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

BZA APPLICATION FORM

Plan No: BZA-015524-2018

GENERAL INFORMATION

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

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

PETITIONER : AT&T Mobility C/O Dan Bilezikian / SAI Communications, Inc.

PETITIONER'S ADDRESS : 125 Tremont St. Rehoboth, MA 02769

LOCATION OF PROPERTY : 288 Norfolk St Cambridge, MA 02139

TYPE OF OCCUPANCY : Commercial **ZONING DISTRICT :** Residence C-1 Zone

REASON FOR PETITION :

Other: Wireless Communications

DESCRIPTION OF PETITIONER'S PROPOSAL :

AT&T proposes to install six (6) panel antennas: four (4) will be installed within faux chimneys, two (2) will be facade mounted to the building's elevator shaft and painted to match the brick.

SECTIONS OF ZONING ORDINANCE CITED :

Article 4.000 Section 4.32.G.1 (Telecommunication Facility).

Article 4.000 Section 4.40 (Footnote 49) (Telecomunnication Facility).

Article 10.000 Section 10.40-10.46 (Special Permi).

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

Dan Bilezikian / SAI Communications, Inc.
(Print Name)

Address : 125 Tremont St.
Rehoboth, MA 02769

Tel. No. : 401-368-0006

E-Mail Address : dan.bilezikian@sai-comm.com

Date : 1/31/18

BZA APPLICATION FORM - OWNERSHIP INFORMATION

(To be completed by **OWNER**, signed before a notary, and returned to Secretary of Board of Appeal).

I/We Norshire LLC Neal Heffron
(OWNER)

Address:

State that I/We own the property located at 288 Norfolk St which is the subject of this zoning application.

The record title of this property is in the name of

*Pursuant to a deed of duly recorded in the date 11/4/2008, Middlesex South County Registry of Deeds at Book 51897, Page 321; 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 Bristol

The above-name Neal Heffron personally appeared before me, this 14 of May, 2013 and made oath that the above statement is true.

Notary

My commission expires 3/10/17 (Notary Seal).

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

(ATTACHMENT B - PAGE 3)

BARBARA D'AMICO
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
March 10, 2017

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 288 Norfolk St Cambridge, MA 02139 (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, as shown in the application letter accompanying this application 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 effect on the continued operation of or development of adjacent use. 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 nmot impair the integrity of the C-1 or adjoining non-residential districts. It will not be incompatible with residential and non-residential uses in the area, and its design and location will mitigate any visual impacts.

BZA APPLICATION FORM

DIMENSIONAL INFORMATION

APPLICANT: SAI Communications, Inc. **PRESENT USE/OCCUPANCY:** Retail/Office

LOCATION: 288 Norfolk St Cambridge, MA 02139 **ZONE:** Residence C-1 Zone

PHONE: _____ **REQUESTED USE/OCCUPANCY:** No change

		EXISTING CONDITIONS	REQUESTED CONDITIONS	ORDINANCE REQUIREMENTS [1]	
TOTAL GROSS FLOOR AREA:		N/A	N/A	N/A	(max.)
LOT AREA:		22,161	300	5,000	(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	112	no change	no change	(min.)
	DEPTH	230	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	61.3/71.3	61.3/71.3	none	(max.)
	LENGTH	90	no change	no change	
	WIDTH	77	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 a retail office and gym. There are three (3) existing wireless carriers at the site. AT&T proposes to house its equipment in the building's basement and will mount its antennas and associated cabling/equipment on the rooftop and building facade. The rooftop faux chimneys and the facade antennas will be painted brick.

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'.

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

2018 FEB -1 PM 3:36

OFFICE OF THE CITY CLERK
CAMBRIDGE, MASSACHUSETTS

BZA APPLICATION FORM

Plan No: BZA-015524-2018

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Original Signature(s) : _____
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Dan Bilezikian / SAI Communications, Inc
(Print Name)

Address : 125 Tremont St.
Rehoboth, MA 02769

Tel. No. : 401-368-0006

E-Mail Address : dan.bilezikian@sai-comm.com

Date : 1/31/18

Cambridge Board of Zoning Appeal

Special Permit Application

288 Norfolk Street, Cambridge, MA

Map 85 Lot 76

Applicant:

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

c/o Dan Bilezikian, SAI Communications

dan.bilezikian@sai-comm.com

(401-368-0006)

January 15, 2018

January 15, 2018

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:	288 Norfolk Street Assessor's Map 85, Lot 76 (the "Property")
Re:	Application for: (i) Eligible Facilities Request pursuant to Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012, 47 U.S.C. § 1455; or, in the alternative, (ii) Special Permit under Cambridge Zoning Ordinance Section 4.32(g)(1) and M.G.L. c. 40A, Section 9; and (iii) 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

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"), New Cingular Wireless PCS, LLC ("AT&T") hereby submits 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 install a "Telephone Exchange including Transmission Facilities to serve a Mobile Communication System" (the "Facility") on the exterior of the building located on the Property (the "Special Permit Application").[1] The Property is located in the Residence C-1 zoning district. As

[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

demonstrated in this application letter, the proposed Facility satisfies the requirements for the grant of a special permit pursuant to Section 10.43 of the Ordinance.

Under Section 6409, AT&T's proposed installation of equipment on and within the existing building, previously approved by the Board for use as a wireless communication base station by providers of functionally equivalent services, 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, the AT&T's proposed modifications to its existing Facility on the Property located in Residence C-1 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 application is a check payable to the City of Cambridge in the amount of $500.00. In addition to the signed original of this letter are three (3) copies of the letter and the following materials:

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;

    d. BZA Application Form – Supporting Statement for a Special Permit; and

    e. BZA Application Form – Check List;

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

3. The following Zoning Drawings prepared by Dewberry Engineers, Inc.:

SHEET	TITLE	REV DATE
T-1	Title Sheet	1/26/18
Z-1	Abutters Plan	1/26/18
Z-2	Proposed Roof and Basement Plans	1/26/18
Z-2A	Proposed Basement & Parking Area	1/26/18
Z-3	South & North Elevations	1/26/18

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.

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

5. Photographs of the existing building and simulations of the proposed Facility; January 12, 2018:

6. Radio Frequency Report, prepared by Radu Alecsandru, AT&T, dated February 1, 2017, demonstrating the public need for the Facility, radio frequency coverage maps showing (a) existing coverage; and (b) coverage with the proposed Facility;

7. Alternate Site Summary

8. Structural Retaining Letter prepared by Dewberry Engineers, Inc., dated January 9, 2017;

9. Maximum Permissible Exposure Study, Theoretical Report, prepared by SAI Communications, dated May 4, 2017;

10. Noise Study, prepared by Noise Control Engineering, Inc., dated June 3, 2013.

11. Deed to subject property; and

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

II. PROPOSED FACILITY DESIGN

AT&T seeks to co-locate its Facility on the roof of the building located at the Property along with several other existing wireless communications facilities operated by wireless carriers, Sprint/Nextel, Verizon and T-Mobile. Consistent with the concealment elements of the existing facilities, AT&T proposes to install six (6) antennas (Alpha Sector: 2 antennas, Beta Sector: 2 antennas, and Gamma Sector: 2 antennas) on steel frames within faux chimneys and on the building's elevator shaft exterior façade. Four (4) antennas will be housed within the faux chimneys that match the color and size of Verizon's two (2) existing faux canisters. Two (2) antennas will be façade mounted to the building's elevator shaft and painted to match the building's brick. Fifteen (15) remote radio-head units (RRUs) will be mounted on the steel frames supporting the beta and gamma sectors. AT&T will install its equipment cabinets within the proposed 15' x 15' equipment area located in the building basement. There will be additional ancillary equipment such as associated cabling, cable trays, conduits and the like, located on the existing rooftop along with one (1) federally mandated GPS antenna mounted to a cable tray. 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.

[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.

The Facility will bring advanced wireless voice, text and data communications services to the surrounding areas. It will allow residents, professionals, government, businesses and 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 City of Cambridge and from the Property, 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 and elevator shaft façade 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 Wellington-Harrington section of Cambridge 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 with the inclusion of the proposed Facility.

V. THE FEDERAL SPECTRUM ACT AND THE FCC ORDER

As set forth below, the proposed co-location of AT&T's transmission equipment constitutes an Eligible Facilities Request pursuant to the federal Spectrum Act,[3] as further implemented by the FCC 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.

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[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—

> (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.

FCC Order, ¶ 88.

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

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

approval means all necessary approvals to permit the proposed 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 co-location on the existing base station constitutes 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 MODIFICATIONS ARE 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 is a "base station" for purposes of Section 6409.

AT&T proposes to install its proposed transmission equipment as described above and depicted on the Plans submitted herewith. The proposed 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 co-location of transmission equipment constitutes 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 not exceed 10 feet above the existing building;

(ii) Protrude from the edge of the edge of the building by more than six feet because AT&T's proposed antennas will not protrude more than six feet from building façade;

(iii) Involve the installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets;

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

(v) Otherwise defeat the existing concealment elements of the tower or base station because the proposed antennas will be located within proposed faux chimneys consistent with the concealment elements of the existing facilities on the building, or façade mounted and painted to match the existing building, and will continue to integrate the Facility into the existing architecture of the building. Therefore, AT&T's proposed Facility will remain aesthetically consistent with the exterior

finish of the building as well as maintain the concealment elements of the original design.

See FCC Order, §1.40001(b)(7)(i)-(v).

V. COMPLIANCE WITH THE CAMBRIDGE ZONING ORDINANCE

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

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 C-1 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:

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 o 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, façade and in the basement, minimizes the visual impact of the proposed Facility in that (i) antennas on the rooftop will be concealed within faux chimneys and antennas on the elevator shaft façade will be painted to match the elevator shaft exterior, (ii) all equipment will be hidden from view by placement within the proposed equipment area in the basement and proposed RRUs and cable trays will be placed on a steel platform 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: 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, students and faculty, and the general public in that area.[6] 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.

After a search for alternative locations to site the Facility, only one other structure in the vicinity was found possibly suitable to provide the wireless communications services required by AT&T's Radio Frequency engineers to satisfy the coverage needs in this area of Cambridge. That structure is a 50 ft. church steeple atop the Massachusetts Avenue Baptist Church located at 146 Hampshire Street. While a church steeple in this location might satisfy AT&T's coverage requirements, the 288 Norfolk Street building is a significantly better choice to host the Facility because it is a commercial building that already houses the wireless facilities of three (3) other major carriers. The Facility's design is similar to that used on the rooftop by Verizon. The height of the Building, as opposed to the church steeple, allows AT&T's antennas to be located at the requisite height, and in close proximity to Hampshire Street, AT&T's targeted coverage area.

Given that Verizon, Sprint/Nextel and T-Mobile already operate wireless facilities at the Property and because the building itself along with other buildings at and around the Property are non-residential, the Board should find that (1) non-residential uses predominate in the vicinity and (2) the Facility is not inconsistent with the prevailing character in the surrounding neighborhood. Also, the proposed Facility is located away from a residential area, and as previously noted, is designed to hide certain equipment from view and otherwise to visually

[6] 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.

blend with the building and rooftop colors and the existing wireless facilities of other carriers so as not to be visually obtrusive to the surrounding area.

Further, by co-locating its proposed transmission equipment, and obviating the need to construct a facility in a location not currently used for wireless communications within this area of Cambridge in order to meet its wireless network coverage needs, AT&T's proposed facility is consistent with the existing use and character of the neighborhood. In addition, the co-location of AT&T's transmission equipment with the requirements set forth in Section 4.32(g), Footnote 49 of the Ordinance, the Spectrum Act and the eligible facilities request criteria set forth in 47 CFR § 1.40001. Therefore, granting the special permit is consistent with the Board's obligations pursuant to the Spectrum Act and FCC Order.

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 meet the eligible facilities request criteria set forth in 47 CFR § 1.40001.

B. **AT&T complies with the Special Permit Criteria set forth in Section 10.43 of the Ordinance**.

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,

AT&T's Response: As provided above, AT&T's co-location of the proposed transmission equipment complies with the requirements set forth in Section 4.32(g), Footnote 49 of the Ordinance, the Spectrum Act and the eligible facilities request criteria set forth in 47 CFR § 1.40001. 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.

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

AT&T's Response: 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. 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.

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 will be housed in faux chimneys and on the elevator shaft facade, painted to match the color of the façade. Equipment cabinets will not be installed on the roof but will be housed within the equipment area in the basement with some cabling, cable trays and other equipment located on the roof floor and not visible from the street. 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 residential uses. Conversely, the surrounding properties and general public will benefit from the potential to enjoy improved wireless communications services. 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.

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 wil 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,.Maximum Permissible Exposure Study, Theoretical Report). 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.

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 co-location of the proposed transmission equipment directly accords with the purposes of the Ordinance because the transmission equipment will not result in 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 drivers 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 transmission equipment will be installed on an existing building that includes existing wireless communications uses, and the co-location of the proposed transmission equipment concealed within faux chimneys, within the building, or by painting to match the existing façade, is consistent with the existing concealment elements and with the building's character and will not affect the value of the building or the natural resources of the City. Because the installation of the proposed transmission equipment is designed to be consistent with the existing concealment elements of the facilities on the building and characteristics of the Property, the visual impact on the underlying and adjacent zoning districts will be *de minimis*. As a result, the proposed modifications to the existing Facility are consistent with the Ordinance's purpose to allow for less intrusive wireless telecommunications facilities in all districts (other than Open Space) including the Residence C-1 zoning district. 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.

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 permi 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 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 will be co-located on and within the existing building, and utilize appropriate concealment methods to hide proposed transmission equipment or otherwise obstruct it from view, and blends with the structures and colors of the building to the extent feasible. The proposed Facility is consistent with the existing facilities on the building and the previously approved design and concealment elements. Therefore, the proposed modifications are responsive to the existing pattern of development in the Property's applicable zoning district such that granting the special permit is consistent with the Board's obligations pursuant to the Spectrum Act and FCC Order.

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

AT&T's Response: Inasmuch as the 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, 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 [7]

(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.

[7] Inasmuch as Section 19.33is most relevant to the Facility, it is stated here in full.

(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.

AT&T's Response: As shown in the photosimulations, the Facility is visually consistent with the color of the elevator shaft façade and the other faux canister structures already installed on the rooftop by Verizon. Accordingly, the antennas all will be screened from view by the faux chimneys or visually blended by being painted to match the elevator shaft façade. 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 proposed equipment area in the building basement. Given that other wireless carriers have similar installations on the building's rooftop and façade of the building, AT&T's 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 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 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 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 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 the Facility will include a proposed equipment area in the building basement and rooftop antennas and other equipment will be substantially similar to the existing installations of other wireless carriers, 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 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 Facility will not change the building's scale or wall treatment except to the extent that antennas will be mounted on the building elevator shaft façade and in faux chimneys on the rooftop of the building, similar to the existing installations as shown on the Zoning Drawings submitted with the application (see Exhibit 3). Given that the antennas will be located within faux chimneys on the roof or painted to match the color of the elevator shaft facade, any visual impact will be minimal. Further, the proposed Facility is consistent with characteristics of the existing building design, maintains the existing concealment elements of the existing facilities, and therefore minimizes any visual impact from the Facility.

(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 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 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 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 Facility's installation on an existing building that already houses the wireless facilities of other wireless carriers, the efforts to visually blend the Facility with the building's texture and color, and the design of the Facility to be consistent with the concealment elements of the existing facilities, the Facility will reinforce the existing Cambridge landscape as it currently is manifested at the Property.

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

AT&T's Response: Inasmuch as the 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 Facility's installation on an existing commercial building, the Facility will enhance open space amenities in that no existing open space will be used in the project.

VI. SUMMARY

For the foregoing reasons AT&T respectfully requests that the Board to determine that pursuant to the Spectrum Act and the FCC Order, the Request constitutes and 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 co-location and operation of AT&T's proposed Facility.

Best Regards,

Dan Bilezikian

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

BZA APPLICATION FORM

CHECK LIST

PROPERTY LOCATION: 288 Norfolk Street **DATE:** Oct. 20, 2017

PETITIONER OR REPRESENTATIVE: AT&T c/o Dan Bilezikian, SAI Communications

ADDRESS & PHONE: 125 Tremont St., Rehoboth, MA 02769, 401-368-0006

BLOCK: Map 85 **LOT:** 76

PLEASE CHECK THAT YOU HAVE INCLUDED THE FOLLOWING WITH YOUR APPLICATION. **APPLICATIONS WILL NOT BE ACCEPTED FOR PROCESSING & SCHEDULING UNLESS ALL REQUIRED DOCUMENTS ARE PROVIDED.**

PLEASE INCLUDE THIS CHECKLIST WITH YOUR APPLICATION.
ALL DOCUMENTS ARE TO BE TYPED OR WRITTEN LEGIBLY.

DOCUMENTS	REQUIRED	ENCLOSED
Application Form - 3 Copies with Original Signatures	✔	
Supporting Statements	✔	
Application Fee ($) (SEE ATTACHED FEE SCHEDULE)	✔	
Assessor's Plat (Available at Engineering Dept. - 147 Hampshire Street)	✔	
Dimensional Form - Refer to Cambridge Zoning Ordinance - 2 Copies (Subject to further review by Zoning Specialist)	✔	
Ownership Certificate, Notarized - 2 Copies	✔	
Floor Plans - 2 Copies	✔	
Elevations - 2 Copies *	✔	
Certified Plot Plan - 2 Copies (By Registered Land Surveyor)	✔	
Photographs Of Property	✔	
Parking Plan (if relevant to your application)		✔
FOR SUBDIVISION ALSO INCLUDE:**		
Proposed Deeds	✔	
Evidence of Separate Utilities ***		✔
Proposed Subdivision Plan		✔

Petitioners are advised to refer to Attachment A (Procedures for applying to the Board of Zoning Appeal) & consult zoning staff for review.
It is advisable for the Petitioner to discuss the petition with the abuttors as listed in the Zoning BZA Case file.

* For Special Permits under Art. 4.32.G.1 (Communication Towers and Antennas), include a photo simulation.
** See attachment G.
*** Can be submitted after subdivision has been approved.

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 SAI Communications, Inc.

