency Range	1695-1880 MHz	1850-1990 MHz	1920-2180 MHz	2300-2400 MHz
Gain[1]	18.0 dBi	18.1 dBi	18.3 dBi	18.0 dBi
Gain (Average)[2]	17.1 dBi	17.5 dBi	17.7 dBi	17.2 dBi
Azimuth Beamwidth (-3dB)	63°	62°	62°	60°
Elevation Beamwidth (-3dB)	5.6°	5.1°	4.7°	4.0°
Electrical Downtilt	0° to 8°	0° to 8°	0° to 8°	0° to 8°
Elevation Sidelobes (1st Upper)	<-18 dB	<-18 dB	<-18 dB	<-16 dB
Front-to-Back Ratio @180°	> 35 dB	> 35 dB	> 35 dB	> 35 dB
Cross-Polar Discrimination at Peak	> 18 dB	> 17 dB	> 18 dB	> 17 dB
Cross-Polar Discrimination at Sector[2]	> 11 dB	> 9 dB	> 9 dB	> 7 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Voltage Standing Wave Ratio (VSWR)	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc
Input Power Continuous Wave (CW)	300 watts	300 watts	300 watts	300 watts
Polarization	Dual Linear 45°	Dual Linear 45°	Dual Linear 45°	Dual Linear 45°
Input Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Lightning Protection	DC Ground	DC Ground	DC Ground	DC Ground

[1]Peak gain across sub-bands.
[2]Electrical specifications follow document "Recommendation on Base Station Antenna Standards" (BASTA) V9.6.

SPECIFICATIONS

HexPort Multi-Band Antenna

HPA65R-BU8A

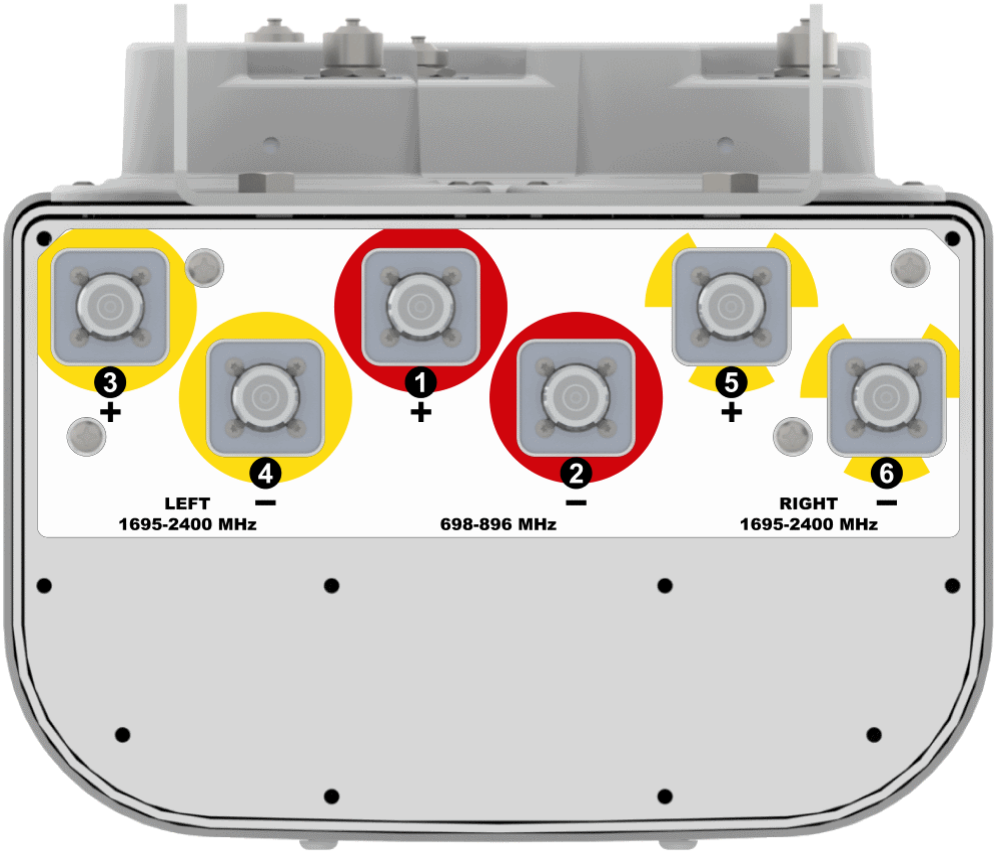
Mechanical

Dimensions (LxWxD)	96.0x11.7x7.6 in (2437x297x193 mm)
Survival Wind Speed	> 150 mph (> 241 kph)
Front Wind Load	287 lbs (1278 N) @ 100 mph (161 kph)
Side Wind Load	206 lbs (916 N) @ 100 mph (161 kph)
Equivalent Flat Plate Area	11.2 ft^2 (1.0 m^2)
Weight *	54.0 lbs (24.5 kg)
RET Weight	3.3 lbs (1.5 kg) for two RET's
	5.0 lbs (2.3 kg) for three RET's
Connector	6 x 4.3-10 female
Mounting Pole	2 to 5 in (5 to 12 cm)

** Weight excludes mounting and RET*

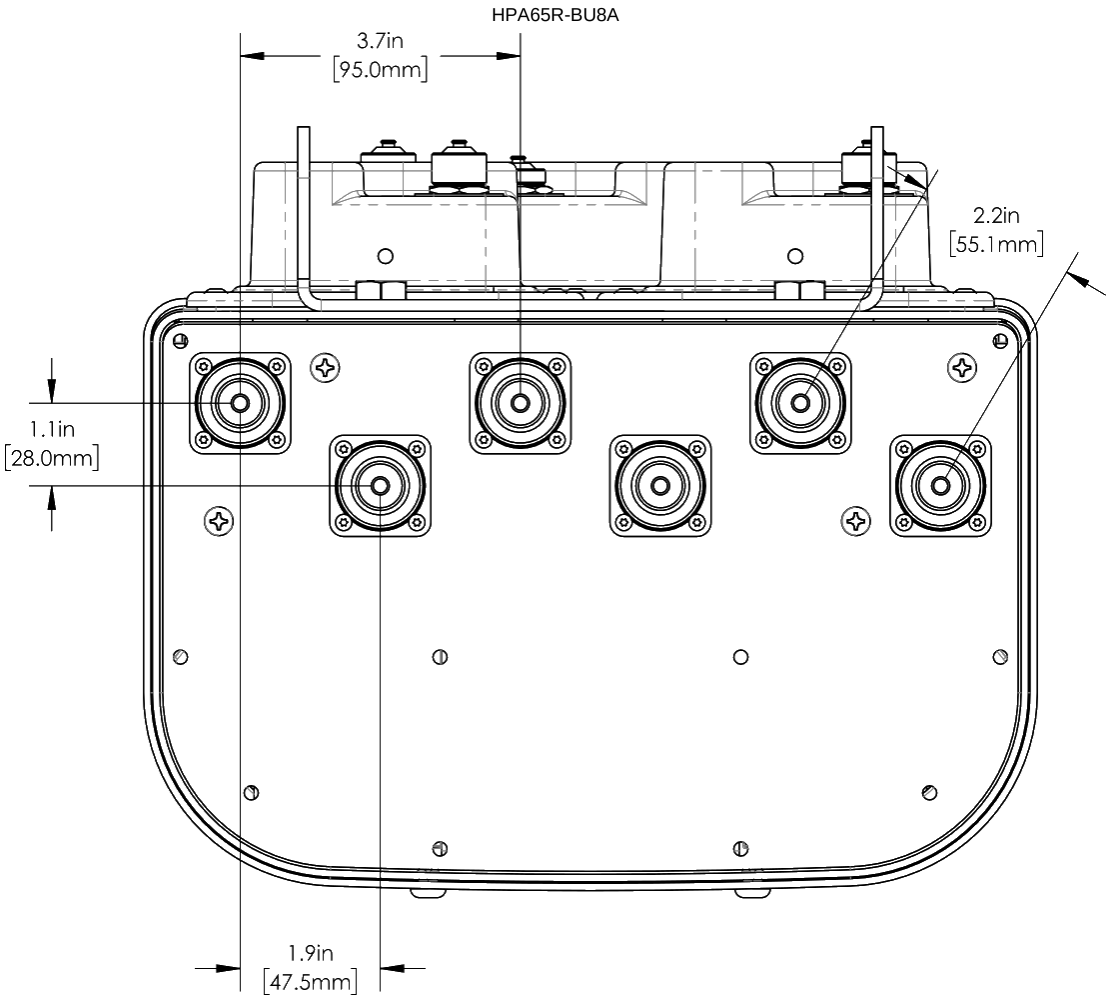
Bottom View

HPA65R-BU8A model



Mechanical

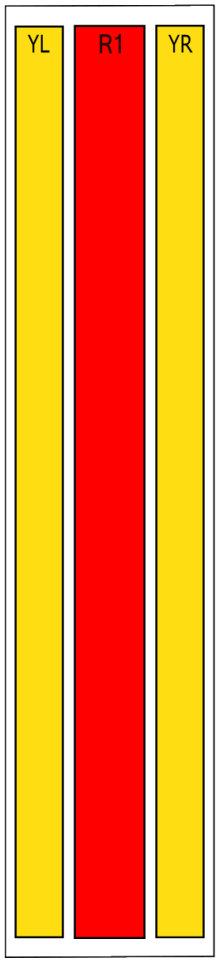
Connection Spacing Diagram



RET to Element Configuration

HPA65R-BU8AA Element and RET configuation

Top of antenna
Viewed from rear



RET placement as view from rear of antenna

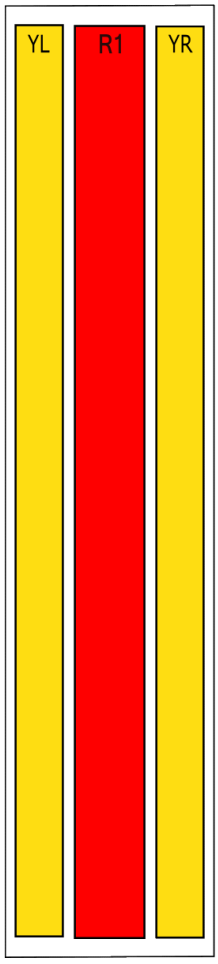
Top of antenna

Array	Ports	Freq (MHz)	Ports controlled by common RET
R1	1, 2	698-896	1, 2
YL	3, 4	1695-2400	3, 4
YR	5, 6	1695-2400	5, 6