PETITIONER'S ADDRESS: PO Box 246 Rehoboth, MA 02769

LOCATION OF PROPERTY: 288 Norfolk Street

TYPE OF OCCUPANCY: Retail-Office **ZONING DISTRICT:** C-1

REASON FOR PETITION:

_____ Additions

_____ Change in Use/Occupancy

_____ Conversion to Addi'l Dwelling Unit's

_____ Dormer

_____ New Structure

_____ Parking

_____ Sign

_____ Subdivision

__X__ Other: Wireless Communications

DESCRIPTION OF PETITIONER'S PROPOSAL:

AT&T proposes to install six (6) panel antennas: four (4) will be installed within faux chimneys, two (2) will be facade mounted to the building's elevator shaft and painted to match the brick. See attached plans for install specifics.

SECTIONS OF ZONING ORDINANCE CITED:

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

Article 10 Section 10.40 to 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)

Dan Bilezikian / SAI Communications, Inc.
(Print Name)

Address: 125 Tremont St.
Rehoboth, MA 02769

Tel. No.: 401-368-0006

E-Mail Address: dan.bilezikian@sai-comm.com

Date: 1/26/18

BZA APPLICATION FORM - OWNERSHIP INFORMATION

(To be completed by **OWNER**, signed before a notary, and returned to Secretary of Board of Appeal).

I/We Norshire LLC Neal Heffron
(OWNER)

Address:

State that I/We own the property located at 288 Norfolk St which is the subject of this zoning application.

The record title of this property is in the name of

*Pursuant to a deed of duly recorded in the date 11/4/2008, Middlesex South County Registry of Deeds at Book 51897, Page 321; 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 Bristol

The above-name Neal Heffron personally appeared before me, this 29 of May, 2013 and made oath that the above statement is true.

_____ Notary

My commission expires 3/10/17 (Notary Seal).

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

(ATTACHMENT B - PAGE 3)

BARBARA D'AMICO
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
March 10, 2017

BZA APPLICATION FORM

DIMENSIONAL INFORMATION

APPLICANT: AT&T c/o SAI Communications **PRESENT USE/OCCUPANCY:** Retail-Office

LOCATION: 288 Norfolk St. **ZONE:** C-1

PHONE: 401-368-0006 **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:		22,161	300 sf	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	112'	no change	no change	(min.)
	DEPTH	230'	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	61.3' / 71.3'	61.3' / 70.3'	no extension	(max.)
	LENGTH	90'	no change	no change	
	WIDTH	77'	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.; woodframe, concrete, brick, steel, etc.

The lot consists of a retail office and gym. There are three (3) existing wireless carriers at the site. AT&T proposes to house its equipment in the building's basement and will mount its antennas and associated cabling/equipment on the rooftop and building facade. The rooftop faux chimneys and the facade antennas will be painted brick.

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'.

BZA APPLICATION FORM

SUPPORTING STATEMENT FOR A VARIANCE

***EACH OF THE FOLLOWING REQUIREMENTS FOR A VARIANCE MUST BE ESTABLISHED AND SET FORTH IN COMPLETE DETAIL* BY THE APPLICANT IN ACCORDANCE WITH MGL 40A, SECTION 10:**

A) A Literal enforcement of the provisions of this Ordinance would involve a substantial hardship, financial or otherwise, to the petitioner or appellant for the following reasons:

N/A, no variance necessary

B) The hardship is owing to the following circumstances relating to the soil conditions, shape or topography of such land or structures and especially affecting such land or structures but not affecting generally the zoning district in which it is located for the following rearsons:

N/A, no variance necessary

C) ***DESIRABLE RELIEF MAY BE GRANTED WITHOUT EITHER:***

1) Substantial detriment to the public good for the following reasons:

N/A, no variance necessary

2) Relief may be granted without nullifying or substantially derogating from the intent or purpose of this Ordinance for the following reasons:

N/A, no variance necessary

* **If You have any questions as to whether you can establish all of the applicable legal requirements, you should consult with your own attorney.**

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 288 Norfolk Street ***(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 will all applicable Special Permit criteria as stated in the Ordinance, as shown in the application letter accompanying this application 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 of or development of adjacent use. It will not create any nuisance or consume any public utilities that would diminsh 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 C-1 or adjoining non-residential districts. It will not be incompatible with residential and non-residential uses in the area, and its design and location will mitigate any visial impacts.

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	

ULS Help	ULS Glossary - FAQ - Online Help - Technical Support - Licensing

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

	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

FCC | Wireless | ULS | CORES

Help | Tech Support

Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Phone: 1-888-CALL-FCC (1-888-225-5322)
TTY: 1-888-TELL-FCC (1-888-835-5322)
E-mail: fccinfo@fcc.gov

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

Universal Licensing System

ULS License

Cellular License - KNKA226 - ORANGE LICENSES HOLDING, LLC

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	L00963843000	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

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

Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Phone: 1-888-CALL-FCC (1-888-225-5322)
TTY: 1-888-TELL-FCC (1-888-835-5322)
E-mail: fccinfo@fcc.gov

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.

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 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

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 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.

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

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Help | Tech Support

Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Phone: 1-877-480-3201
TTY: 1-717-338-2824
Submit Help Request

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.

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

CAMBRIDGE HAMPSHIRE STREET
SITE NO.: MA2312
288 NORFOLK STREET
CAMBRIDGE, MA 02139

ZONING

NOT FOR CONSTRUCTION

LOCUS MAP

TAKE I-90 E. TAKE EXIT 18 ON THE LEFT TOWARD CAMBRIDGE. MAKE A SLIGHT LEFT ONTO CAMBRIDGE ST. CONTINUE ONTO RIVER ST. CONTINUE ONTO PROSPECT ST. TURN RIGHT ONTO HAMPSHIRE ST. TURN LEFT ONTO NORFOLK ST. 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
SAI COMMUNICATIONS
27 NORTHWESTERN DRIVE
SALEM, NH 03079

PHONE # (781) 715-5532

CONSTRUCTION
EMPIRE TELECOM
1150 FIRST AVENUE
SUITE 600
KING OF PRUSSIA, PA 19406

PHONE # (484) 804-4500

CONSULTANT TEAM

SITE NAME:
CAMBRIDGE HAMPSHIRE STREET

SITE NUMBER:
MA2312

PROPERTY OWNER:
NORSHIRE LLC.
288 NORFOLK STREET
CAMBRIDGE, MA 02139

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

ELECTRIC UTILITY:
EVERSOURCE
1-800-592-2000

TELEPHONE UTILITY:
VERIZON
1-800-837-4966

COORDINATES*
LATITUDE: 42° 22' 16.63" N (NAD83)
LONGITUDE: 71° 05' 49.59" W (NAD83)
*PER FAA-1A

PROJECT SUMMARY

SITE ADDRESS:
288 NORFOLK STREET
CAMBRIDGE, MA 02139

ZONING CLASSIFICATION:
RESIDENCE C-1

PROJECT DIRECTORY

THE SITE WILL CONSIST OF MOUNTING (2) SECTORS OF ANTENNAS CONCEALED INSIDE FIBERGLASS CHIMNEYS ON PROPOSED STEEL FRAME MOUNTS (2 ANTENNAS/SECTOR) & (2) ANTENNAS FACADE MOUNTED TO THE EXISTING BUILDING. A PROPOSED 15'-0"X15'-10" EQUIPMENT ROOM WILL BE LOCATED INSIDE THE EXISTING BUILDING'S BASEMENT.

PROJECT DESCRIPTION

SAI CM	DATE
AT&T CM	DATE
SAI RF	DATE
AT&T RF	DATE

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	PROPOSED ROOF & BASEMENT PLANS
Z-2A	PROPOSED BASEMENT & PARKING AREA PLANS
Z-3	SOUTH & NORTH ELEVATIONS
Z-4	WEST ELEVATION & ANTENNA DETAILS

SHEET INDEX

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

SAI
27 NORTHWESTERN DRIVE
SALEM, NH 03079

CAMBRIDGE
HAMPSHIRE STREET
SITE NO.: MA2312

ZONING DRAWINGS		
13	01/26/18	FOR SUBMITTAL
12	01/11/18	FOR SUBMITTAL
11	11/16/17	FOR SUBMITTAL
10	10/12/17	FOR SUBMITTAL
9	01/27/17	FOR SUBMITTAL
8	04/16/14	FOR SUBMITTAL
7	04/09/14	FOR SUBMITTAL
6	02/20/14	FOR SUBMITTAL
5	01/02/14	FOR SUBMITTAL
4	11/21/13	FOR SUBMITTAL
3	09/09/13	FOR SUBMITTAL
2	08/13/13	FOR SUBMITTAL
1	08/05/13	FOR SUBMITTAL
0	05/29/13	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:	SK
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50003936
JOB NUMBER:	50048589

SITE ADDRESS
288 NORFOLK STREET
CAMBRIDGE, MA 02139

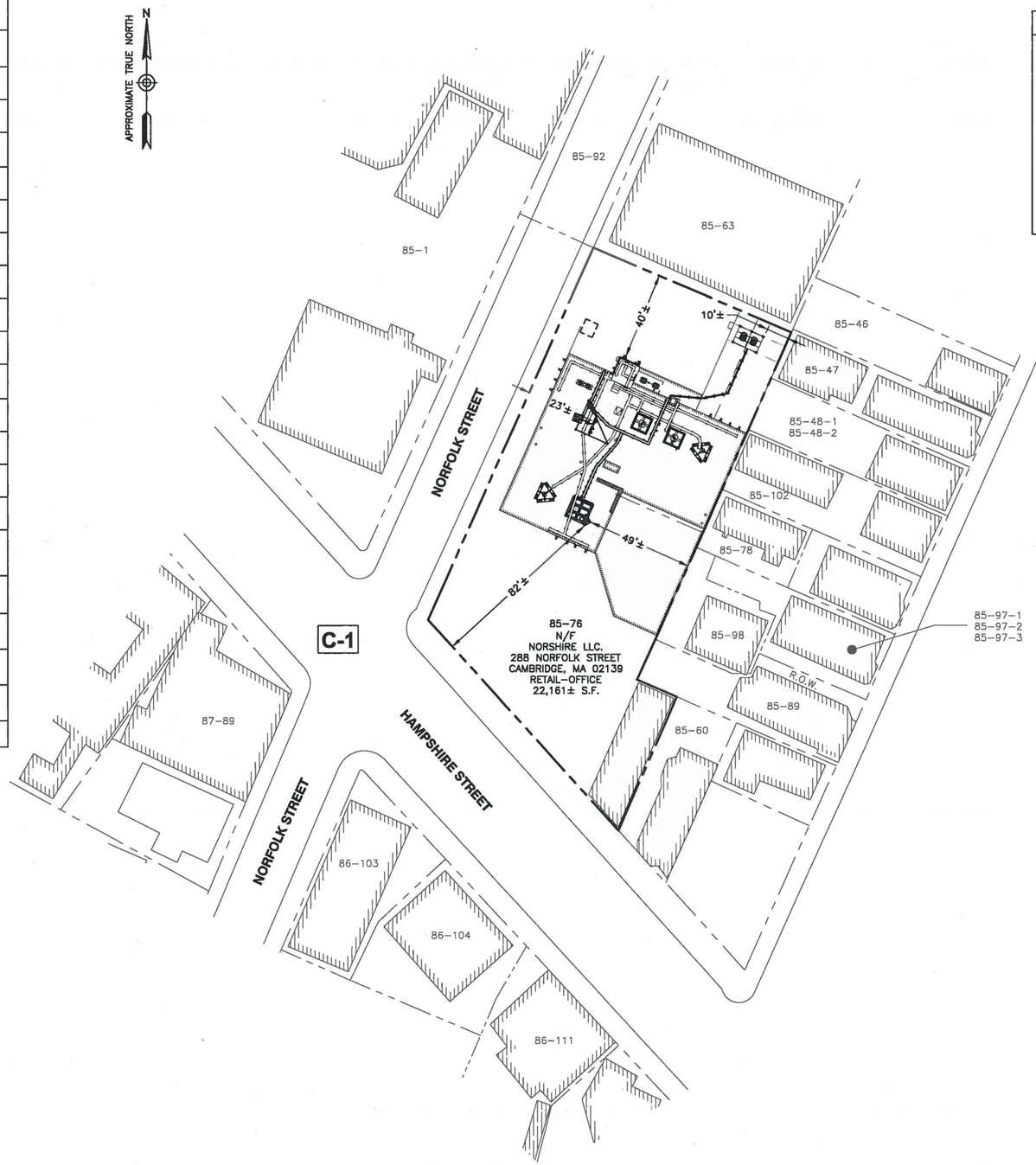
SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1

ABUTTERS LIST		
N/F*		
MAP/LOT PROPERTY ADDRESS	RECORD OWNER	MAILING ADDRESS
85–1 283 NORFOLK ST	CAMBRIDGE CITY OF PUBLIC WORKS DEP.	147 HAMPSHIRE ST CAMBRIDGE, MA 02139
85–46 189 ELM ST	CHERNEY, CHARLES & CANDACE BOTT	189 ELM ST CAMBRIDGE, MA 02139
85–47 185R ELM ST	CAZEAU, ANDRE & MANTANIE CAZEAU, TRS., THE CAZEAU REALTY TRUST	P.O. BOX 400844 CAMBRIDGE, MA 02140
85–48–1 183 ELM ST #1	SUZUKI YUJI, KEIKO SUZUKI & SARA SUZKI	183 ELM ST #1 CAMBRIDGE, MA 02140
85–48–2 183 ELM ST #1	LEE BRITTANY L.	183 ELM ST #2 CAMBRIDGE, MA 02140
85–102 177 ELM ST	BERRY, JESSICA C.	177 ELM ST CAMBRIDGE, MA 02139
85–60 137 HAMPSHIRE ST	NORSHIRE LLC.	288 NORFOLK ST CAMBRIDGE, MA 02139
85–63 300 NORFOLK ST	CAMBRIDGE CITY OF, PUBLIC WORKS DEP.	147 HAMPSHIRE ST CAMBRIDGE, MA 02139
85–78 173 ELM ST	SYTCHOR, MIKHAIL	173R ELM ST CAMBRIDGE, MA 02139
88–89 167 ELM ST	PETERSON HILLARY FITZPATRICK & BENJAMIN J. PETERSON	167 ELM ST CAMBRIDGE, MA 02139
85–92 NORFOLK ST	CAMBRIDGE CITY OF, MISC. CITY HALL	CITY HALL CAMBRIDGE, MA 02139
85–97–1 171 ELM ST, UNIT 1	PEDRELLI, PAOLA	171 ELM ST, UNIT 1 CAMBRIDGE, MA 02139
85–97–2 171 ELM ST, UNIT 2	WHITE, ANNE ELISABETH & DAVID CARL PACE	171 ELM ST, UNIT 2 CAMBRIDGE, MA 02139
85–97–3 171 ELM ST, UNIT 3	KHANGURA, NAVTEJ	171 ELM ST, UNIT 3 CAMBRIDGE, MA 02139
85–98 169R ELM ST	ELIZABETH WILLARD THAMES, AMES NATHAN THAMES	169R ELM ST CAMBRIDGE, MA 02139
86–103 270 NORFOLK ST	ROWLEY, JOHN F. JAMES J. JOANNE K. ROWLEY TRS.	29 RUSKIN ST WEST ROXBURY, MA 02132
86–104 140 HAMPSHIRE ST	ROWLEY, JOHN F. JAMES J. JOANNE K. ROWLEY TRS.	29 RUSKIN ST WEST ROXBURY, MA 02132
86–111 132 HAMPSHIRE ST	JEFFRIES BENJAMIN E., TR, OF HAMPSHIRE ST REALTY TRUST	P.O. BOX 534 STONINGTON, ME 04681
87–89 146 HAMPSHIRE ST	MASS. AVE. BAPTIST CHURCH INC.	146 HAMPSHIRE ST CAMBRIDGE, MA 02139
*ABUTTER INFORMATION LISTED AS NOW OR FORMERLY AS OF 10/12/17. INFORMATION OBTAINED FROM CITY OF CAMBRIDGE ONLINE GIS DATA BASE.		

PER SECTION 5.31 OF CAMBRIDGE ZONING REGULATIONS			
SETBACK CALCULATIONS:			
FRONT (NORFOLK ST.):	H+L / 4	=	
	61'+72'± / 4	=	33'
REAR :	H+L / 4	=	
	61'+148'± / 4	=	52'
SIDE:	H+L / 5	=	
	61'+83'± / 5	=	29'

ZONING REQUIREMENTS		
ZONING DISTRICT: RESIDENCE C–1		
SETBACK:	REQUIREMENT:	PROPOSED*:
ANTENNA FRONT YARD MINIMUM (NORFOLK ST.)	33'	23'±
ANTENNA REAR YARD MINIMUM	52'	49'±
ANTENNA SIDE YARD MINIMUM	29'	40'±
*APPROXIMATE DISTANCE FROM PROPERTY LINE TO CLOSEST PROPOSED CHIMNEY/ANTENNA		



ABUTTERS PLAN 1
SCALE: 1"=60' FOR 11"x17"
1"=30' FOR 22"x34"
0' 30' 60'

ZONING DISTRICTS	
C-1	RESIDENCE C–1

NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. SOME EXISTING AND PROPOSED INFORMATION NOT SHOWN FOR CLARITY.
3. ABUTTERS PLAN BASED ON ASSESSORS MAPS OBTAINED FROM CITY OF CAMBRIDGE GIS DATABASE OBTAINED ON 10/12/17.
4. SETBACKS ARE TAKEN FROM THE PROPOSED CHIMNEYS/ANTENNAS TO THE NEAREST PROPERTY LINES.
5. THIS DOCUMENT IS FOR ZONING PURPOSES ONLY. NOT FOR CONSTRUCTION.
6. EXISTING BUILDINGS, PARKING LOTS, ROADS AND PROPERTY LINES ARE SHOWN AS APPROXIMATE AND HAVE NOT BEEN VERIFIED THROUGH A FIELD SURVEY.
7. DIRECT ABUTTERS OF THE SUBJECT PARCEL ARE LISTED AND SHOWN.