RET to Element Configuration

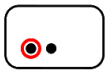
HPA65R-BU8AB Element and RET configuration

Top of antenna
Viewed from rear



RET placement as view from rear of antenna

Top of antenna



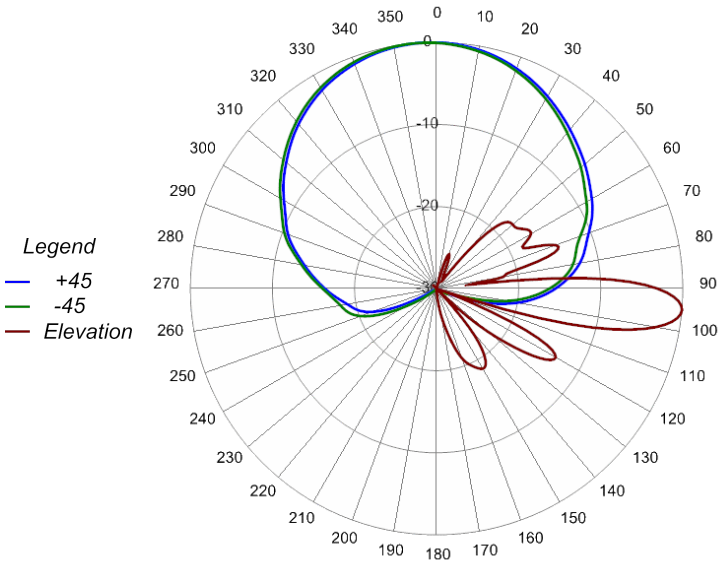
698-896
Ports 1, 2
(R1)

Left & Right
1695-2400
Ports 3, 4, 5, 6
(YL & YR)

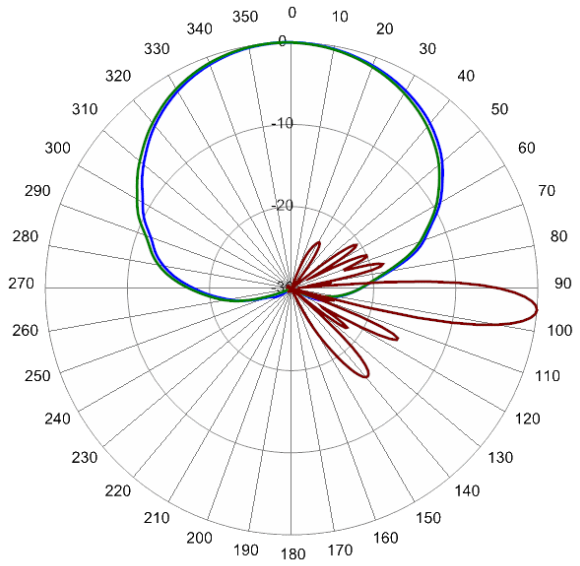
Array	Ports	Freq (MHz)	Ports controlled by common RET
R1	1, 2	698-896	1, 2
YL	3, 4	1695-2400	3, 4, 5, 6
YR	5, 6	1695-2400	

Typical Antenna Patterns

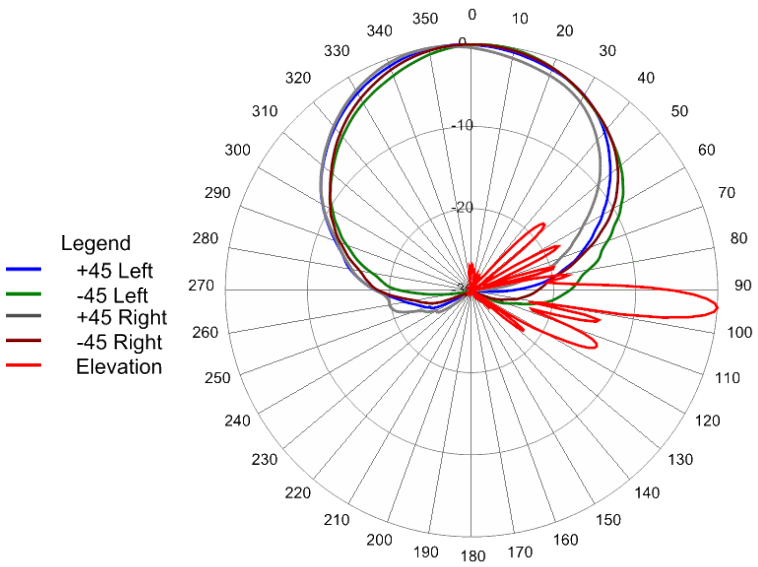
For detailed information on additional antenna patterns, contact customer support at support@cciproducts.com



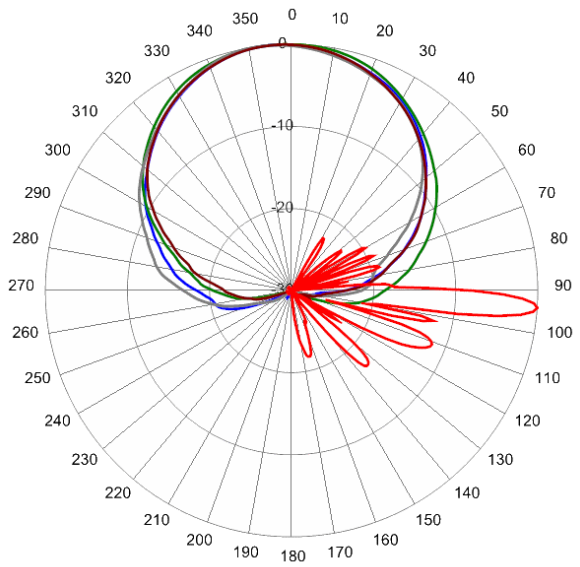
704 MHz Azimuth with Elevation 5°



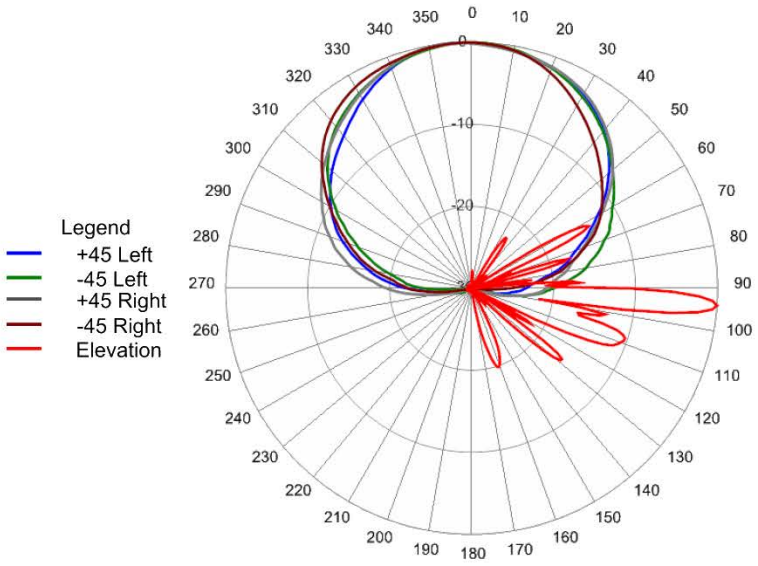
840 MHz Azimuth with Elevation 5°



1740 MHz Azimuth with Elevation 4°



1970 MHz Azimuth with Elevation 4°



2155 MHz Azimuth with Elevation 4°

Parts & Accessories

HPA65R-BU8AA-K	Eight foot (2.4 m) HexPort antenna with 65° azimuth beamwidth, 4.3-10 female connectors, three factory installed BSA-RET200 RET actuators (Type 1 external) and MBK-01 mounting bracket
HPA65R-BU8AB-K	Eight foot (2.4 m) HexPort antenna with 65° azimuth beamwidth, 4.3-10 female connectors, two factory installed BSA-RET200 RET actuators (Type 1 external) and MBK-01 mounting bracket
HPA65R-BU8AC-K	Eight foot (2.4 m) HexPort antenna with 65° azimuth beamwidth, 4.3-10 female connectors, 3 factory installed BSA-RET400 RET actuators (Type 17 internal) and MBK-02 mounting bracket
MBK-01	Mounting bracket kit (top and bottom) with 0° to 10° mechanical tilt adjustment
BSA-RET200	Remote electrical tilt actuator
HPA-CBK-AG-RRU	HexPort antenna with 3 RET to RRU AISG cable kit
HPA-CBK-RA-AG-RRU	HexPort antenna with 3 RET to RRU AISG right angle cable kit
QPA-CBK-AG-RRU	HexPort antenna with 2 RET to RRU AISG cable kit
QPA-CBK-RA-AG-RRU	HexPort antenna with 2 RET to RRU AISG right angle cable kit

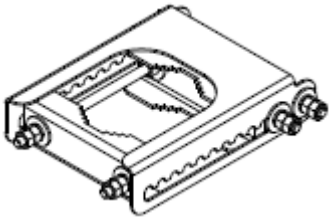
MultiPort Series

Mounting Bracket Kit

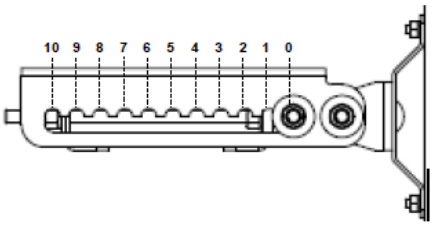
MBK-01

Mechanical

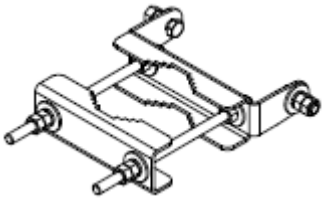
Weight	12.6 lbs (5.7 kg)
Hinge Pitch	47.25 in (1200 mm)
Mounting Pole Dimension	2 to 5 in (5 to 12 cm)
Fastener Size	M12
Installation Torque	40 ft·lb (54 Nm)
Mechanical Tilt Adjustment	0° - 10°



MBK-01 Top Adjustable Bracket



MBK-01 Top Adjustable Bracket Side View



MBK-01 Bottom Fixed Bracket

Remote Electrical Tilt Actuator (RET)

General Specifications

Part Number	BSA-RET200
Protocols	AISG 2.0
RET Type	Type 1
Adjustment Cycles	>10,000 cycles
Tilt Accuracy	±0.1°
Temperature Range	-40° C to 70° C

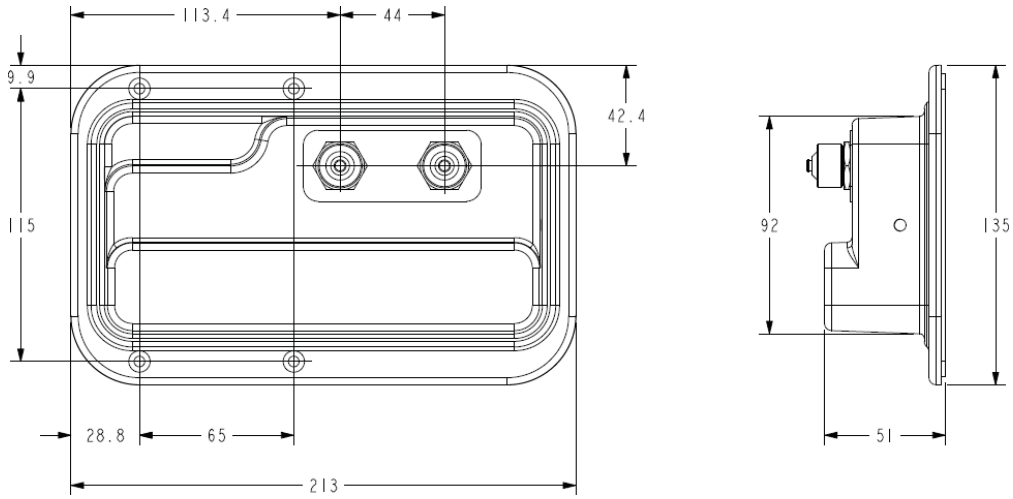
Electrical

Data Interface Signal	DC
Input Voltage	10-30 Vdc
Current Consumption Tilt	120 mA at V_{in}=24
Current Consumption Idle	55 mA at V_{in}=24
Hardware Interface	AISG-RS 485 A/B
Input Connector	Male 1 x 8 pin Daisy Chain
Output Connector	Female 1 x 8 pin Daisy Chain

Mechanical

Dimensions (LxWxD)	8.0x5.0x2.0 in. (213x135x51 mm)
Housing	ASA/ABS/Aluminum
Weight	1.7 lbs (0.75 kg)

ASA= Acrylic Styrene Acrylonitrile
ABS=Acrylanitrile Butadiene Styrene



AISG Cable Kit

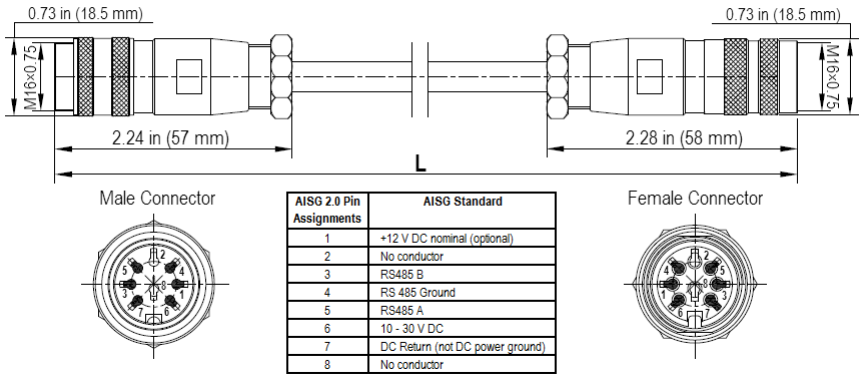
HPA-CBK-AG-RRU

Electrical Specifications

Individual Cable Part Number	AISGC-M-F-18	AISGC-M-F-10FT
Cable style	UL2464	UL2464
Protocol	AISG 1.1 and AISG 2.0	AISG 1.1 and AISG 2.0
Maximum voltage	300 V	300 V
Rated current	5 A at 104° F (40° C)	5 A at 104° F (40° C)

Mechanical Specifications

Individual Cable Part Number	AISGC-M-F-18	AISGC-M-F-10FT
Cables per kit	2	2
Connectors	2 x 8 pin IEC 60130-9 Straight male/straight female	2 x 8 pin IEC 60130-9 Straight male/straight female
Tightening torque	Hand tighten only ≈ 1.84 ft-lbs (2.5 Nm)	Hand tighten only ≈ 1.84 ft-lbs (2.5 Nm)
Construction	Shielded (Tinned Copper Braid)	Shielded (Tinned Copper Braid)
Braid coverage	85%	85%
Jacket Material	Matte Polyurethane (Black)	Matte Polyurethane (Black)
Conductors	1 twisted pair - 24 AWG 3 conductors - 19 AWG AWM style 2464	1 twisted pair - 24 AWG 3 conductors - 19 AWG AWM style 2464
Cable Diameter	0.307 in (7.8 mm)	0.307 in (7.8 mm)
Length	18 - 20 in (457 - 508 mm)	120 in (3048 mm)
Weight	0.27 lbs (0.12 kg)	0.69 lbs (.31 kg)
Minimum bend radius	3.9 in (100 mm)	3.9 in (100 mm)



AISG 2.0 Pin Assignments	AISG Standard
1	+12 V DC nominal (optional)
2	No conductor
3	RS485 B
4	RS 485 Ground
5	RS485 A
6	10 - 30 V DC
7	DC Return (not DC power ground)
8	No conductor

AISG-Male to AISG-Female Jumper Cable

Environmental Specifications

Individual Cable Part Number	AISGC-M-F-18	AISGC-M-F-10FT
Temperature Range	-40° to 80° C	-40° to 80° C
Flammability	UL 1581 VW-1	UL 1581 VW-1
Ingress Protection	IEC 60529:2001, IP67	IEC 60529:2001, IP67

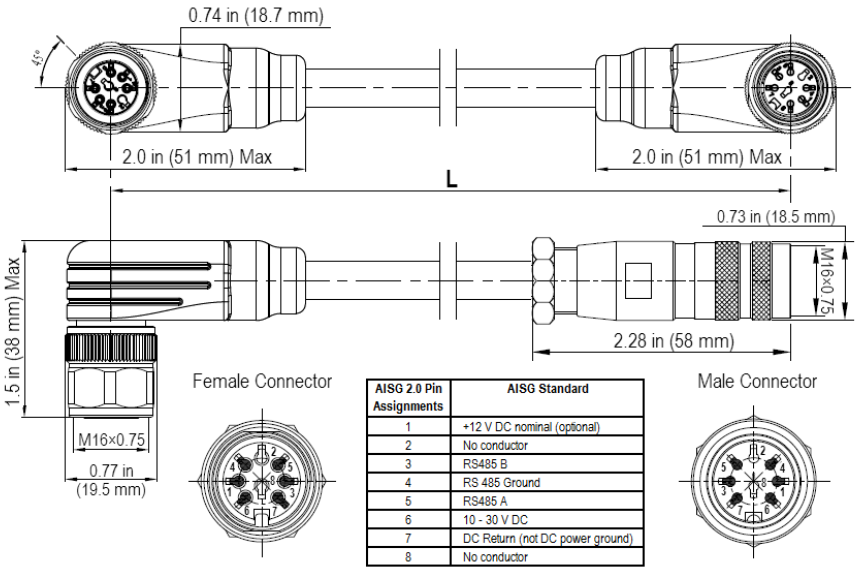
AISG Cable Kit

HPA-CBK-RA-AG-RRU

Electrical/Mechanical/Environmental Specifications

	RET to RET Cables	RRU to Antenna Cables
Individual Cable Part Number	AISGC-MRA-FRA-20	AISGC-M-FRA-10FT
Cable style	UL2464	
Protocol	AISG 1.1 and AISG 2.0	
Maximum voltage	300 V	
Rated current	5 A at 104° F (40° C)	
Temperature Range	-40° to 80° C	
Flammability	UL 1581 VW-1	
Ingress Protection	IEC 60529:2001, IP67	
Tightening torque	Hand tighten only ≈ 1.84 ft-lbs (2.5& Nm)	
Construction	Shielded (Tinned Copper Braid)	
Braid coverage	85%	
Jacket Material	Matte Polyurethane (Black)	
Conductors	1 twisted pair - 24 AWG 3 conductors - 19 AWG AWM style 2464	
Cable Diameter	0.307 in (7.8 mm)	
Minimum bend radius	3.9 in (100 mm)	
Connectors	2 x 8 pin IEC 60130-9 Right angle male/right angle female	2 x 8 pin IEC 60130-9 Straight male/right angle female
Length	20 in (508 mm)	120 in (3048 mm)
Weight	0.23 lbs (0.10 kg)	0.77 lbs (0.35 kg)
Cables per kit	2	2