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

SAI
27 NORTHWESTERN DRIVE
SALEM, NH 03079

CAMBRIDGE HAMPSHIRE STREET SITE NO.: MA2312

ZONING DRAWINGS		
13	01/26/18	FOR SUBMITTAL
12	01/11/18	FOR SUBMITTAL
11	11/16/17	FOR SUBMITTAL
10	10/12/17	FOR SUBMITTAL
9	01/27/17	FOR SUBMITTAL
8	04/16/14	FOR SUBMITTAL
7	04/09/14	FOR SUBMITTAL
6	02/20/14	FOR SUBMITTAL
5	01/02/14	FOR SUBMITTAL
4	11/21/13	FOR SUBMITTAL
3	09/09/13	FOR SUBMITTAL
2	08/13/13	FOR SUBMITTAL
1	08/05/13	FOR SUBMITTAL
0	05/29/13	FOR SUBMITTAL

Dewberry®
Dewberry Engineers Inc.
280 SUMMER STREET
10TH FLOOR
BOSTON, MA 02210
PHONE: 617.695.3400
FAX: 617.695.8310

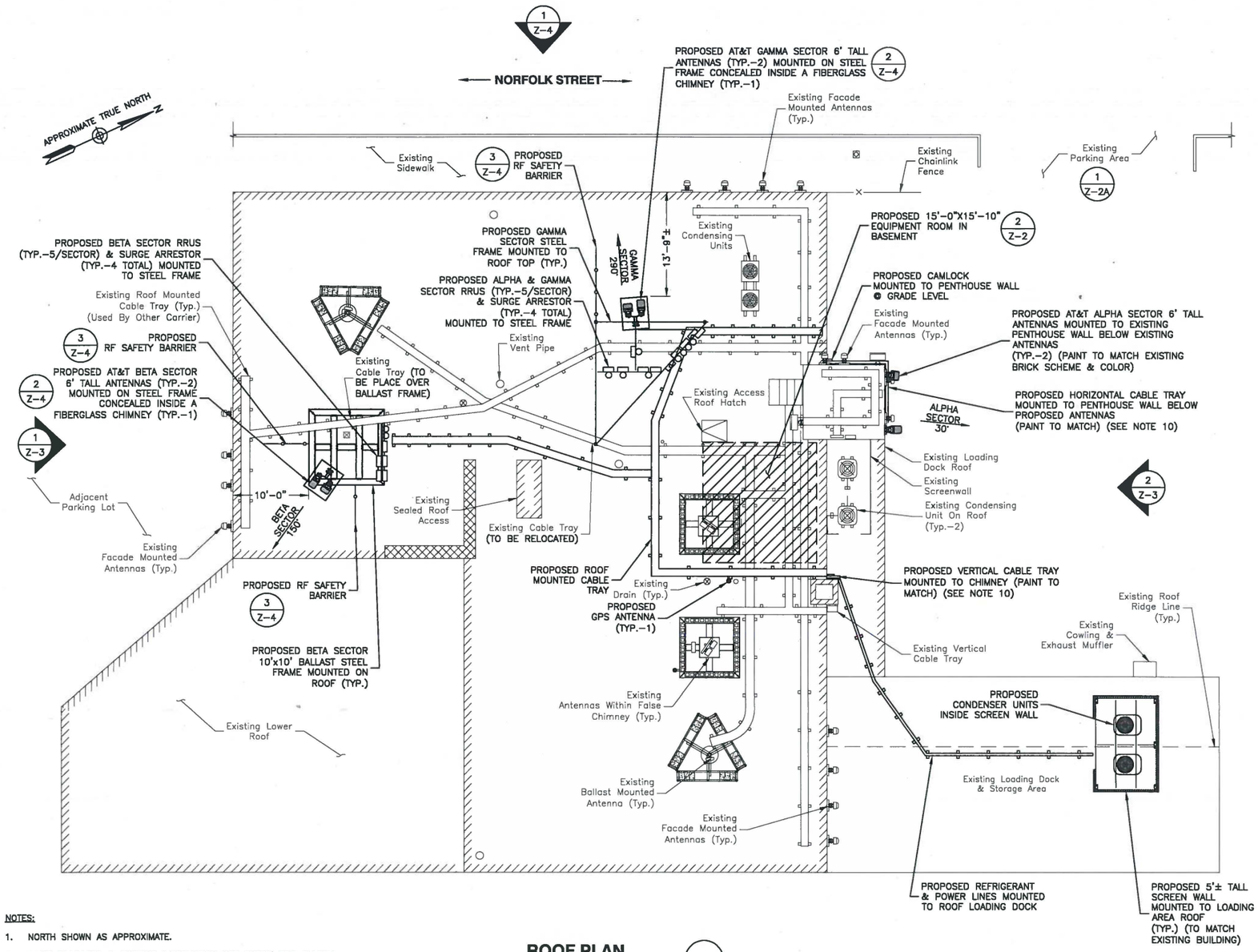
COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

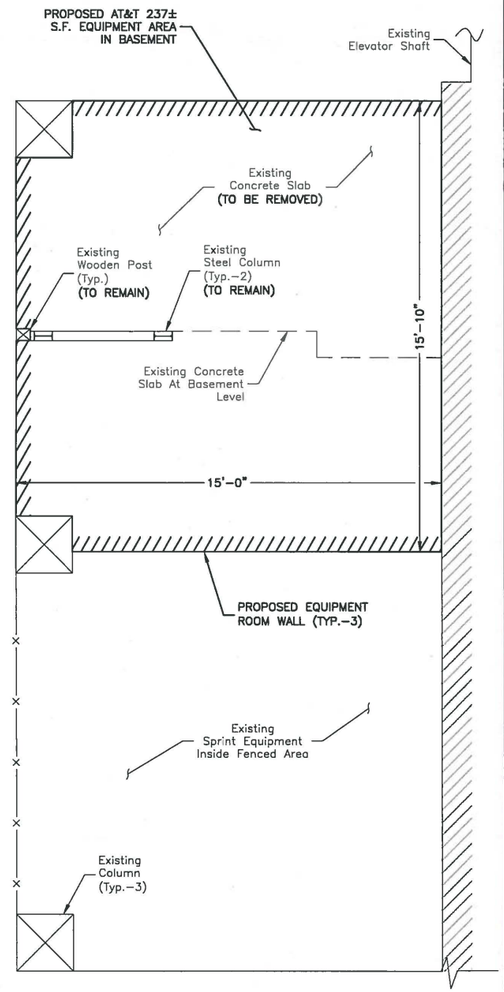
DRAWN BY:	SK
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50003936
JOB NUMBER:	50048589

SITE ADDRESS
288 NORFOLK STREET
CAMBRIDGE, MA 02139

SHEET TITLE
ABUTTERS PLAN

SHEET NUMBER
Z–1





NOTES:

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4. (2) 2" TELCO CONDUIT WILL BE ROUTED TO TELCO DEMARC LOCATION PENDING FINAL DESIGN.
5. GROUND WILL BE TO STREET SIDE BASEMENT WATER METER.
6. EQUIPMENT ROOM IS TO BE TIED INTO THE BUILDING ALARM SYSTEM AT THE CLOSEST POINT.
7. NO EMERGENCY GENERATOR PROPOSED FOR THIS AT&T INSTALLATION.
8. THIS DOCUMENT IS FOR ZONING PURPOSES ONLY, NOT FOR CONSTRUCTION.
9. BASED ON THE ELECTRICAL REPORT BY DEWBERRY ENGINEERS DATED 08/21/13, OPTION 2 HAS BEEN CHOSEN FOR THE AT&T INSTALLATION. PLEASE REFER TO THE REPORT, AVAILABLE ON REQUEST, FOR DETAILS.
10. PROPOSED ANTENNAS & VERTICAL CABLE TRAY ON THE BUILDING TO BE PAINTED WITH BRICK PATTERN AND COLORS TO MATCH EXISTING, BUT SHALL IN NO EVENT BE INCONSISTENT WITH ANY CONDITIONS OF APPROVAL IMPOSED BY THE CAMBRIDGE BOARD OF ZONING APPEAL.
11. FINAL BARRIER LOCATIONS PENDING FINAL DESIGN AND TO BE REVIEWED AND APPROVED BY AT&T PRIOR TO INSTALLATION.
12. FINAL RF SIGNAGE LOCATIONS PENDING FINAL DESIGN AND TO BE REVIEWED AND APPROVED BY AT&T PRIOR TO INSTALLATION.

ROOF PLAN (1)

SCALE: 1/16"=1' FOR 11"x17"
1/8"=1' FOR 22"x34"

0' 4' 8' 16'

EQUIPMENT PLAN (IN BASEMENT) (2)

SCALE: 3/16"=1' FOR 11"x17"
3/8"=1' FOR 22"x34"

0' 2' 4' 6'

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CAMBRIDGE
HAMPSHIRE STREET
SITE NO.: MA2312

ZONING	DRAWINGS
13 01/26/18	FOR SUBMITTAL
12 01/11/18	FOR SUBMITTAL
11 11/16/17	FOR SUBMITTAL
10 10/12/17	FOR SUBMITTAL
9 01/27/17	FOR SUBMITTAL
8 04/16/14	FOR SUBMITTAL
7 04/09/14	FOR SUBMITTAL
6 02/20/14	FOR SUBMITTAL
5 01/02/14	FOR SUBMITTAL
4 11/21/13	FOR SUBMITTAL
3 09/09/13	FOR SUBMITTAL
2 08/13/13	FOR SUBMITTAL
1 08/05/13	FOR SUBMITTAL
0 05/29/13	FOR SUBMITTAL

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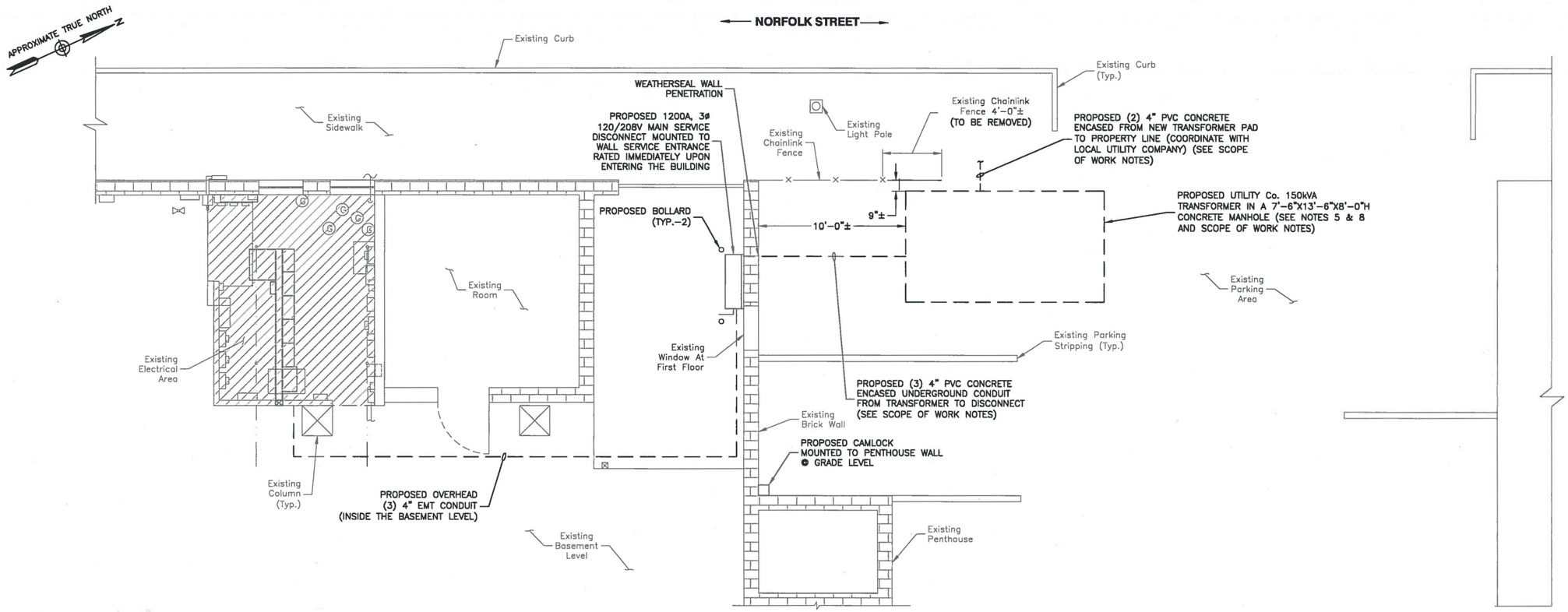
COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

DRAWN BY:	SK
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50003936
JOB NUMBER:	50048589

SITE ADDRESS
288 NORFOLK STREET
CAMBRIDGE, MA 02139

SHEET TITLE
PROPOSED ROOF & BASEMENT PLANS

SHEET NUMBER
Z-2



PROPOSED BASEMENT & PARKING AREA PLAN 1

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

0' 2' 4' 8'

SCOPE OF WORK*:

EVERSOURCE TO INSTALL:

1. (2) 4"ϕ PVC ENCASED IN CONCRETE CONDUITS FROM MHC2998 TO 2' INSIDE THE PRIVATE PROPERTY, TLD=30'±
2. 3-4/0 Al CABLE FROM PM19785 TO PM24718 VIA MHC2998, TLD=128'±
3. REPLACE PM19785 LIVE-FRONT 300kVA XFMR WITH D/R 300kVA XFMR.
4. EVERSOURCE TO MAKE UP PRIMARY AND SECONDARY CABLE TERMINATIONS AT THE NEW TRANSFORMER.

CUSTOMER TO INSTALL:

5. (2) 4"ϕ PVC CONDUIT ENCASED IN CONCRETE FROM PRIVATE PROPERTY LINE TO NEW FOUNDATION, TLD=35'±
6. 3 SETS OF 4-600MCM FROM MAIN SWITCH TO TRANSFORMER. EC SHALL COORDINATE WIRE SIZE & TERMINATIONS WITH EVERSOURCE PRIOR TO ROUGHT-IN OR WIRE PURCHASE.

*ALL WORK TO BE VERIFIED WITH UTILITY COMPANY PRIOR TO CONSTRUCTION.

NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. SOME PROPOSED & EXISTING INFORMATION NOT SHOWN FOR CLARITY.
3. GROUND WILL BE TO STREET SIDE BASEMENT WATER METER.
4. EQUIPMENT ROOM IS TO BE TIED INTO THE BUILDING ALARM SYSTEM AT THE CLOSEST POINT.
5. PROPOSED TRANSFORMER SHALL BE INSTALLED PER THE UTILITY PROVIDER REQUIREMENTS AND SPECIFICATIONS.
6. CONTRACTOR TO SAW CUT EXISTING PAVED SURFACE FOR THE CONDUIT AND CONCRETE MANHOLE. ANY DAMAGE TO THE PAVED AREA IS TO BE REPAIRED IN KIND.
7. PROPER PRECAUTIONS SHALL BE MADE TO PROTECT ANY EXISTING UNDERGROUND UTILITIES DURING TRENCHING, ESPECIALLY, BUT NO LIMITED TO, UNDERGROUND PIPES, AND DRAINAGE. ANY DAMAGE SHALL BE REPAIRED IMMEDIATELY.
8. CONTRACTOR TO GRADE & LEVEL EXISTING GRADE AS REQUIRE PRIOR TO CONCRETE MANHOLE INSTALLATION.
9. GROUND CONCRETE MANHOLE AND TRANSFORMER PER UTILITY PROVIDER REQUIREMENTS AND SPECIFICATIONS.

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CAMBRIDGE HAMPSHIRE STREET SITE NO.: MA2312

ZONING DRAWINGS		
13	01/26/18	FOR SUBMITTAL
12	01/11/18	FOR SUBMITTAL
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2	08/13/13	FOR SUBMITTAL
1	08/05/13	FOR SUBMITTAL
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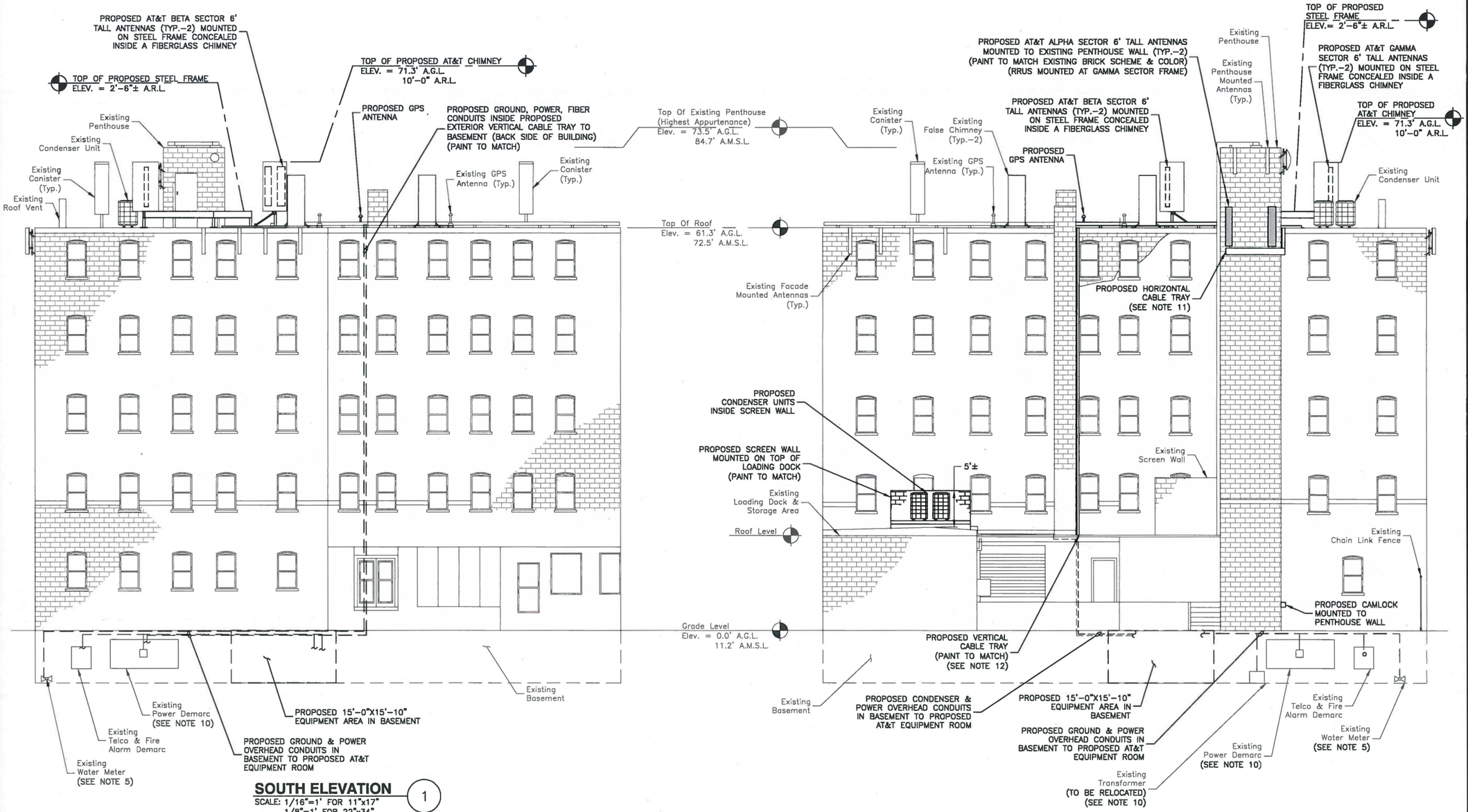
COMMONWEALTH OF MASSACHUSETTS
BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

DRAWN BY:	SK
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50003936
JOB NUMBER:	50048589

SITE ADDRESS
288 NORFOLK STREET
CAMBRIDGE, MA 02139

SHEET TITLE
PROPOSED BASEMENT & PARKING AREA PLANS

SHEET NUMBER
Z-2A



SOUTH ELEVATION 1

SCALE: 1/16"=1' FOR 11"x17"
1/8"=1' FOR 22"x34"

0' 4' 8' 16'

NORTH ELEVATION 2

SCALE: 1/16"=1' FOR 11"x17"
1/8"=1' FOR 22"x34"

0' 4' 8' 16'

C.L. – Centerline
A.G.L. – Above Ground Level
A.M.S.L. – Above Mean Sea Level
A.R.L. – Above Roof Level

NOTES:

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12. CABLE TRAY ROUTING WILL NOT INTERFERE WITH EXISTING WINDOWS.