Mechanical Specifications



AISG 2.0 Pin Assignments	AISG Standard
1	+12 V DC nominal (optional)
2	No conductor
3	RS485 B
4	RS 485 Ground
5	RS485 A
6	10 - 30 V DC
7	DC Return (not DC power ground)
8	No conductor

Right Angle to Right Angle and Right Angle to Straight Jumper Cable

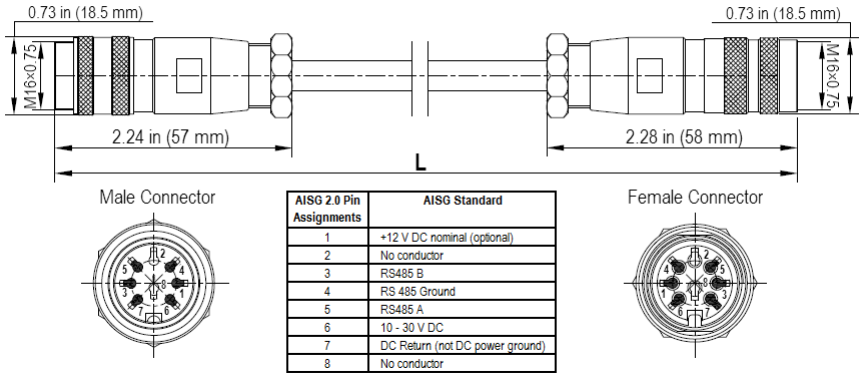
Quad Port AISG Cable Kit

QPA-CBK-AG-RRU

Electrical/Mechanical/Environmental Specifications

	RET to RET Cables	RRU to Antenna Cables
Individual Cable Part Number	AISGC-M-F-18	AISGC-M-F-10FT
Cable style	UL2464	
Protocol	AISG 1.1 and AISG 2.0	
Maximum voltage	300 V	
Rated current	5 A at 104° F (40° C)	
Temperature Range	-40° to 80° C	
Flammability	UL 1581 VW-1	
Ingress Protection	IEC 60529:2001, IP67	
Tightening torque	Hand tighten only ≈ 1.84 ft-lbs (2.5 Nm)	
Construction	Shielded (Tinned Copper Braid)	
Braid coverage	85%	
Jacket Material	Matte Polyurethane (Black)	
Conductors	1 twisted pair - 24 AWG 3 conductors - 19 AWG AWM style 2464	
Cable Diameter	0.307 in (7.8 mm)	
Minimum bend radius	3.9 in (100 mm)	
Connectors	2 x 8 pin IEC 60130-9 Straight male/straight female	
Length	18-20 in (457-508)	120 in (3048 mm)
Weight	0.27 lbs (0.12 kg)	0.69 lbs (0.31 kg)
Cables per kit	1	2

Mechanical Specifications



AISG 2.0 Pin Assignments	AISG Standard
1	+12 V DC nominal (optional)
2	No conductor
3	RS485 B
4	RS 485 Ground
5	RS485 A
6	10 - 30 V DC
7	DC Return (not DC power ground)
8	No conductor

AISG-Male to AISG-Female Jumper Cable

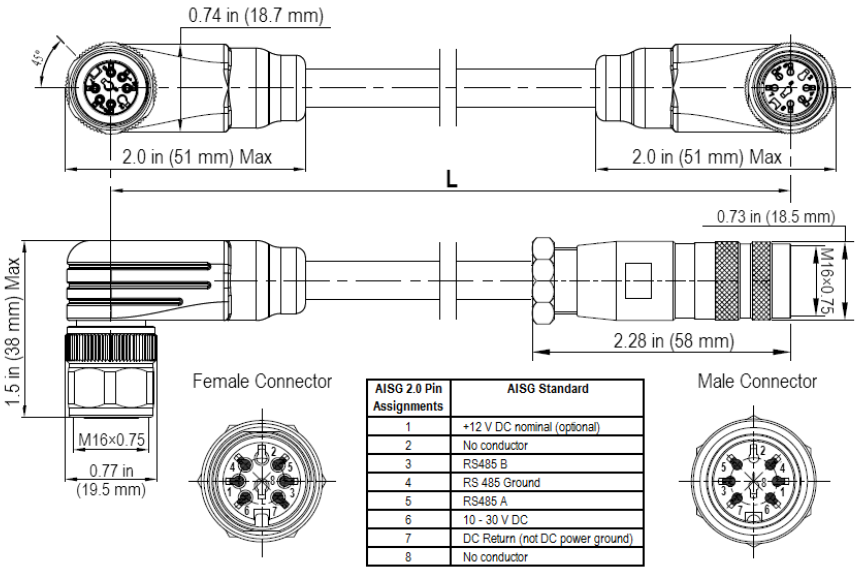
Quad Port AISG Cable Kit

QPA-CBK-RA-AG-RRU

Electrical/Mechanical/Environmental Specifications

	RET to RET Cables	RRU to Antenna Cables
Individual Cable Part Number	AISGC-MRA-FRA-20	AISGC-M-FRA-10FT
Cable style	UL2464	
Protocol	AISG 1.1 and AISG 2.0	
Maximum voltage	300 V	
Rated current	5 A at 104° F (40° C)	
Temperature Range	-40° to 80° C	
Flammability	UL 1581 VW-1	
Ingress Protection	IEC 60529:2001, IP67	
Tightening torque	Hand tighten only ≈ 1.84 ft-lbs (2.5& Nm)	
Construction	Shielded (Tinned Copper Braid)	
Braid coverage	85%	
Jacket Material	Matte Polyurethane (Black)	
Conductors	1 twisted pair - 24 AWG 3 conductors - 19 AWG AWM style 2464	
Cable Diameter	0.307 in (7.8 mm)	
Minimum bend radius	3.9 in (100 mm)	
Connectors	2 x 8 pin IEC 60130-9 Right angle male/right angle female	2 x 8 pin IEC 60130-9 Straight male/right angle female
Length	20 in (508 mm)	120 in (3048 mm)
Weight	0.23 lbs (0.10 kg)	0.77 lbs (0.35 kg)
Cables per kit	1	2

Mechanical Specifications



AISG 2.0 Pin Assignments	AISG Standard
1	+12 V DC nominal (optional)
2	No conductor
3	RS485 B
4	RS 485 Ground
5	RS485 A
6	10 - 30 V DC
7	DC Return (not DC power ground)
8	No conductor

Right Angle to Right Angle and Right Angle to Straight Jumper Cable

STANDARDS & CERTIFICATIONS

Standards & Compliance

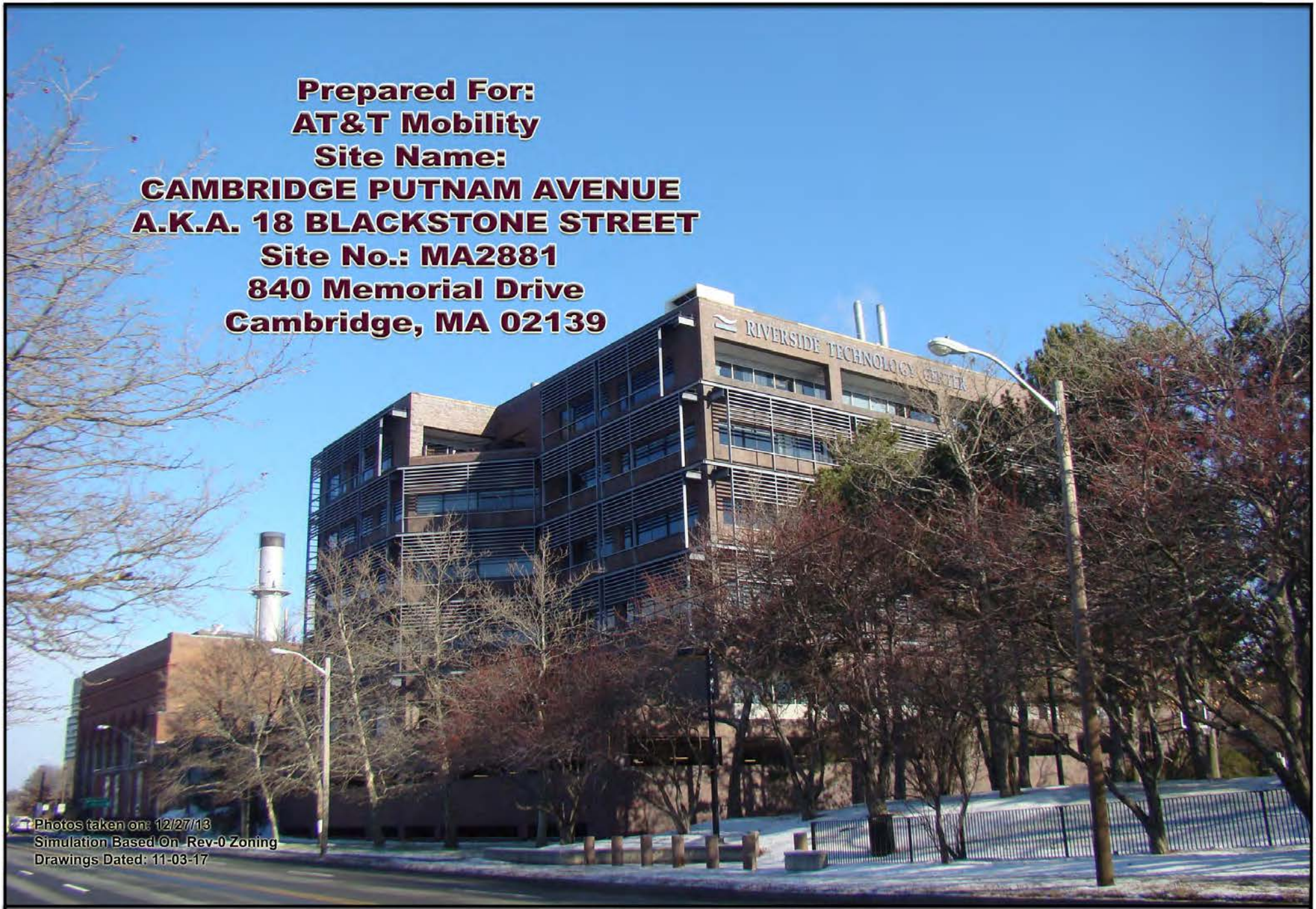
Safety	EN 60950-1, UL 60950-1
Emission	EN 55022
Immunity	EN 55024
Environmental	IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-5, IEC 60068-2-6, IEC-60068-2-11, IEC 60068-2-14, IEC 60068-2-18, IEC 60068-2-27, IEC 60068-2-29, IEC 60068-02-30, IEC 60068-2-52, IEC 60068-2-64, GR-63-CORE 4.3.1, EN 60529, IP 24

Certifications

Antenna Interface Standards Group (AISG), Federal Communication Commission (FCC) Part 15 Class B, CE, CSA US, ISO 9001:2008

EXHIBIT 5

Prepared For:
AT&T Mobility
Site Name:
CAMBRIDGE PUTNAM AVENUE
A.K.A. 18 BLACKSTONE STREET
Site No.: MA2881
840 Memorial Drive
Cambridge, MA 02139



Photos taken on: 12/27/13
Simulation Based On Rev-0 Zoning
Drawings Dated: 11-03-17

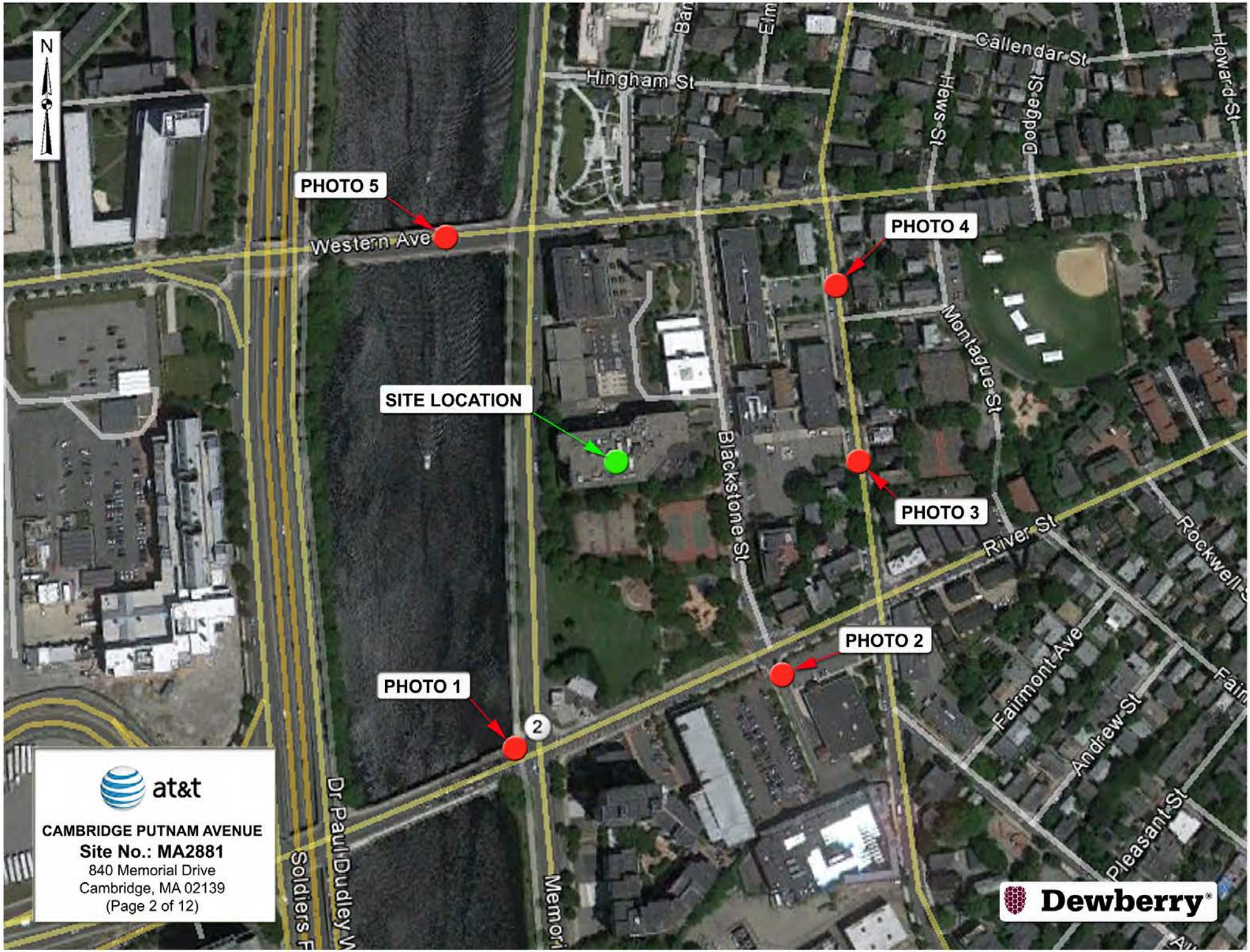
For visual reference only. Actual visibility is dependent upon weather conditions, season, sunlight, and viewer location.

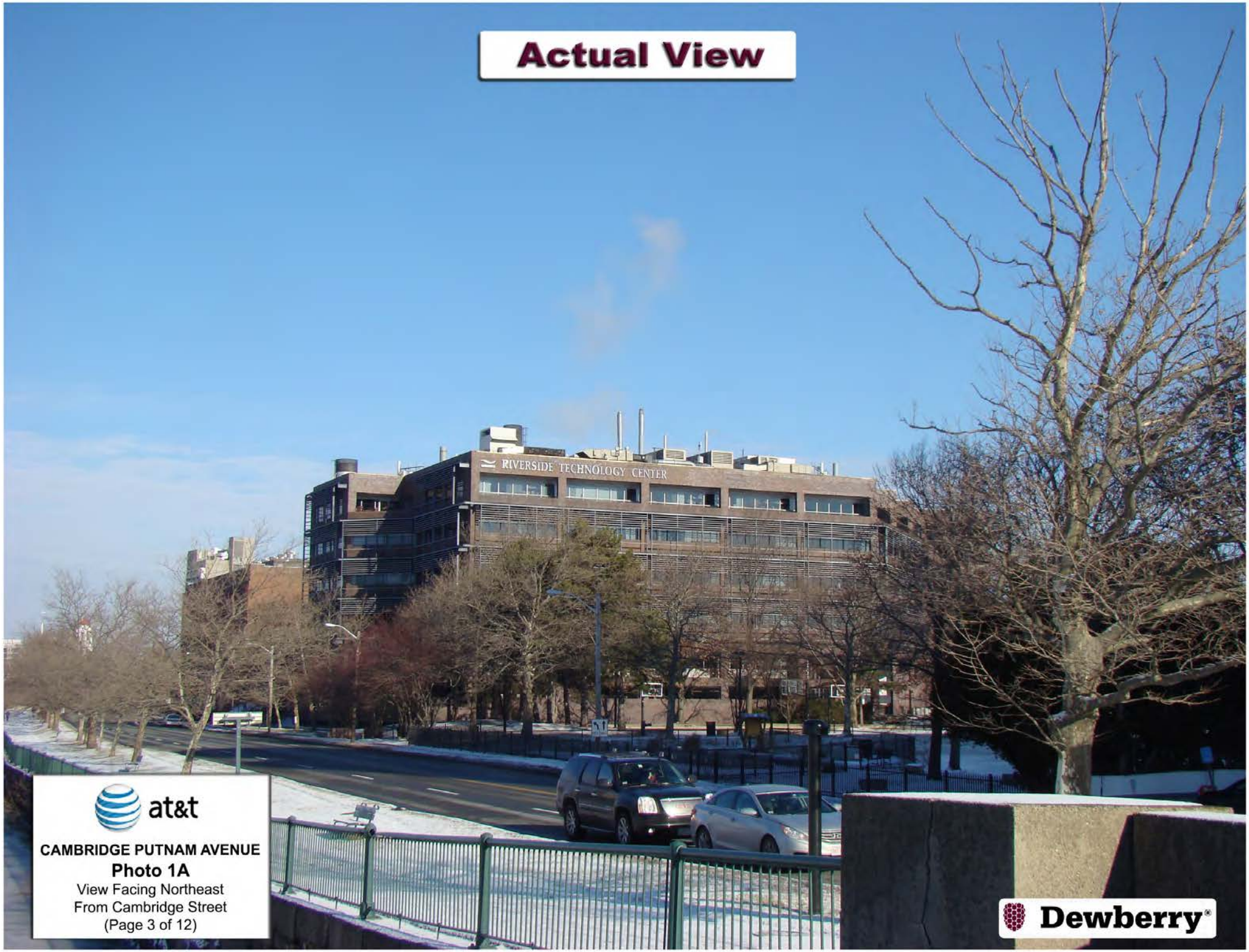
at&t
550 Cochituate Road
Suites 13 & 14
Framingham, MA 01701