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No. 49220
REGISTERED PROFESSIONAL ENGINEER

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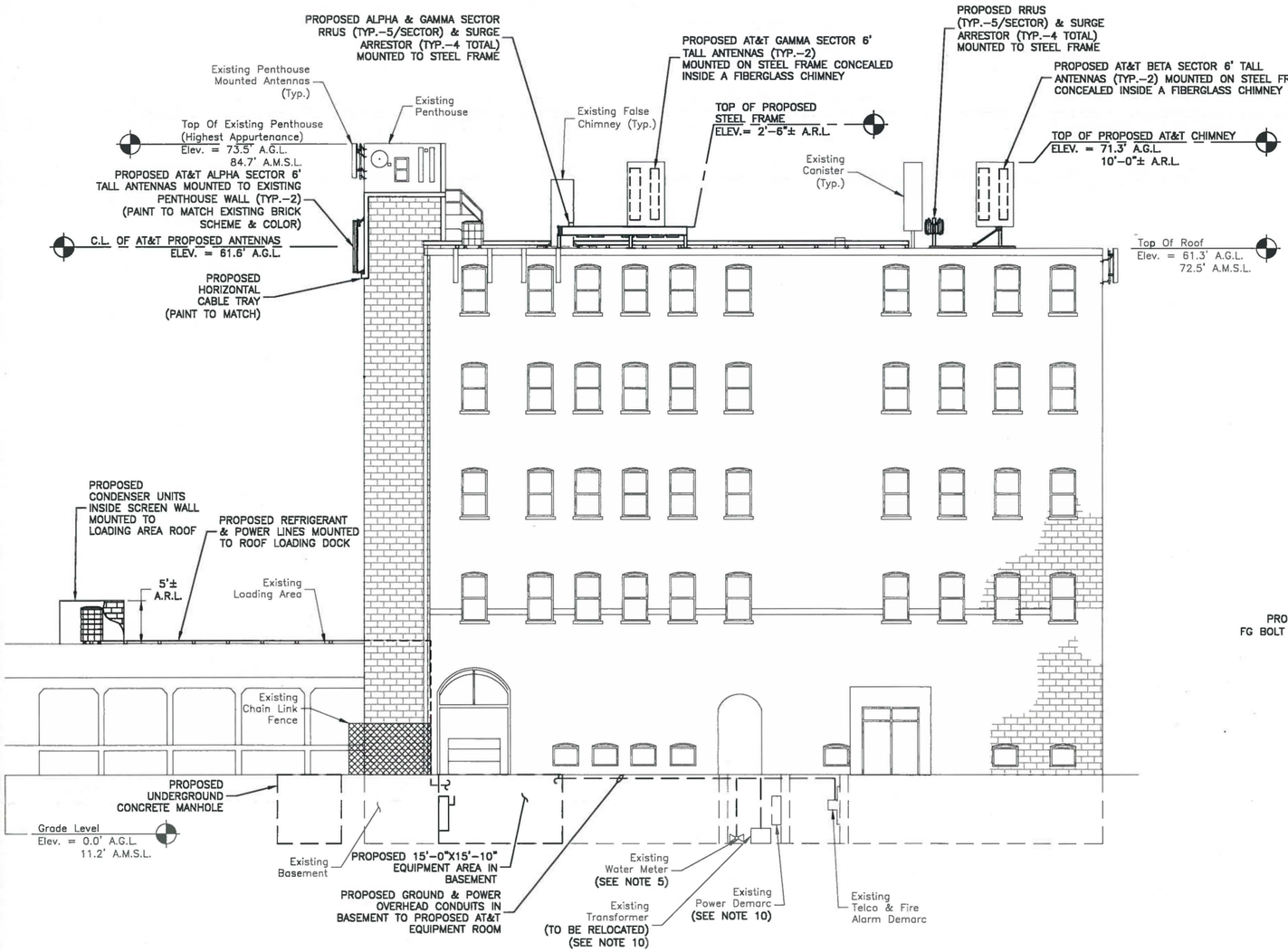
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50003936
JOB NUMBER:	50048589

SITE ADDRESS
288 NORFOLK STREET
CAMBRIDGE, MA 02139

SHEET TITLE
SOUTH & NORTH ELEVATIONS

SHEET NUMBER
Z–3



WEST ELEVATION (1)

SCALE: 1/16"=1' FOR 11"x17"
1/8"=1' FOR 22"x34"

0' 4' 8' 16'

C.L. – Centerline
A.G.L. – Above Ground Level
A.M.S.L. – Above Mean Sea Level
A.R.L. – Above Roof Level

NOTES:

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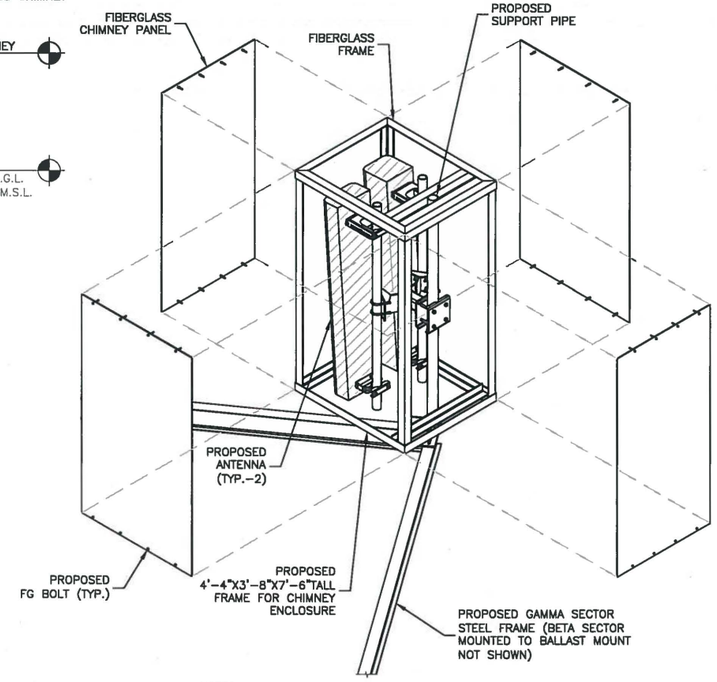
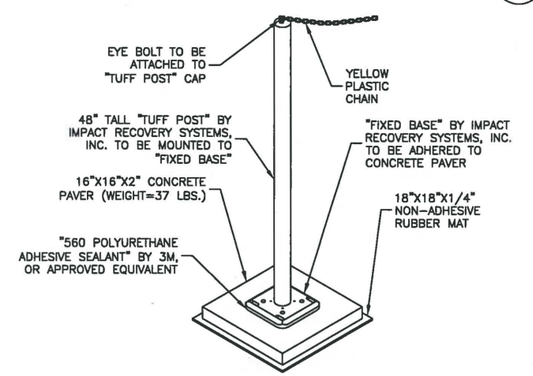


NOTES:

1. DESIGN IS FOR ZONING PURPOSES ONLY, NOT FOR CONSTRUCTION.
2. A.R.L. = ABOVE ROOF LEVEL
3. PROPOSED CHIMNEY ON THE BUILDING MUST BE PAINTED WITH BRICK PATTERN AND COLORS TO MATCH EXISTING.
4. CONTRACTOR TO VERIFY ALL ANTENNA & DOWNTILT BRACKET DIMENSIONS PRIOR TO FABRICATION AND COMMENCEMENT OF WORK.
5. ALL STEEL TO BE GALVANIZED.
6. FIBERGLASS CHIMNEY AND CONNECTION DESIGN TO BE BY FIBERGLASS MANUFACTURER.

FIBERGLASS CHIMNEY DETAIL (ISOMETRIC) (2)

SCALE: N.T.S.



RF SAFETY BARRIER DETAIL (3)

SCALE: N.T.S

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SITE NO.: MA2312

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BENJAMIN B. REVETTE
CIVIL
No. 49220
REGISTERED PROFESSIONAL ENGINEER

DRAWN BY:	SK
REVIEWED BY:	OAS
CHECKED BY:	BBR
PROJECT NUMBER:	50003936
JOB NUMBER:	50048589

SITE ADDRESS
288 NORFOLK STREET
CAMBRIDGE, MA 02139

SHEET TITLE
WEST ELEVATION & ANTENNA DETAILS

SHEET NUMBER
Z–4

OctoPort Multi-Band Antenna

Model OPA-65R-LCUU-H6

The CCI Octoport Multi-Band Antenna Array is an industry first 8-port antenna with full WCS Band Coverage. With four high band ports covering PCS, AWS and WCS bands, two 700 MHZ ports, and two 850 MHz ports our octoport antenna is ready for 4X4 high band MIMO.

Modern networks demand high performance, consequently CCI has incorporated several new and innovative design techniques to provide an antenna with excellent side-lobe performance, sharp elevation beams, and high front to back ratio.

Multiple networks can now be connected to a single antenna, reducing tower loading and leasing expense, while decreasing deployment time and installation cost.

Full band capability for 700 MHz , Cellular 850 MHz, PCS 1900 MHz, AWS 1710/2170 MHz and WCS 2300 MHz coverage in a single enclosure.

Octoport Multi-Band Antenna Array

Benefits

- **Includes WCS Band**
- **Reduces tower loading**
- **Frees up space for tower mounted E-nodes**
- **Single radome with eight ports**
- **All Band design simplifies radio assignments**
- **Sharp elevation beam eases network planning**

Features

- High Band Ports include WCS Band
- Four High Band ports with four Low Band ports in one antenna
- Sharp elevation beam
- Excellent elevation side-lobe performance
- Excellent MIMO performance due to array spacing
- Excellent PIM Performance
- A multi-network solution in one radome

Applications

- 4x4 MIMO on High Band and Dual 2x2 MIMO on 700 & 850 Low Bands
- Adding additional capacity without adding additional antennas
- Adding WCS Band without increasing antenna count

OctoPort Multi-Band Antenna

Model OPA-65R-LCUU-H6

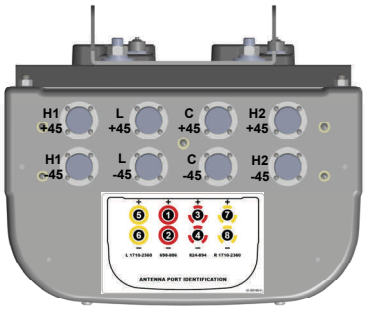
HPA-65R Multi-Band Antenna

Electrical Specifications

Frequency Range	2 X Low Band Ports (L) which cover the range from 698-806	2 X Low Band Ports (C) which cover the range from 824-894	4 X High Band Ports (H1 & H2) which cover the full range from 1710-2360 MHz			
			1850-1990 MHz	1710-1755/2110-2170 MHz	2305-2360 MHz	
Gain	14.0 dBi	14.4 dBi	16.9 dBi	16.3 dBi	17.2 dBi	17.4 dBi
Azimuth Beamwidth (-3dB)	65°	64°	61°	66°	62°	57°
Elevation Beamwidth (-3dB)	12.0°	10.5°	5.8°	6.3°	5.2°	4.6°
Electrical Downtilt	0° to 10°	0° to 10°	0° to 8°	0° to 8°	0° to 8°	0° to 8°
Elevation Sidelobes (1st Upper)	< -17 dB	< -19 dB	< -19 dB	< -18 dB	< -18 dB	< -17 dB
Front-to-Back Ratio @180°	> 30 dB	> 30 dB	> 30 dB	> 30 dB	> 30 dB	> 30 dB
Front-to-Back Ratio over ± 20°	> 30 dB	> 30 dB	> 30 dB	> 30 dB	> 30 dB	> 30 dB
Cross-Polar Discrimination (at Peak)	> 25 dB	> 20 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Cross-Polar Discrimination (at ± 60°)	> 17 dB	> 14 dB	> 17 dB	> 17 dB	> 17 dB	> 17 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB	> 26 dB	> 25 dB	> 26 dB	> 26 dB
VSWR	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc
Input Power	500 Watts CW	500 Watts CW	300 Watts CW	300 Watts CW	300 Watts CW	300 Watts CW
Polarization	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°
Input Impedance	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms
Lightning Protection	DC Ground	DC Ground	DC Ground	DC Ground	DC Ground	DC Ground

Mechanical Specifications

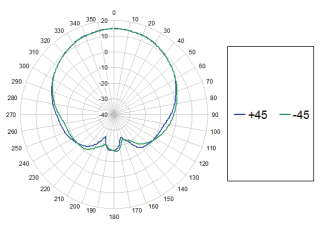
Dimensions (LxWxD)	72.0 x 14.8 x 9.0 inches (1828 x 376 x 229 mm)
Survival Wind Speed	> 150 mph
Front Wind Load	247 lbs (1099 N) @ 100 mph (161 kph)
Side Wind Load	165 lbs (735 N) @ 100 mph (161 kph)
Equivalent Flat Plate Area	9.7 ft^2 (0.90 m^2)
Weight (without Mounting)	57 lbs (26 kg)
RET System Weight	6.6 lbs (3.0 kg)
Connector	8; 7-16 DIN female long neck
Mounting Pole	2-5 inches (5-12 cm)



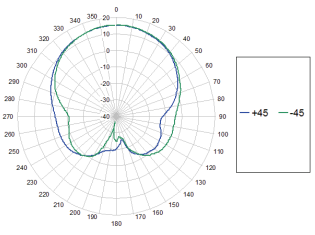
Bottom View

Rear View

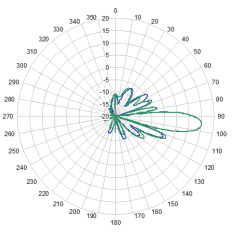
Antenna Patterns*



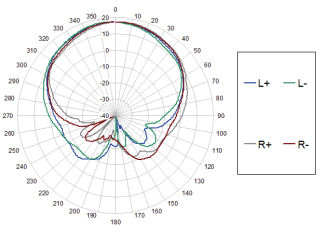
737 MHz Azimuth



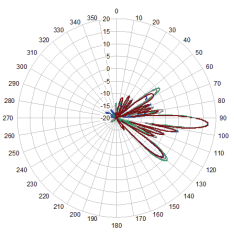
894 MHz Azimuth



Elevation 5°



1920 MHz Azimuth



Elevation 4°

*Typical antenna patterns. For detail information on antenna pattern, please contact us at info@cciproducts.com. All specifications are subject to change without notice.

OctoPort Multi-Band Antenna

Model OPA-65R-LCUU-H6

RET [Remote Electrical Tilt] System

General Specification

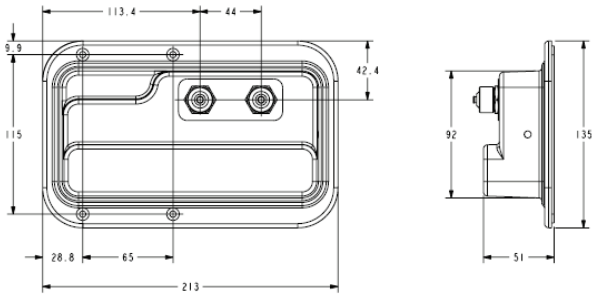
Part Number	BSA-RET200
Protocols	AISG 2.0
Adjustment Cycles	>10,000 cycles
Tilt Accuracy	±0.1°
Temperature Range	-40°C to +70°C

Electrical Specification

Interface Signal	Data | dc
Input Voltage Range	10-30 Vdc
Current consumption during tilting	120mA at Vin = 24V
Current consumption idle	55mA at Vin=24V
Hardware Interface	AISG - RS 485 A/B
Input Connector	1x8-pin Daisy Chain In Male
Output Connector	1x8-pin Daisy Chain Out Female

Mechanical Specification and Dimensions

Housing Material	ASA / ABS / Aluminum
Dimensions (H x W x D)	8 x 5 x 2 inches (213 x 135 x 51 mm)
Weight	1.5 lbs (0.68 kg)



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 60068-2-30, IEC 60068-2-52, IEC 60068-2-64, GR-63-CORE 4.3.1, EN60529 IP24

Regulatory Certification

AISG, FCC Part 15 Class B, CE, CSA US

58532A

GPS L1 Reference Antenna

The Symmetricom 58532A GPS L1 Reference Antenna is the latest in a line of Symmetricom antennas used to deliver L1 carrier frequency signals to GPS synchronization modules and receivers. Based on a design with proven reliability in tens of thousands of installations, the 58532A, like its predecessors, is characterized by low noise and high gain to provide optimum signal quality.