CAMBRIDGE PUTNAM AVENUE
Site No.: MA2881
DEWBERRY NO. 50096257

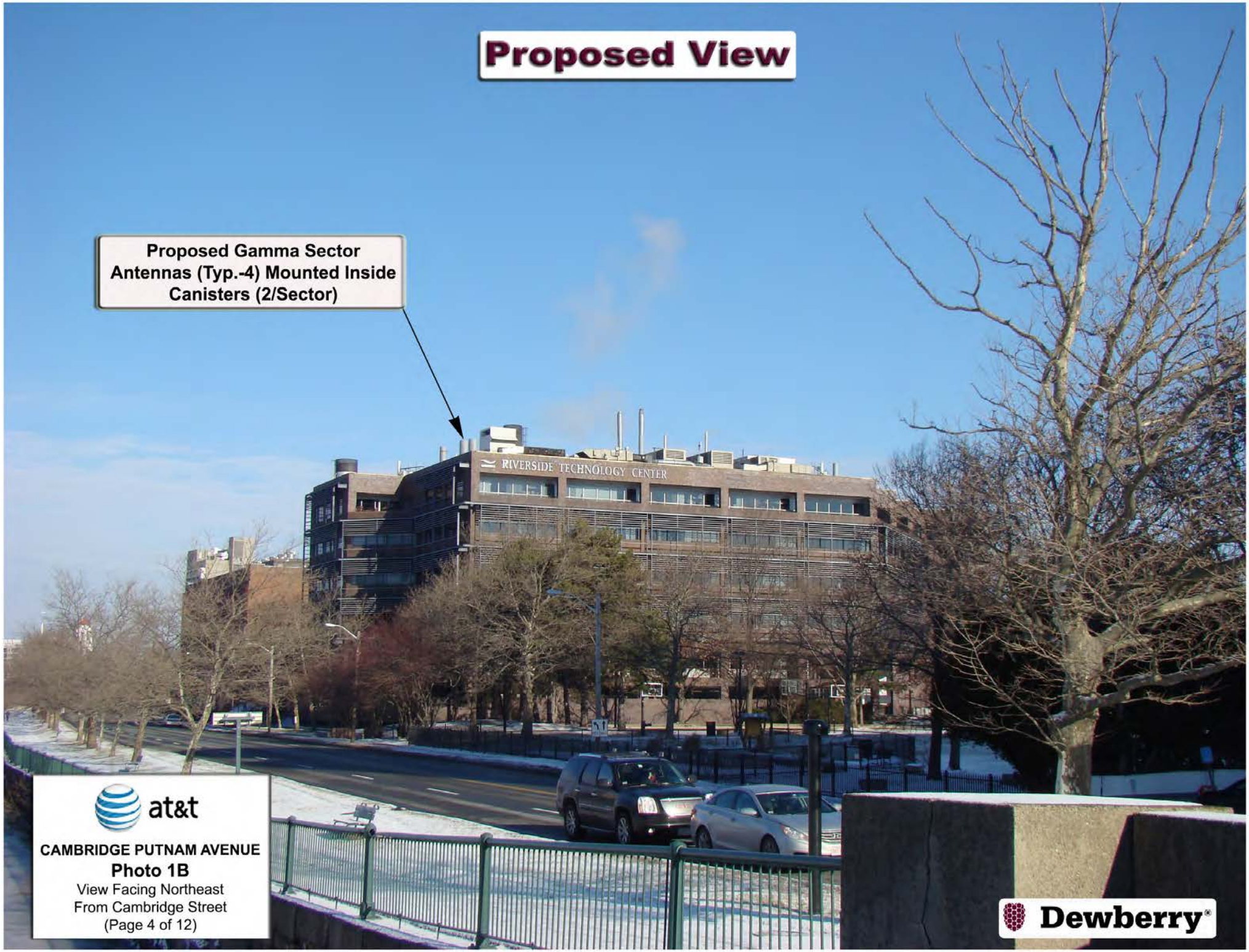
CENTERLINE COMMUNICATIONS
95 Ryan Drive, Suite 1
Raynham, MA 02767

Dewberry®
Dewberry Engineers Inc.
280 Summer St.
10th Floor
Boston, MA 02210


N
PHOTO 5
Western Ave
PHOTO 4
SITE LOCATION
PHOTO 3
PHOTO 2
PHOTO 1
Hingham St
Callendar St
Howard St
Hews St
Dodge St
Montague St
Blackstone St
River St
Rockwell
Fairmont Ave
Andrew St
Pleasant St
Dr Paul Dudley W
Soldiers F
Memori
2
at&t
CAMBRIDGE PUTNAM AVENUE
Site No.: MA2881
840 Memorial Drive
Cambridge, MA 02139
(Page 2 of 12)
Dewberry


Actual View
RIVERSIDE TECHNOLOGY CENTER
at&t
CAMBRIDGE PUTNAM AVENUE
Photo 1A
View Facing Northeast
From Cambridge Street
(Page 3 of 12)
Dewberry

Proposed View



at&t

CAMBRIDGE PUTNAM AVENUE

Photo 1B

View Facing Northeast
From Cambridge Street
(Page 4 of 12)

Dewberry®

Actual View

at&t

CAMBRIDGE PUTNAM AVENUE

Photo 2A

View Facing Northwest
From River Street
(Page 5 of 12)

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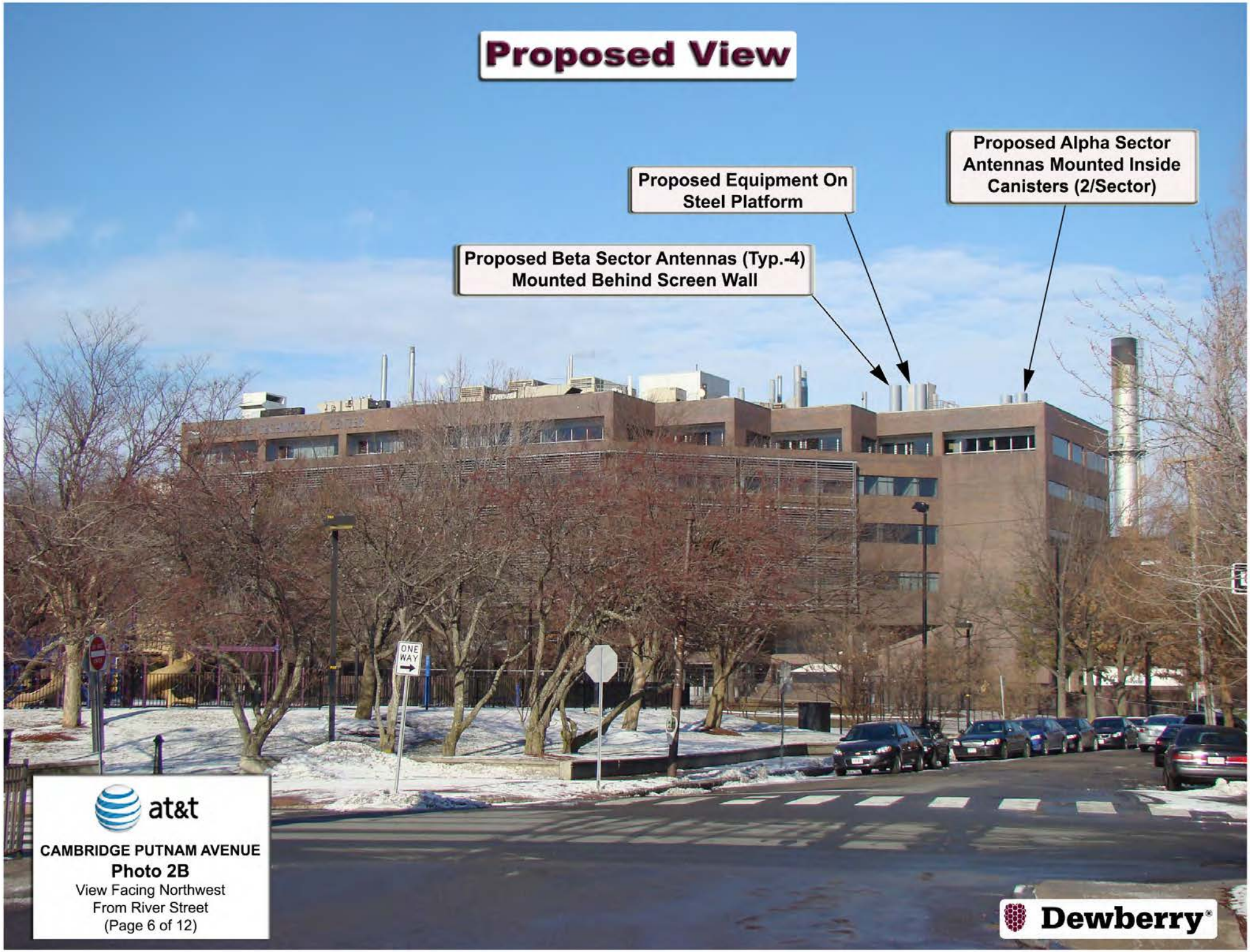
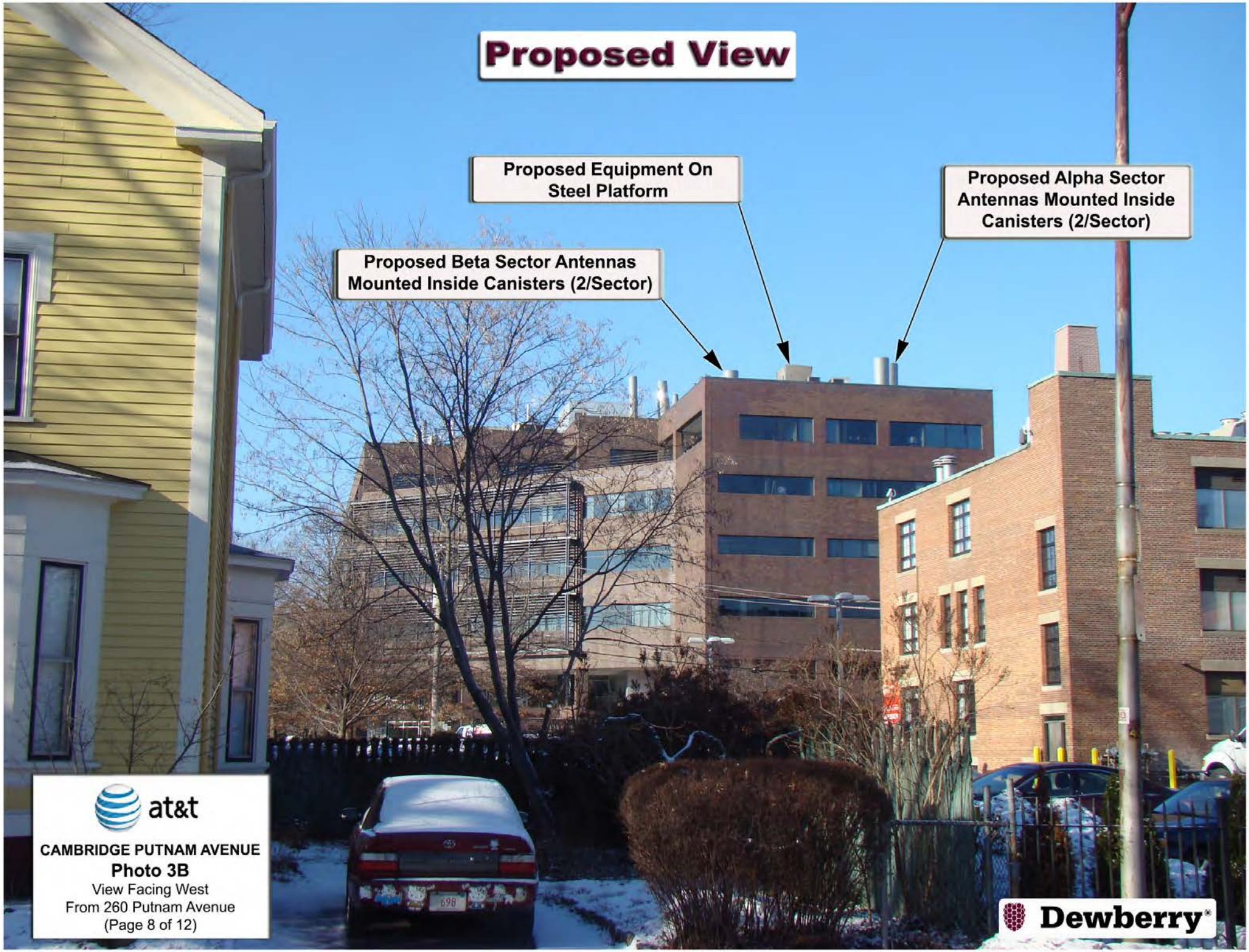