Outstanding Immunity to RF Interference

Noise and interference near the L1 carrier can compromise reception of GPS signals. The 58532A features excellent filtering, with narrow bandwidth and steep rolloff to preserve the GPS signal while attenuating unwanted signals near the L1 carrier.

Improved Immunity to Lightning

Electromagnetic fields caused by nearby lightning strikes can induce surge voltages in the antenna cable, damaging the antenna. The 58532A offers improved immunity to induced voltages through built-in diode protection.

Symmetricom™
Heartbeat of the Net

Durable and Easy to Install

Designed for easy installation in outdoor locations, the 58532A features a durable, unobtrusive, cone-shaped cover that prevents snow and debris build-up. In addition, a sturdy aluminum mounting base allows easy attachment to the Option AUB antenna mast. With this type of mounting, the antenna/cable connector (type N) is protected from the weather. If your system requires the new 58529A Antenna Line Amplifier with Bandpass Filter or 58530A GPS L1 Bandpass Filter, then these cylindrical products can fit directly inside the antenna mast to be sheltered from the weather as well.

Power is conveniently supplied to the antenna via the RF cable. The antenna requires 5 Vdc at less than 27 mA. This is available from several different GPS engines.

Option 001 includes an N Plug to TNC Jack adapter to accommodate TNC cable users.

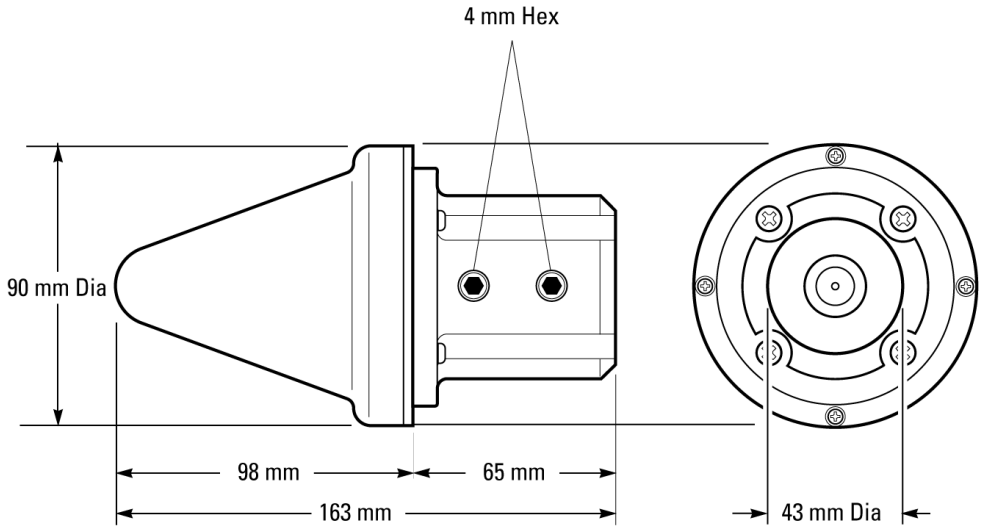


Figure 1. Antenna and mounting base dimensions

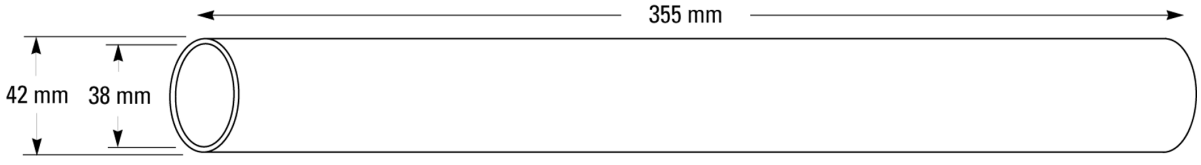


Figure 2. Option AUB mounting mast dimensions

Figure 3. Relative amplitude versus frequency response for 58532A GPS L1 Reference Antenna.

ELECTRICAL	
Frequency Range (3 dB Bandwidth)	1575.42 MHz ±10 MHz (typical)
Polarization	Right-hand circular
Output Impedance	50Ω (typical)
Total Gain	>30 dBi (38 dBi typical @ elevation angle 90°)
Out-of-Band Signal Attenuation	60 dB (typical) at 1575.42 MHz ±50 MHz
Noise Figure	<2.2 dB (1.8 dB typical)
VSWR	<2.5 (1.5 typical)
dc Power	5 Vdc ±0.5 Vdc, <27 mA (20 mA typical)
PHYSICAL	
Connector	Type-N Jack
Dimensions	
Antenna without Mounting Base	90 mm D x 128 mm H (includes connector)
Mounting Base	43 mm I.D. , 75 mm O.D., 65 mm H
Mounting Mast (Option AUB)	38 mm I.D., 42 mm O.D., 355 mm L
Weight	
Antenna without Mounting Base	187 g
Mounting Base	240 g
Mounting Mast (Option AUB)	250 g
Material	
Antenna	
Radome	UV-stabilized polycarbonate
Bottom housing	Die-cast aluminum, powder coated
Mounting Base	Die-cast aluminum, powder coated
Option AUB Mounting Mast	Anodized aluminum with teflon coating or stainless steel
Color, Antenna and Mounting Base	White
Operating Temperature	–40°C to +85°C
Storage Temperature	–45°C to +90°C

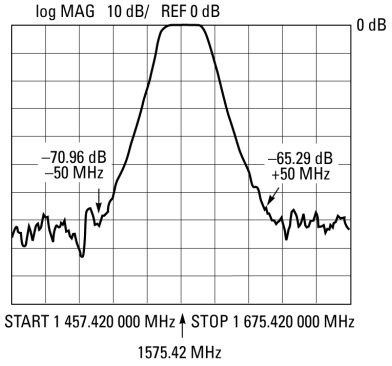


Figure 1. Relative amplitude versus frequency response for 58532A GPS L1 Reference Antenna.

Ordering Information: (Contact Symmetricom for pricing and availabilty)
58532A GPS L1 Reference Antenna
Option AUB Mounting Mast
Option 001 N to TNC Adapter

For more information:

Dependable Accessories for Your GPS Installation — Brochure

Designing Your GPS Antenna System — Configuration Guide

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fax: 44-1483-510319

DS/58532A/D/0200/2M

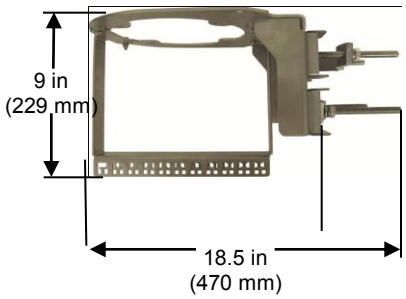
DC6-48-60-18-8F

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**



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 Unit Description

RRUS 11 and RRUS 61

DESCRIPTION

111/1551-LZA 701 6001 Uen L

Contents

1 Introduction

This document describes the Remote Radio Unit multi-Standard (RRUS) 11 and the RRUS 61. In the document, RRUS without a model number means both RRUS 11 and RRUS 61.

Note: Remote Radio Unit (RRU) is often used as a generic expression for a remotely installed Radio Unit (RU). It is also the name of models prior to the RRUS versions described in this document, for example Remote Radio Unit Wideband (RRUW).

1.1 Warranty Seal

The unit is equipped with a warranty seal sticker.

Note: Seals implemented by Ericsson must not be broken or removed, as it otherwise voids warranty.

2 Product Overview

The RRUS remotely extends the reach of the RBS by up to 40 km. The RRUS is designed to be located near the antenna. A fiber optic cable connects the RRUS to the RBS main unit or an expanded macro RBS. The RRUSs can be connected in a star or cascade configuration with optical cable links, as shown in Figure 1.

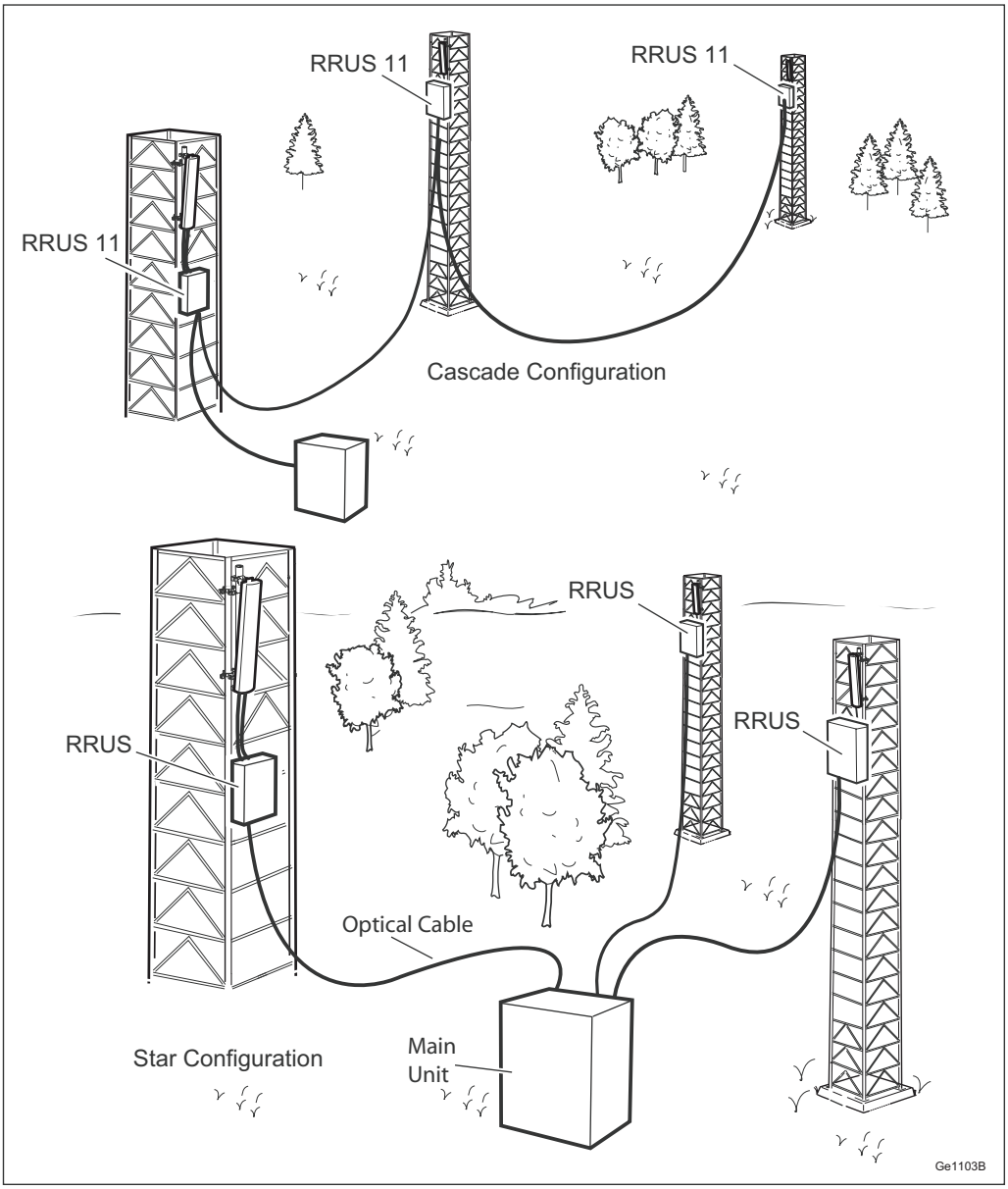


Figure 1 RRUSs in Star and Cascade Configurations

2.1 Main Features

Depending on the software application, the RRUS supports the Antenna System Controller (ASC), the Tower Mounted Amplifier (TMA), the Frequency Shifting Tower Mounted Amplifier (TMF), or the Remote Electrical Tilt Unit (RETU). The RETU can be connected either through the ASC or the Remote Interface Unit (RIU) over the antenna interface, or directly using the RRUS Antenna Line Device (ALD) or Remote Electrical Tilt (RET) control interface.

For Long Term Evolution (LTE) configurations with dual transmitter (TX) RRUSs, redundancy can be achieved by cross-connecting the antenna feeders between the RRUS and the antenna. For more information, refer to *Cross-Sector Antenna Sharing Redundancy*.

The RET interface on the RRUS is the link to the antenna communication system. See Table 14 for information about the RRUS connection interface for ALD (RET).

RRUS 11 supports Wideband Code Division Multiple Access (WCDMA), Code Division Multiple Access (CDMA) and LTE Frequency Division Duplexing FDD (depending on frequency band). It has two duplex receiver/transmitter (RX/TX) branches and supports cross connection of RX ports with other RRUs.

RRUS 61 supports LTE Time Division Duplexing (TDD). It has two duplex RX/TX branches.

2.2 Optional Equipment

The optional equipment for the RRUS is the following:

- Wall installation equipment
- Pole installation equipment
- Power Supply Unit (PSU)
- Radio Frequency (RF) monitoring port

3 Technical Data

This section describes the physical characteristics, environmental data, and the power supply of the RBS.

3.1 Dimensions

This section provides technical data and dimensions for the RRUS 11, and RRUS 61.

3.1.1 RRUS 11 Dimensions

Table 1 lists the technical data for the RRUS 11. Figure 2 shows the dimensions for the RRUS 11.

Table 1 RRUS 11 Technical Data

Description	Value
Maximum nominal output power	Without license key: 2x10 W or 1x20 W
	2x20 W or 1x40 W (1x30 W), 2x30 W, 2x40 W(1) require license keys(2)
Number of carriers	Without licence key: one carrier
	With license keys: up to four carriers

Description	Value
Frequency	1920 to 1980 MHz uplink 2110 to 2170 MHz downlink B1 for WCDMA and LTE
	1850 to 1910 MHz uplink 1930 to 1990 MHz downlink B2 for WCDMA and LTE
	1710 to 1755 MHz uplink 2110 to 2155 MHz downlink B4 for WCDMA and LTE
	824 to 849 MHz uplink 869 to 894 MHz downlink B5 for WCDMA and LTE
	2,500 to 2,570 MHz uplink 2,620 to 2,690 MHz downlink B7 for LTE
	699 to 715 MHz uplink 729 to 745 MHz downlink B12 for LTE (3)
	832 to 862 MHz uplink 791 to 821 MHz downlink B20 for LTE
	1850 to 1915 MHz uplink 1930 to 1995 MHz downlink B25 for LTE
	1850 to 1910 MHz uplink 1930 to 1990 MHz downlink B25 for CDMA
	817 MHz to 824 MHz uplink 862 MHz to 869 MHz downlink B26A for CDMA and LTE

Description	Value
Dimensions with Solar Shield and Handle	
Height	500 mm
Width	431 mm
Depth	182 mm
Weight	
RRUS 11	23 kg
Color	
Gray	

(1) For RRUS 11 B7, 2x30W is guaranteed for operating ambient temperatures < +50 °C. For higher temperatures, 2x20W is guaranteed.
(2) Detailed information about LTE licences can be found in Licensing. Detailed information about WCDMA licences can be found in Licenses and Hardware Activation Codes.
(3) RRUS 11 for B12 has a bandwidth that is 2 MHz narrower than 3GPP. The supported frequency corresponds to EARFCN (Channel Numbers) of 5010-5169 in downlink and 23010-23169 in uplink.

The RRUS 11 size, height, width, and depth with solar shield, is shown in Figure 2.

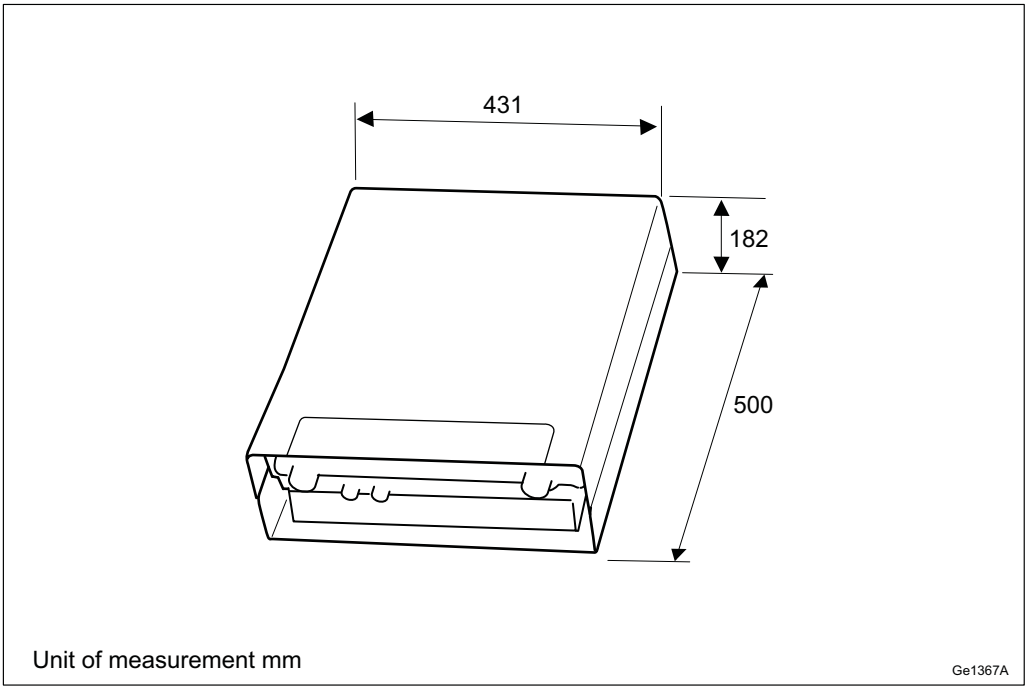


Figure 2 RRUS 11 Height, Width, and Depth with Solar Shield

3.1.2 RRUS 61 Dimensions

Table 2 lists the technical data for the RRUS 61. Figure 3 shows the dimensions for the RRUS 61.