Proposed View
Proposed Alpha Sector Antennas Mounted Inside Canisters (2/Sector)
Proposed Equipment On Steel Platform
Proposed Beta Sector Antennas (Typ.-4) Mounted Behind Screen Wall
ONE WAY
at&t
CAMBRIDGE PUTNAM AVENUE
Photo 2B
View Facing Northwest
From River Street
(Page 6 of 12)
Dewberry


Actual View
at&t
CAMBRIDGE PUTNAM AVENUE
Photo 3A
View Facing West
From 260 Putnam Avenue
(Page 7 of 12)
Dewberry


Proposed View
Proposed Equipment On Steel Platform
Proposed Alpha Sector Antennas Mounted Inside Canisters (2/Sector)
Proposed Beta Sector Antennas Mounted Inside Canisters (2/Sector)
at&t
CAMBRIDGE PUTNAM AVENUE
Photo 3B
View Facing West
From 260 Putnam Avenue
(Page 8 of 12)
Dewberry


Actual View
at&t
CAMBRIDGE PUTNAM AVENUE
Photo 4A
View Facing Southwest
From 214 Putnam Avenue
(Page 9 of 12)
Dewberry


Proposed View
Proposed Alpha Sector Antennas Mounted Inside Canisters (2/Sector)
Proposed Beta Sector Antennas Mounted Inside Canisters (2/Sector)
Proposed Equipment On Steel Platform
at&t
CAMBRIDGE PUTNAM AVENUE
Photo 4B
View Facing Southwest
From 214 Putnam Avenue
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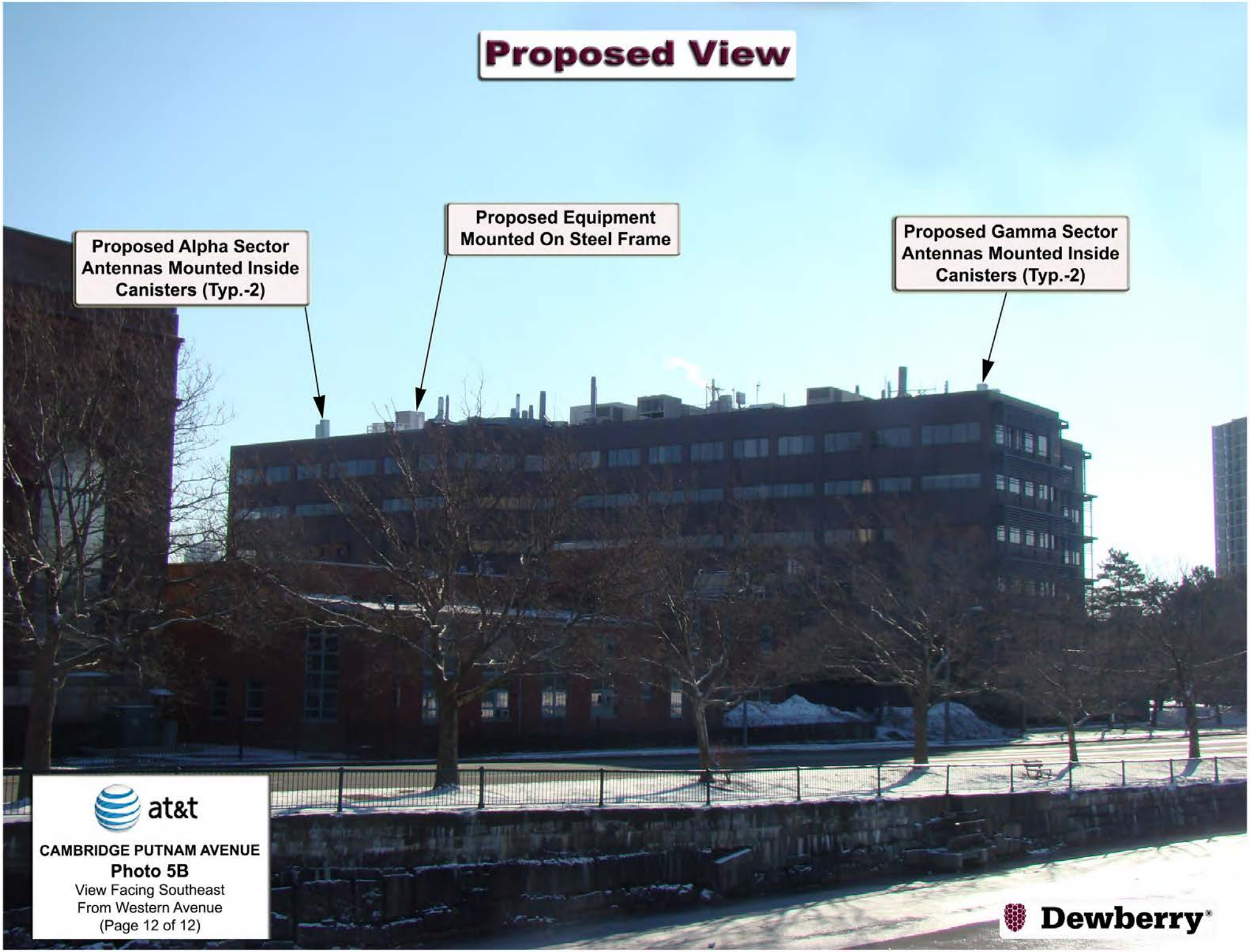
Dewberry


Actual View
at&t
CAMBRIDGE PUTNAM AVENUE
Photo 5A
View Facing Southeast
From Western Avenue
(Page 11 of 12)
Dewberry

Proposed View



at&t

CAMBRIDGE PUTNAM AVENUE

Photo 5B

View Facing Southeast
From Western Avenue
(Page 12 of 12)

Dewberry®

EXHIBIT 6

RF Report

Proposed Cambridge PCS Facility

(Site MA2881 – 840 Memorial Drive (aka 18 Blackstone Street), Cambridge, MA)

September 24, 2018

TABLE OF CONTENTS

ATTACHMENTS

Exhibit 1: Current Coverage in Cambridge MA,
Exhibit 2: Proposed Coverage in Cambridge MA

1. Overview

New Cingular Wireless PCS, LLC ("AT&T") is providing the following information in support of its application to the Cambridge Board of Zoning Appeals (BZA) to construct and operate a building and rooftop mounted wireless telecommunications facility ("Facility") in Cambridge for its Personal Communication Services. The proposed Facility is to be located on the building rooftop at 840 Memorial Drive, Cambridge, MA (Assessors' Map 129, Lot 58) (the "Site"). The Facility is needed to provide coverage for significant coverage gaps that exist along Memorial Drive, as discussed in this report. This report addresses AT&T's need for the proposed facility at the Site and confirms that there are no superior existing structures, buildings or towers in this part of Cambridge that meet AT&T's coverage objectives for this area.

Included in this package are a brief summary of the proposed Facility's objectives, an analysis of alternate site candidates considered, and radio frequency ("RF") coverage plots showing the predicted propagation of the proposed Facility based on the antenna mounting height necessary to achieve AT&T's coverage goals.

2. AT&T's Proposed Facility

As shown on the zoning drawing plans submitted with the zoning application, AT&T proposes to construct, operate and maintain a personal wireless service facility consisting principally of the following elements:

- Twelve (12) panel antennas (four per sector, each antenna measuring 8 ft. in height) mounted within canisters on the roof of the building. 2 antenna per canister.

- Twenty-one (21) radio-head units (RRUs) (seve per sector) and four (4) surge protectors ballast mounted to the cable tray level at the antenna frames on the roof, near the antennas.

- Fiber optic and DC power cables running from the radio-head units through a fiber and power feed along the building rooftop to AT&T's equipment frame on the building's roof.

- Two (2) GPS antennas, mounted on the roof.

- Electric and telephone utilities conduits.

3. Coverage and Capacity Objectives

AT&T provides digital cellular communications service as allocated by the Federal Communications Commission ("FCC"). AT&T is in the process of expanding and enhancing its network throughout Massachusetts and specifically in Cambridge to provide high speed data services commonly referred to as "long term evolution" ("LTE"). LTE operates in the 700, 850, 1900, 2100 and 2300 MHz frequencies under license from the FCC.

Regarding the 840 Memorial Drive site, AT&T has determined that significant coverage gaps exist in Cambridge along Memorial Drive (Targeted Coverage Area), particularly with respect to in- building coverage.

Wireless communications is no longer just limited to providing mobility for voice services. It has evolved into offer a wider range of advanced services to include wide-area voice, data, internet, video, and broadband wireless data, among others, all in a mobile environment. In order to offer these competitive services to more residents, businesses and commuters traveling in and through the Targeted Coverage Area, AT&T needs to improve the quality of its coverage by filling in as many of the existing gaps as possible with signal strengths conducive to in-building and in-vehicle usage, and to provide the capacity and bandwidth requirements to meet the increasing demand on the network.

In summary, the key objective of the 840 Memorial Drive (MA2881) site is to provide improved in-building and in-vehicle coverage in the Cambridge Area.

4. Site Search and Selection Process/Candidate Evaluation

To find a site that provides acceptable service and fills the gaps in coverage, computer modeling is used to define a search ring. The search ring is designed such that a site located within the ring would have a high probability of completing coverage in the Targeted Coverage Area (assuming that sufficient height is used).

Once the search ring is determined, AT&T's real estate consultants search within the defined area for existing buildings or tower structures of sufficient height that would fill coverage gaps within the network. As more fully explained below, AT&T does not have an existing facility that is capable of providing the required coverage to the Targeted Coverage Area. In fact, only two (2) other sites appear to satisfy AT&T's coverage needs for this area. From both radio frequency coverage and zoning perspectives, the proposed site at 840 Memorial Drive is found to be best of all alternative site possibilities.

5. Alternative Site Analysis

AT&T has been unable to identify any existing or approved wireless facility or other suitable existing or approved structure, building or tower in the specified search area of Cambridge from which to address the significant coverage gaps in the Targeted Coverage Area, other than the buildings located at 808 Memorial Drive and 24 Blackstone Street. These sites would provide the coverage that AT&T's Radio Frequency experts are looking to achieve, however the proposed site at 840 Memorial Drive is superior due to its frontage along Memorial Drive and the fact carriers are existing on the rooftop.

6. Coverage Plots

To demonstrate why the proposed Facility is necessary, I have developed the following radio frequency coverage maps:

- Exhibit 1, entitled "Current Coverage in Cambridge MA", shows AT&T's existing wireless coverage in and around the Targeted Coverage Area without the proposed facility.

- Exhibit 2, entitled "Proposed Coverage in Cambridge MA", shows AT&T's proposed coverage in and around the Targeted Coverage Area with the proposed facility to be installed at the Site.

These coverage maps were generated using Forsk Atoll, an RF Propagation computer modeling program. The software takes into account the geographical features of an area, antenna models, antenna heights and RF transmitting power. The pie-shaped symbols depict existing wireless facility site locations. The areas in blue will have adequate outdoor or "in-vehicle" coverage, but insufficient signal strength for reliable in-building service. The areas in green will have good in-building service as well.

The map showing coverage without the proposed upgraded Facility site indicates that AT&T cannot achieve its coverage objective with currently existing sites. Accordingly, the proposed facility at the Site is necessary to fill coverage gaps and upgrade AT&T's wireless service in and around the Targeted Coverage Area.

7. Summary

No other existing structures are better suited than the subject Site to provide the coverage and capacity requirements needed for this area of Cambridge, Massachusetts. The location and the facility configuration were chosen to achieve an optimal balance between meeting coverage objectives and minimizing the aesthetic impact to the community while fully complying with the Cambridge Zoning Code. It will comply with all applicable FCC regulations

regarding RF emissions and other matters. The proposed Facility site is feasible and appropriate, and will improve wireless service along Memorial Drive and the surrounding vicinity.

8. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate.

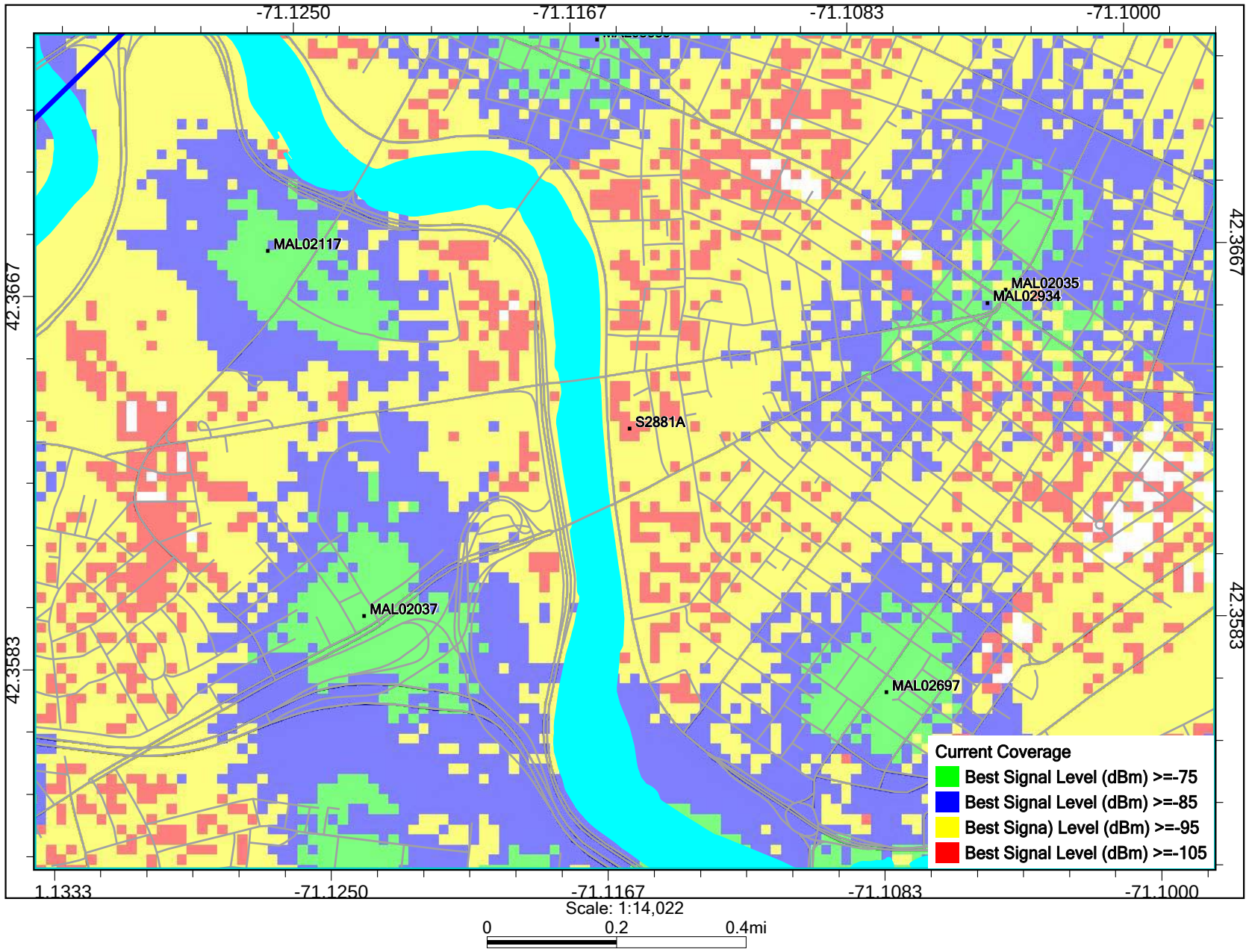
9/24/18

Radu Alecsandru, RF Engineer
AT&T Mobility

Date

at&t

Current Coverage



at&t

Proposed Coverage