Table 2 RRUS 61 Technical Data

Description	Value
Maximum nominal output power	Without license key: 2x10 W (or 1x20 W)
	2x20 W (or 1x30 W, or 1x40 W), 2x30 W, 2x40 W require license keys(1)
Number of carriers	One carrier
Frequency	2302.5 to 2322.5 MHz uplink and downlink B40B for LTE
	2305 to 2325 MHz uplink and downlink B40C for LTE
	2320 to 2340 MHz uplink and downlink B40D for LTE
	2327.5 to 2347.5 MHz uplink and downlink B40E for LTE
	2357.5 to 2377.5 MHz uplink and downlink B40F for LTE
	2325 to 2345 MHz uplink and downlink B40G for LTE
	2335 to 2355 MHz uplink and downlink B40M for LTE
	2300 to 2382 MHz uplink and downlink B40 for LTE
Dimensions without Solar Shield and Handle	

Description	Value
Height	406 mm
Width	416 mm
Depth	128 mm
Dimensions with Solar Shield and Handle	
Height	500 mm
Width	431 mm
Depth	182 mm
Weight	
RRUS 61	21.6 kg
Color	
Gray	

(1) Detailed information about LTE licences can be found in License Management.

The RRUS 61 size, height, width, and depth with solar shield, is shown in Figure 3.

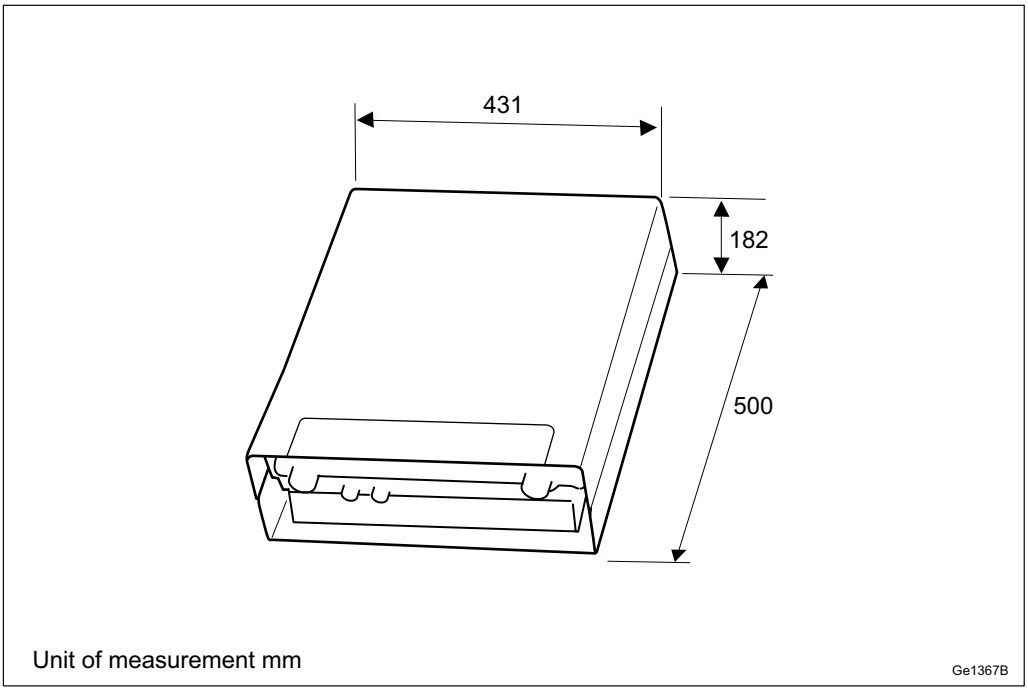


Figure 3 RRUS 61 Height, Width, and Depth with Solar Shield

3.2 Space Requirements

This section describes the space requirements for installing the RRUS.

The RRUS with cable connections running downwards can be installed as follows:

- On a wall
- On a pole

Both wall and pole installations can be indoors or outdoors.

Pole installations can be on monopoles, masts, or towers. Figure 5 shows sample pole installations.

3.2.1 Generic Requirements

The RRUS is installed with the cable connections facing downwards.

Allow a minimum of 1 m free space in front of the RRUS to ensure sufficient working space.

Note: If no other possibilities are available, under exceptional conditions, the RRUS may be installed horizontally with the front downwards. This installation alternative limits the power supply options and the maximum output power. Details regarding optional actions can be found in *Installing Remote Radio Units*.

3.2.2 Wall Installation

The wall must be even within 5 mm/m. The installation requirements are shown in Figure 4.

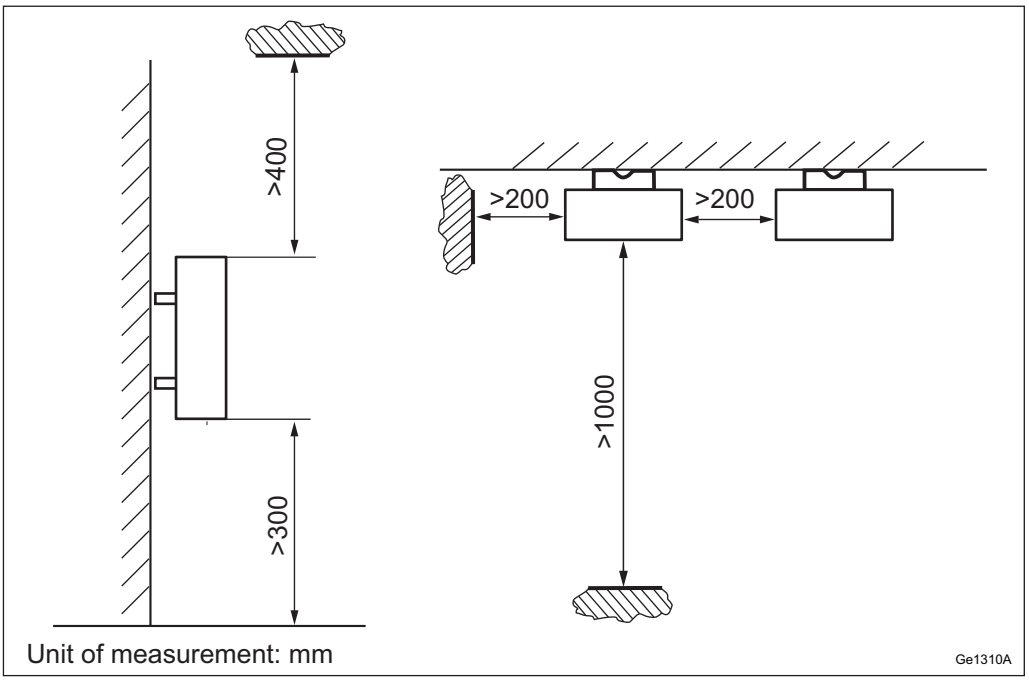


Figure 4 RRUS Wall Installation Requirements

3.2.2.1 Site Layout

To ensure adequate airflow between the units, allow a minimum of 400 mm free space above and 300 mm free space minimum below each RRUS. Allow a minimum of 200 mm free space between RRUSs installed side by side.

3.2.3 Pole Installation

The supported pole diameters are listed in Table 3.

Table 3 Pole Diameters

Mounting Equipment	Pole Diameter	Supported RRUSs
Single fixture	60 – 120 mm	All types
Mounting bracket	35 – 155 mm	All types

3.2.3.1 Site Layout

Allow a minimum of 200 mm free space between RRUSs installed side by side. To ensure adequate airflow between the units, allow a minimum of 400 mm free space above and 300 mm free space below each RRUS.

Note: For an RRUS with AC power supply, the mounting bracket supports only two RRUS units.

Figure 5 shows example pole installations (left to right: single unit on a monopole, two units on a tower on different struts, and three units on a monopole).

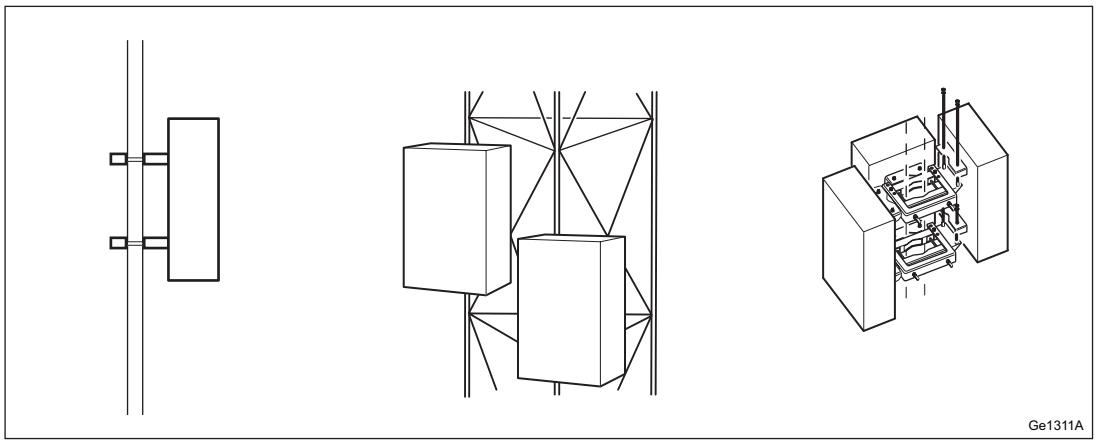


Figure 5 Sample Site Layout for Pole Installation

3.3 Acoustic Noise

The RRUS does not generate acoustic noise.

3.4 Environmental Characteristics

This section contains RRUS operating environment data.

3.4.1 Operating Environment

The following is a list of values for the RRUS normal operating environment:

Temperature	-40 to +55 °C
	-40 to +45 °C (RRUS 11 B1, B2, B4, B20; in high load scenario: 2x40 W)
	-40 to +50 °C (RRUS 11 B5, RRUS 61 B40; in high load scenario: 2x40 W)
Solar radiation	≤ 1,120 W/m²
Relative humidity	5 to 100%
Absolute humidity	0.26 to 40 g/m³
Maximum temperature change	1.0°C/min
Maximum wind load at 50 m/s (pole installed single case)	430 N (front)

3.4.2 Heat Dissipation

The RRUS is convection cooled. The heat dissipation value shown in Table 4 is meant to give an idea of heat dissipation when the unit is installed alone or around other RRUs. The value represents the maximum power consumption of an RRUS, taking into account optional equipment and future expansions.

Table 4 RRUS Heat Dissipation

Unit	Output Power	Maximum Heat Dissipation
RRUS 11 B1, B4	2x30 W	0.34 kW
	2x40 W	0.43 kW
RRUS 11 B2	2x30 W	0.35 kW
	2x40 W	0.43 kW
RRUS 11 B5	2x30 W	0.26 kW
	2x40 W	0.30 kW
RRUS 11 B7	2x30 W	0.46 kW
RRUS 11 B12, B26A	2x30 W (1)	0.32 kW
RRUS 11 B26A	2x40 W	0.33 kW
RRUS 11 B20	2x30 W	0.32 kW
	2x40 W	0.33 kW
RRUS 11 B25	2x30 W	0.35 kW
	2x40 W	0.43 kW
RRUS 61 B40B, B40C, B40D, B40E, B40F, B40G, B40M	2x30 W	0.27 kW
RRUS 61 B40	2x40 W	0.34 kW

(1) 2x30 W is for an RRUS11 with a metalic filter and 2x40 W is for a unit with a ceramic filter.

For power consumption values during traffic, see Table 9.

3.4.3 Ground Vibration

This section describes the RRUS tolerance to ground vibration caused by seismic activity. The RRUS operates reliably during seismic activity as specified by test method IEC/EN 60 068-2-57.

The following is a list of the ground vibration tolerance data:

Random vibration, normal operation	Maximum 0.05 m^2/s^3
Random vibration, exceptional operation	Maximum 0.1 m^2/s^3
Random vibration, non-destruction	Maximum 0.5 m^2/s^3
Random vibration, shock	Maximum 100 m/s^2
Non-destructive seismic exposure, maximum level of Required Response Spectrum (RRS)	50 m/s^2 within 2 to 5 Hz
Non-destructive seismic exposure, test frequency	1 to 35 Hz
Non-destructive seismic exposure, time history	Verteq II

3.4.4 Materials

All Ericsson products fulfill the legal and market requirements regarding:

- Material declaration
- Materials' fire resistance, components, wires, and cables
- Recycling
- Restricted and banned material use.

3.5 Mains Supply Characteristics

This section describes the power supply requirements, power consumption, and fuse and circuit breaker recommendations for the RRUS.

The power for multiple RRUSs can be supplied from different power systems if required.

3.5.1 DC Power Supply Characteristics

The power supply voltage for the RRUS is -48 V DC. The power supply requirements are listed in Table 5.

Table 5 RRUS DC Power Supply Requirements

Conditions	Values and Ranges
Nominal voltage	-48 V DC
Operating voltage range	-40.0 to -57.6 V DC
Non-destructive range	0 to -60 V DC

Fuse and Circuit Breaker Recommendations

External fuse and circuit breaker capabilities for the RRUS are listed in Table 6.

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 609 34.

The RRUS 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 for not tripping the fuse or circuit breaker in case of 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 6 RRUS Fuse or Circuit Breaker Recommendations

Unit (DC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 11 B1, B4	2x10 W	9 A	25 A	32 A
	2x20 W	10 A		
	2x30 W	13 A		
	2x40 W	15 A		
RRUS 11 B2, B5, B12, B20, B25, B26A	2x10 W	8 A		
	2x20 W	10 A		
	2x30 W	13 A		
	2x40 W	15 A		
RRUS 11 B7	2x10 W	10 A		
	2x20 W	13 A		
	2x30 W	16 A		
RRUS 61 B40B, B40C, B40D, B40E, B40F, B40G, B40M	2x10 W	7 A		
	2x20 W	8 A		
	2x30 W	10 A		
RRUS 61 B40	2x40 W	12 A		

(1) These fuse ratings can only be used if it is acceptable that fuses trip due to lightning or network transients.
(2) The recommended fuse rating takes into account the fact that external fuses are not to trip due to lightning or network transients.
(3) The absolute maximum fuse class in accordance with RRUS design restrictions.

3.5.2 AC Power Supply Characteristics

The RRUS AC accepts 100 to 250 V AC if it is used together with the optional PSU. The power supply requirements are listed in Table 7.

Table 7 RRUS AC Power Supply Requirements

Normal Voltage Range	Tolerance Range
200 to 250 V	180 to 275 V AC (1)
100 to 127 V	108 to 130 V AC (1)
100 V	90 to 110 V AC (1)
Connection	Phase-neutral
Frequency range	50 to 60 Hz
Voltage harmonics	< 10% at full load (2)
Shut-off allowance	At undervoltage or overvoltage (3)
Inrush current peak	< 40 A
Inrush current duration	< 10 ms

(1) AC connected through a PSU AC 02
(2) Must comply with IEC 61000-3-2
(3) Alarm raised at 70 ± 5 V, ceased at 80 ± 5 V (phase voltage)

Fuse and Circuit Breaker Recommendations

External fuse and circuit breaker capabilities for the RRUS are listed in Table 8.

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 609 34.

The PSU AC 02 has a built-in Class 1 (Type 1) SPD to protect the equipment in case of lightning and network transients. The recommended fuse or circuit breaker rating is therefore dimensioned for not tripping the fuse or circuit breaker in case of 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. The PSU AC 02 is described in Section 4.5 on page 24.

Table 8 RRUS Fuse/Circuit Breaker Recommendations

Unit (AC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 11 B1, B4, B5, B12, B20, B25, B26A	2x30 W / 2x40 W	• 7 A (100 to 127 V AC) • 4 A (200 to 250 V AC)	32 A	32 A
RRUS 11 B1, B2, B4, B5	2x40 W	• 8 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
RRUS 11 B7	2x30 W	• 8 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
RRUS 61 B40B, B40C, B40D, B40E, B40F, B40G, B40M	2x30 W	• 5 A (100 to 127 V AC) • 2.5 A (200 to 250 V AC)		
RRUS 61 B40	2x40 W	• 7 A (100 to 127 V AC) • 3.5 A (200 to 250 V AC)		

(1) These fuse ratings can only be used if it is acceptable that fuses trip due to lightning or network transients.
(2) The recommended fuse rating takes into account the fact that external fuses are not to trip due to lightning or network transients.
(3) The absolute maximum fuse class in accordance with RRUS design restrictions.

3.5.3 Power Consumption

This section contains RRUS power consumption data. The power consumption data listed in this section refer to normal operation during traffic.

Typical power consumption values are based on a realistic, typical traffic distribution that corresponds to an average output power of 40%. Cooling conditions are based on an annual temperature distribution for the Frankfurt am Main (Germany) climate zone. Optional equipment is not included.

The high-load power consumption values corresponds to 100% of the maximum output power. Cooling conditions are based on a statistical maximum temperature for the Frankfurt am Main (Germany) climate zone (+30 °C). Optional equipment is not included.

Table 9 shows RRUS power consumption.

Table 9 RRUS Power Consumption Values

Unit	Output Power	Typical Power Consumption (1)	High Load Power Consumption (1)
RRUS 11 B1, B4	2 x 30 W	0.29 kW	0.40 kW
	2 x 40 W	0.35 kW	0.51 kW
RRUS 11 B2	2 x 30 W	0.29 kW	0.41 kW
	2 x 40 W	0.35 kW	0.51 kW
RRUS 11 B5	2 x 30 W	0.23 kW	0.32 kW
	2 x 40 W	0.25 kW	0.38 kW
RRUS 11 B7	2 x 30 W	0.40 kW	0.52 kW
RRUS 11 B12, B26A	2 x 30 W,	0.22 kW	0.38 kW
RRUS 11 B26A	2 x 40 W	0.32 kW	0.475 kW
RRUS 11 B20	2 x 30 W	0.22 kW	0.38 kW
	2 x 40 W	0.32 kW	0.41 kW
RRUS 11 B25	2 x 30 W	0.29 kW	0.41 kW
	2 x 40 W	0.35 kW	0.51 kW
RRUS 61 B40B, B40C, B40D, B40E, B40F, B40G, B40M	2 x 30 W	0.25 kW	0.32 kW
RRUS 61 B40	2 x 40 W	0.32 kW	0.42 kW

(1) The power consumption values do not include power to optional external equipment such as RET, TMA, and TMF.

3.6 System Characteristics

This section describes the system characteristics of the RBS.

3.6.1 RF Electromagnetic Exposure for RBS 6000

General information on RF Electromagnetic Fields (EMF) for RRUSs connected to an RBS 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*.

3.6.2 Software

Information on software dependencies can be found in *Compatibilities for Hardware and Software*.

3.6.3 Radio Configurations

Information about available radio configurations can be found in *RBS Configurations*.

4 Hardware Architecture

This section describes the RRUS hardware structure regardless of configuration or frequency. The RRUS components are shown in Figure 6 and listed in Table 10.

Note: The supported configurations are described in *RBS Configurations*.

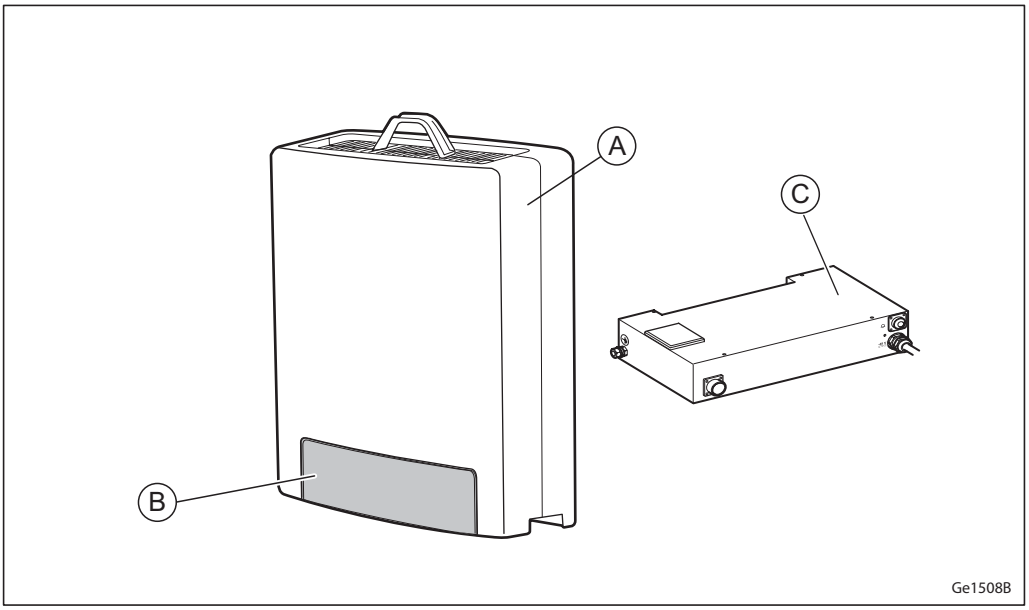


Figure 6 RRUS 11 and RRUS 61 Components

Table 10 Key to RRUS Components

Position	Component
A	Solar shield
B	Slide cover
C	PSU AC 02 (optional)

4.1 RRUS Overview

The RRUS contains most of the radio processing hardware. The following sections describe the component units inside the RRUS.

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 receivers for RX diversity
- RET receiver (the antenna system communication link)

4.1.2 PA

The Power Amplifier (PA) is the linear power amplifier for the RF carrier. RRUS 11 and RRUS 61 have two PAs, one for each branch.

4.1.3 FU

The Filter Unit (FU) consists of band-pass filters and low-noise amplifiers.

In the RRUS, the FU also provides the following:

- Power and supervision for the ASC, the TMA, the TMF, 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/overcurrent protection for the ALD (RET) port.

4.1.6 External Alarm SPD

An SPD provides overvoltage/overcurrent protection for the external alarm ports.

4.2 Solar Shield

The solar shield protects the RRUS from solar radiation. The solar shield is also part of the cooling design. Figure 6 shows the solar shield.

Note: Always attach the solar shield to the RRUS regardless of whether the RRUS is installed in a shady or in a sunny location.

4.3 Slide Cover

The slide cover hides the optical indicators and the maintenance button.

More information can be found in Section 5 on page 27.

4.4 Optical Indicators and Buttons

The RRUS is equipped with optical indicators that show system status. The optical indicators are located on the overlay marking. Table 11 describes how to interpret the optical indicators for RRUS when WCDMA and LTE controlled.

Table 11 RRUS Optical Indicators WCDMA or LTE Controlled

Marking	Indicator	Color	Mode	Indicates
!	Fault	Red	Off	No fault detected in RRUS
			On	Fault detected in RRUS
✔	Operational	Green	Off	RRUS not operational
			On	Power present
			Blink (2 Hz)	Load or testing in progress
			Blink (0.5 Hz)	Dependent resource missing
🔧	Maintenance	Blue (1)	Off	RRUS not in maintenance mode
			On	RRUS in maintenance mode
			Blink (0.5 Hz)	Shutdown in progress
⊶1, ⊶2	Interface	Green	Off	Disconnected
			On	Connected
LMT	–	-	-	Not used
Button:				
🔧	Maintenance	-	-	Switch RRUS mode between Remote and Maintenance

(1) The color can also be yellow. The yellow optical indicator can blink busy.

4.4.1 Maintenance Button Function

See *Indicators, Buttons, and Switches* for information about the maintenance button.

4.5 PSU AC 02 (Optional)

The PSU is required for the AC power input option. The PSU converts RRUS input main power 100 - 250 V AC to -48 V DC and is installed on the back of the RRUS. Figure 7 shows the PSU.

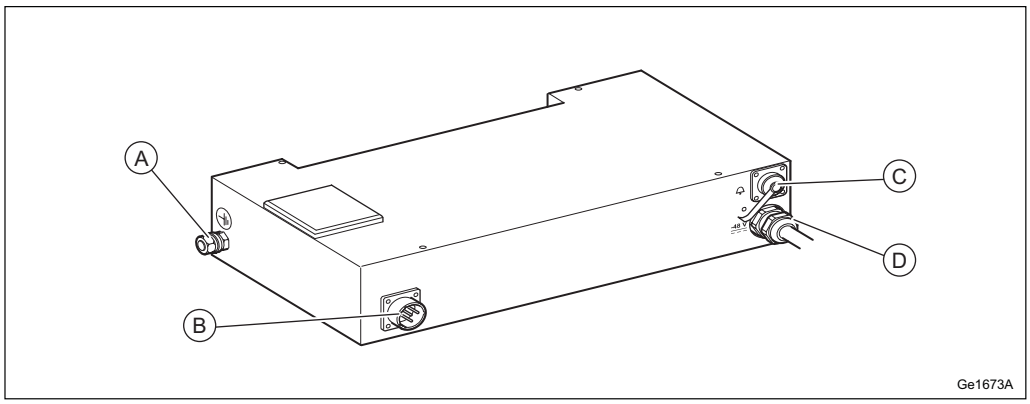


Figure 7 PSU AC 02

Table 12 PSU AC 02 Connection Interfaces

Position	Interface
A	Grounding interface
B	AC power interface
C	Interface for future use
D	DC power interface

For more information about PSU AC 02, see *PSU Description*.

4.6 RF Monitoring Port for RRUS 11 (Optional)

The RF monitoring port can be used to monitor the RRUS downlink RF output power without interrupting service. The RF monitoring port components are shown in Figure 8 and listed in Table 13.

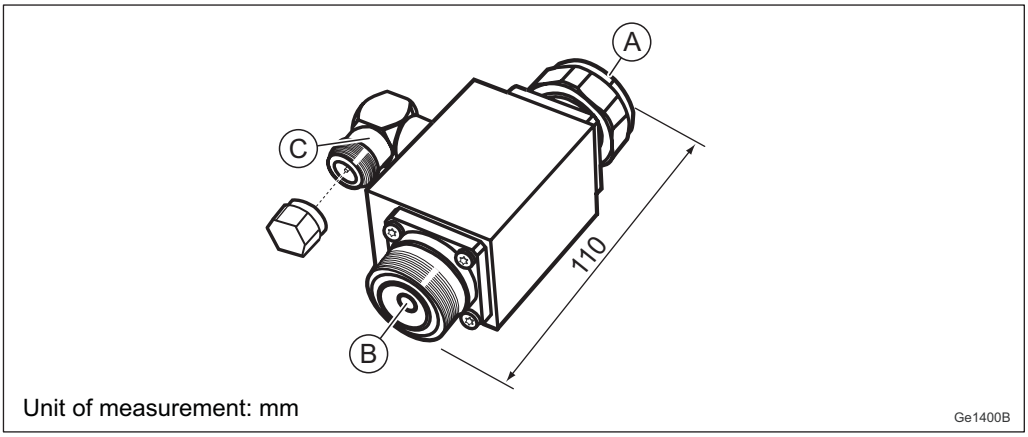


Figure 8 RF Monitoring Port

Table 13 RF Monitoring Port Overview

Position	Interface
A	7/16 RF connector used for connecting to A or B interface
B	7/16 RF connector for connecting the RF cable
C	N-type RF connector for pairing with connector on monitoring equipment (including metal protective cap to be used when the interface is not in use)

The RF monitoring port is connected to the A or B antenna interface on the connection interface panel at the bottom of the RRUS. The A and B interfaces support bidirectional, RX/TX traffic, but only the TX direction can be monitored.

Using the RF monitoring port does not affect RRUS performance. RF leakage due to connecting the antenna cables through the monitoring port does not exceed that of a standard RF cable. Insertion loss between port A and port B is less than 0.2 dB.

5 Connection Interfaces

This section contains information about the RRUS connection interfaces. The RRUS connection interfaces are shown in Figure 9, and listed in Table 14.

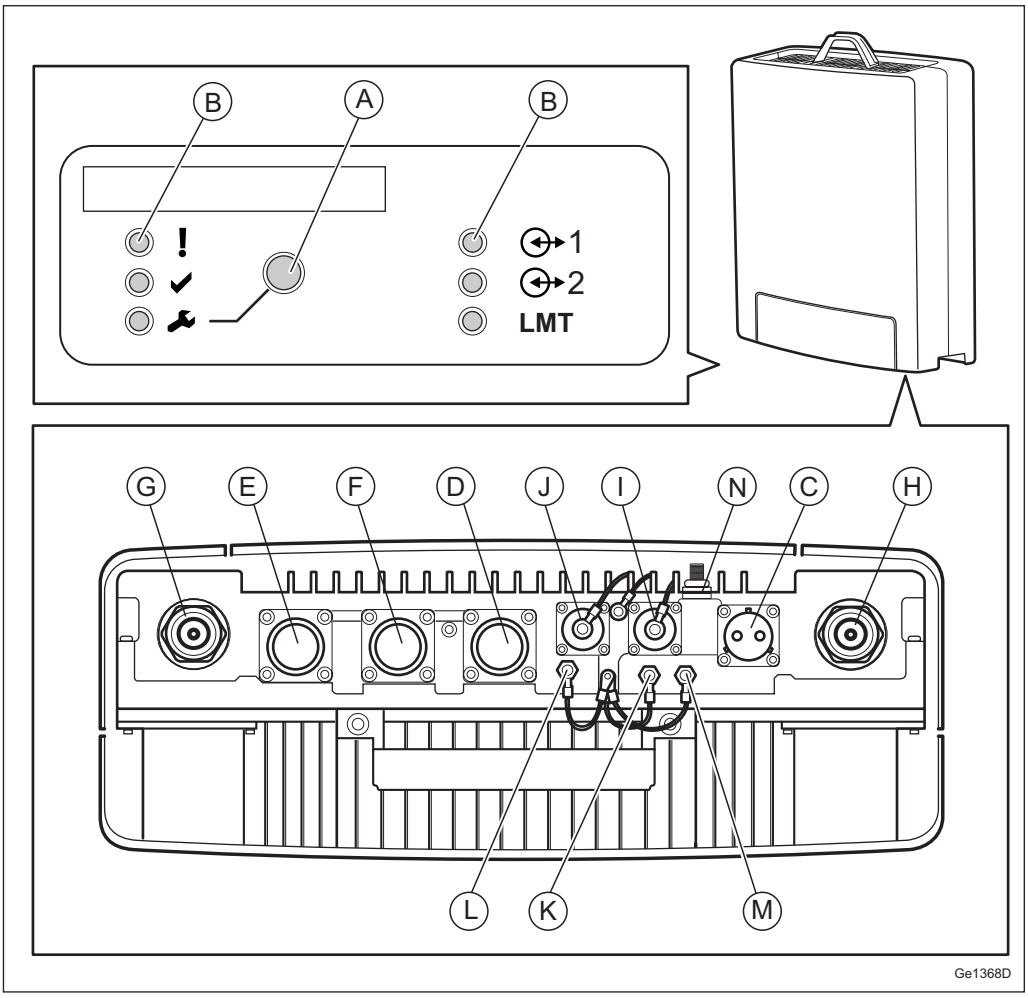


Figure 9 RRUS Connection Interfaces

Table 14 RRUS Connection Interfaces

Position	Description	Marking
A	Maintenance button	

Position	Description	Marking
B	Optical indicators	!, ✔, 🔧 1, 2 LMT
C	-48 V DC power supply	
D	–	LMT
E	Optical cable 1	1
F	Optical cable 2	2
G	Antenna 1	A
H	Antenna 2	B
I	ALD (used for a RET unit for example)	ALD
J	External alarm	
K(1)	Cross connect RXA	RXA I/O
L(1)	RXA co-site	RXA Out
M(1)	Cross connect RXB	RXB I/O
N	Grounding	

(1) Applicable for RRUS 11 only.

5.1 Position A, Maintenance Button

The maintenance button is located at the left of the 🔧 symbol.

Note: Use a pointed object, for instance a screwdriver or a pencil tip, to press the maintenance button.

More information about the maintenance button can be found in *Indicators, Buttons, and Switches*.

5.2 Position B, Optical Indicators

Optical indicators show the system status. More information about the optical indicators can be found in *Indicators, Buttons, and Switches*.

5.3 Position C, -48 V DC Power Supply Interface

The -48 V DC power connection is made through a connector. The connector accepts cables with various cross-sectional areas depending on the cable length. These cross sectional diameter tolerances are listed by cable length in Table 15.

Table 15 -48 V DC Power Supply Cable Diameter Tolerances

Cable Length	Recommended Cross-Sectional Area of Each Conductor
0 to 60 m	6 mm^2
60 to 100 m	10 mm^2

The power cable conductor has a wire for the 0 V conductor and a wire for the -48 V conductor. The wire color code for both is market dependent.

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 RRUS overvoltage and lightning protection does not function properly.

5.4 Position D, LMT

Not used.

5.5 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 RRUS and the main unit. An SFP is used to connect the optical cable to the RRUS.

5.6 Position G and H, Antenna Interface

The antenna interfaces provide RRUS connections to antennas. RF cables connect the RRUS to the antenna.

The antenna connection interface characteristics of these cables are described in Table 16.

Table 16 RRUS Antenna Connection Interface Characteristics

Connector Type	RF Cable Type	Cable Connector Type	Cable Product Number
7/16 IEC-169-4 insert-receiver type	50 Ω 1/2-inch coaxial	7/16 insert-type on both ends	*TSR 951 70*

The antenna cables must be connected as described in Table 17.

Table 17 RRUS Antenna Cable Connectors

RRUS Connectors	Antenna Connectors
A (Antenna 1)	TX/RX
B (Antenna 2)	TX/RX

5.7 Position I, ALD Ctrl Interface

The ALD control (ALD Ctrl) connects an ALD (RET) cable to the RRUS for antenna system communication.

5.8 Position J, Ext Alarm Interface

Two external alarms can be connected to the RRUS external alarm port.

5.9 Position K and M, RXA I/O and RXB I/O Interface (RRUS 11 Only)

The RXA I/O and RXB I/O interface port is used to cross connect the RRUS 11 for antenna diversity, as shown in Figure 10.

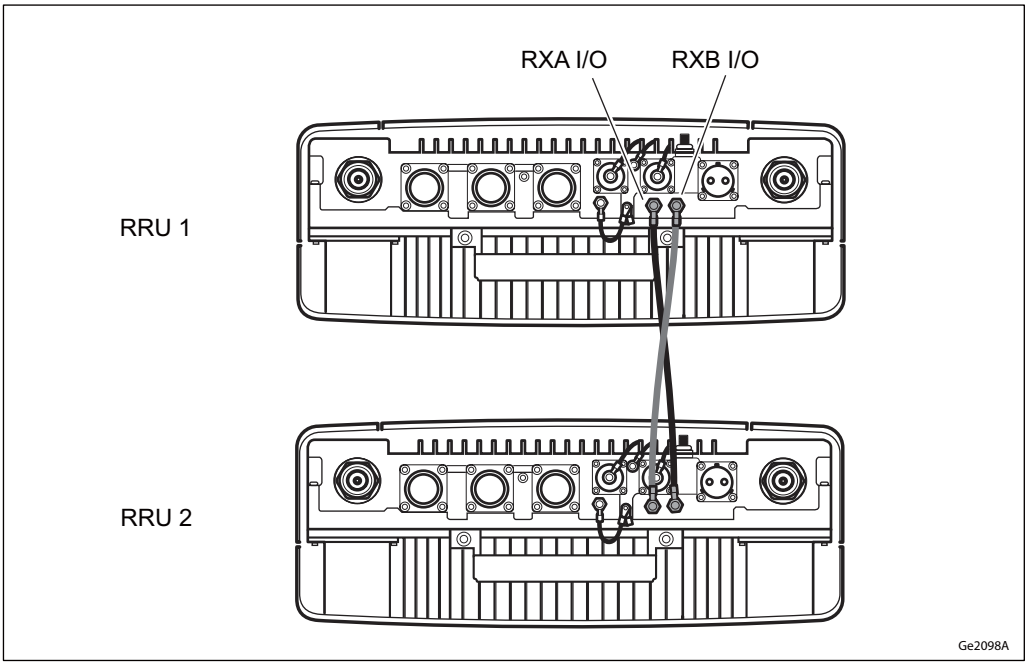


Figure 10 Cross Connecting RRUS 11

5.10 Position L, RXA Out Interface (RRUS 11 Only)

The RXA Out interface port is used to co-site RRUS 11s, as shown in Figure 11.

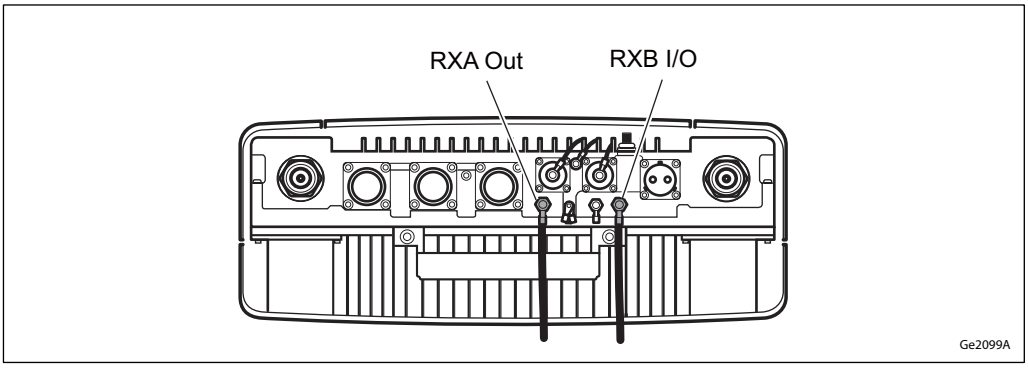


Figure 11 Co-siting RRUS 11

5.11 Position N, Grounding Interface

The RRUS must be grounded to protect it from overvoltage and lightning strikes. The grounding interface on the RRUS accepts a small cable lug on a short, coated cable. Bolt the cable and the loop into place with an M8 bolt as shown in Figure 12.

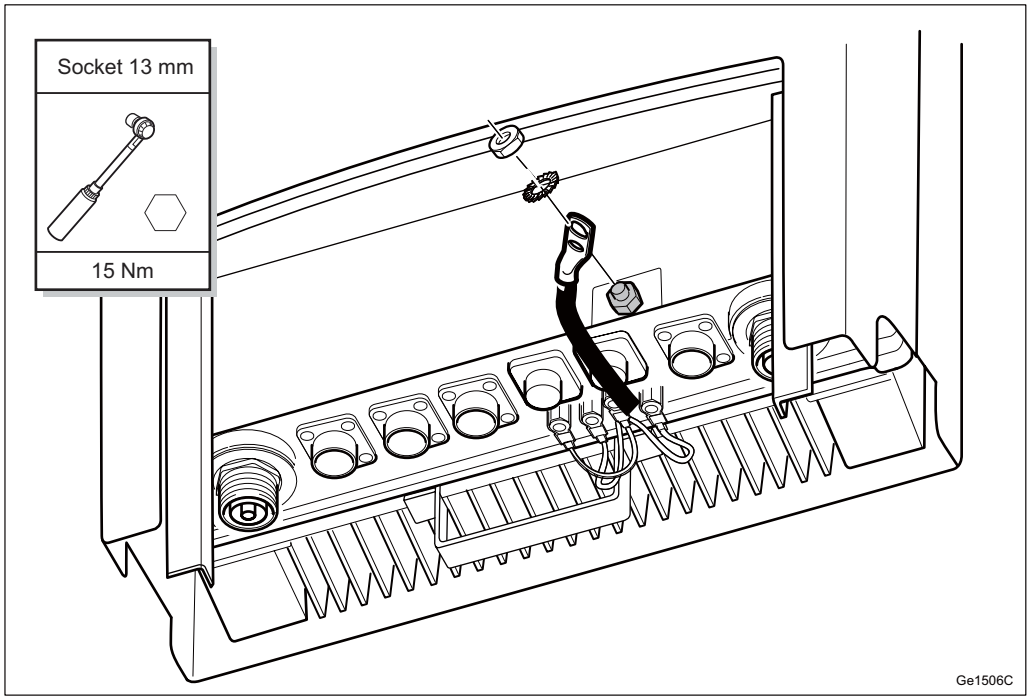


Figure 12 RRUS Grounding Interface

5.12 Optional Equipment Interfaces

The equipment presented in this section is optional and can be ordered separately.

5.12.1 PSU AC (Optional)

The PSU (also called the PSU AC) uses an AC power interface available from Ericsson. The AC cable is connected to the PSU with a contact on the cable. The AC connector comes with the RRUS.

All cables must be shielded. The shielding must be grounded on both the PSU and the power supply equipment side with the site Main Earth Terminal (MET). Each power cable conductor can have a 1.5–4 mm² cross-sectional area.

The PSU is shown in Figure 7.

Note: The wire color code in the external AC power supply cable is market dependent.

5.12.2 RF Monitoring Port for RRUS 11 (Optional)

The optional RF monitoring port allows either periodic or continuous downlink RF output power monitoring without interrupting RRUS 11 service. The monitoring interface can be found on the optional RF monitoring port. The RF

monitoring port can be placed on each antenna interface that is a transmitter port.

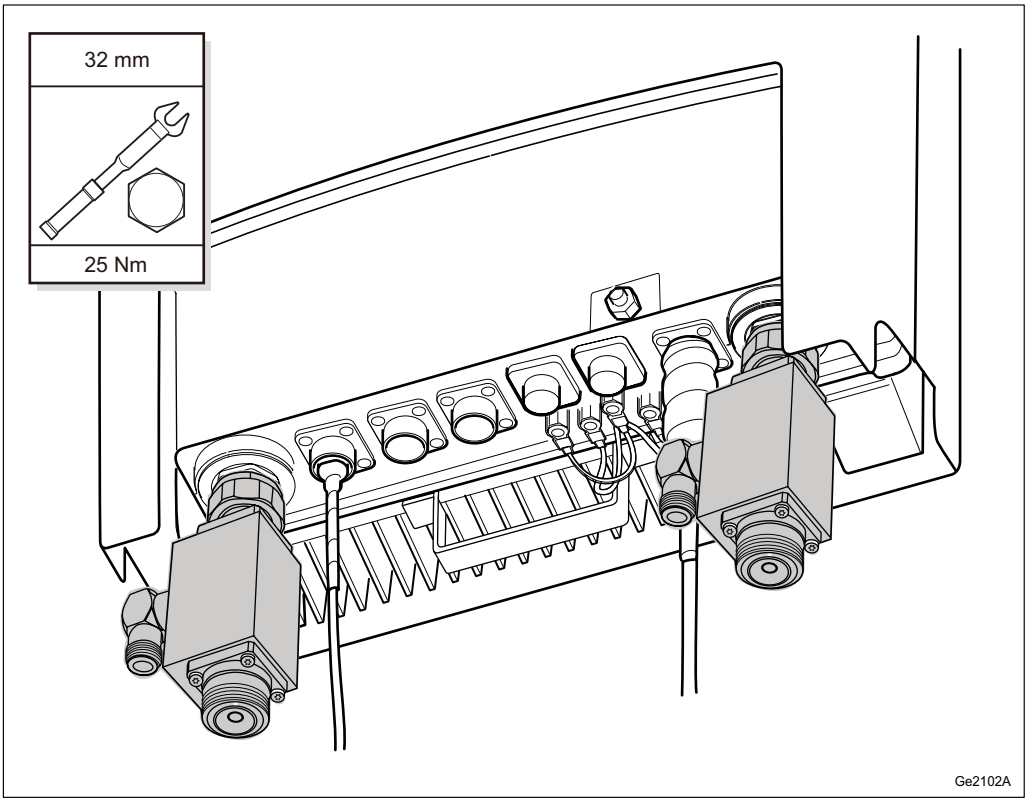


Figure 13 RF Monitoring Interface Connection

6 Standards, Regulations, and Dependability

This section presents a brief overview of standards, regulatory product approval, and declaration of conformity.

Declaration of Conformity

A signed Supplier's Declaration of Conformity (SDoC) for the European market is available on request.

6.1 Regulatory Approval

The RBS complies with the following market requirement:

- EC market requirements, R&TTE Directive1999/5/EC

  CE 0168 ⓘ Alert Mark (Class 2 equipment) Restrictions to use the apparatus may apply in some countries or geographic areas. An individual license to use the specific radio equipment may be required.

  Apparatus may include Radio Transceivers with support for frequency bands not allowed or not harmonized within the European Community (EC).

- FCC and ETL approval

6.1.1 Safety Standards Compliance

In accordance with market requirements, the RBS complies with the following product safety standards and directives:

- IEC 60 950-1:2005, Ed. 2 (worldwide)
- IEC 60 215 (1987) and Amd. 2 (worldwide)
- EN 60 215:1989 and Amd. 1 and 2 (applicable for systems used in the EU)
- EN 60 950-1:2006, Ed. 2 (applicable for systems used in the EU)
- UL 60950-1:ed.2 / CSA-C22.2 No.60950-1-07:ed.2 (Applicable for systems used in North America)

6.1.1.1 RRUS-Specific Safety Standards

In accordance with market requirements, the RRUS complies with the following product safety standards and directives:

- IEC 60950-22:2005 (worldwide)
- EN 60950-22:2006/A11:2008 (applicable for systems used in the EU)
- UL 60950-22 / CSA-C22.2 No. 60950-22-07 (applicable for systems used in North America)
- IEC 60529 (IP55) (worldwide)
- EN 60529 (IP55) (applicable for systems used in the EU)
- UL 50E Ed. 1 2007 / CAN/CSA-C22.2 NO. 94.2-07, type 3R (applicable for systems used in North America)

6.1.2 EMC Standards Compliance

The RBS complies with the following standards regarding Electromagnetic Compatibility (EMC):

- 3GPP TS25.113 (worldwide)
- 3GPP TS36.113 (worldwide)
- ETSI EN 301 489-1 (applicable for systems used in the EU)
- ETSI EN 301 489-8 (applicable for systems used in the EU)
- ETSI EN 301 489-23 (applicable for systems used in the EU)
- FCC CFR 47 part 15 (applicable for systems used in North America)

6.1.3 Radio Standards Compliance

The RBS complies with the following standards regarding radio:

- 3GPP TS25.141 (worldwide)
- 3GPP TS36.141 (worldwide)
- ETSI EN 301 908-1 (applicable for systems used in the EU)
- ETSI EN 301 908-3 (applicable for systems used in the EU)
- ETSI EN 301 908-14 (applicable for systems used in the EU)
- FCC CFR 47 part 2X (applicable for systems used in North America, X is Frequency band dependent)

6.1.4 Marking

To show compliance with legal requirements, the product is marked with one of the following:

- CE mark (applicable for systems used in the EU)
- FCC and ETL mark (applicable for systems used in North America)

6.1.5 Type Approval Standards

The RRUS complies with EC requirements regarding radio performance. The product bears the CE mark to show compliance with the legal requirements of the relevant region.

6.1.6 RoHS

The RRUS complies with Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2002/95/EC).

6.2 Other Standards and Regulations

The standards and regulations in this section are not regulatory approved.

6.2.1 Dependability

The RRUS is designed for a mean time between failures of 50 years at 20°C (24-hour operation).

6.2.2 Spare Parts

This RRUS complies with the Ericsson Serviceability and Spare Parts Strategy.

6.2.3 Surface Quality

The surface quality of the RRUS is in accordance with Ericsson standard class A3.

6.2.4 Vandal Resistance

Unauthorized access is not possible without damaging the unit.

Remote Radio Unit Description

RRUS 02 and RRUS 12

DESCRIPTION

112/1551-LZA 701 6001 Uen D

Contents

1 Introduction

This document describes the Remote Radio Unit multi-Standard (RRUS) 02 and the RRUS 12.

Note: Remote Radio Unit (RRU) is often used as a generic expression for a remotely installed Radio Unit (RU). It is also the name of models prior to the RRUS versions described in this document, for example RRUW.

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 will void warranty.

2 Product Overview

The RRUS remotely extends the reach of the RBS by up to 40 km. The RRUS is designed to be located near the antenna. A fiber optic cable connects the RRUS to the RBS main unit or an expanded macro RBS. The RRUSs can be connected in a star configuration or in a cascade configuration with optical cable links as shown in Figure 1.

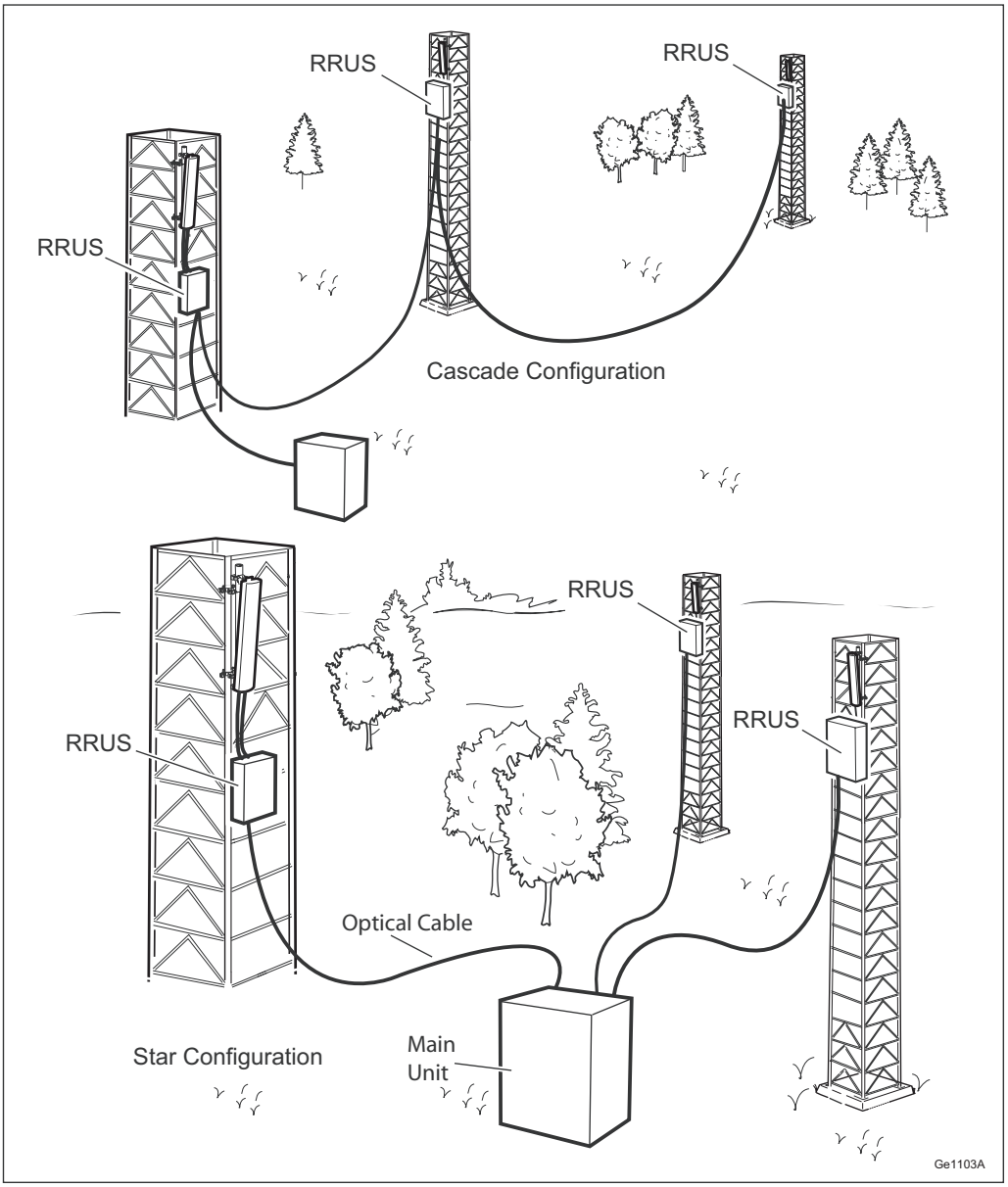


Figure 1 RRUSs in Star and Cascade Configurations

2.1 Main Features

Depending on the software application, the RRUS supports the Antenna System Controller (ASC), the Tower Mounted Amplifier (TMA), the Frequency Shifting Tower Mounted Amplifier (TMF), or the Remote Electrical Tilt Unit (RETU). The RETU can be connected either through the ASC or the Remote Interface Unit (RIU) over the antenna interface or directly using the RRUS Antenna Line Device (ALD) interface, which is used for Remote Electrical Tilt (RET) control .

The RET interface on the RRUS is the link to the antenna communication system. See Table 13 for information about the RRUS connection interface for ALD (RET).

RRUS 02 supports GSM. It has one duplex RX/TX branch and one uplink RX branch. The RRUS 02 supports cross connection of RX ports with other RRUs.

RRUS 12 supports WCDMA and LTE. The RRUS 12 has two duplex RX/TX branches. The RRUS 12 exists in two different types, Type A and Type B, for different frequency bands. The main difference between these types are the physical size (depth) and the supported temperature range.

2.2 Optional Equipment

The optional equipment for the RRUS is the following:

- Wall installation equipment
- Pole or mast installation equipment
- Power Supply Unit (PSU)
- Radio Frequency (RF) monitoring port
- Vandal protection

3 Technical Data

This section contains the physical characteristics, environmental data, and the power supply of the RBS.

3.1 Dimensions

This section contains technical data and dimensions for the RRUS 02 and the RRUS 12.

3.1.1 RRUS 02 Dimensions

Table 1 lists the technical data for the RRUS 02.

Table 1 RRUS 02 Technical Data

Description	**Value**
Maximum nominal output power	20 W, 40 W, 60 W, 80 W, and 100 W (subject for licence handling)
Number of carriers	One to eight carriers (subject for licence handling)
Frequency	890 to 915 MHz uplink 935 to 960 MHz downlink IBW 25 MHz B0 for GSM
Dimensions with Solar Shield and Handle and Feet	
Height	518 mm
Width	470 mm
Depth	156 mm
Dimensions without Solar Shield and without Handle or Feet	
Height	418 mm
Width	458 mm
Depth	129 mm
Weight	
RRUS 02	23.5 kg

Description	Value
Color	
Gray	

The RRUS 02 size, height, width, and depth with solar shield, is shown in Figure 2.

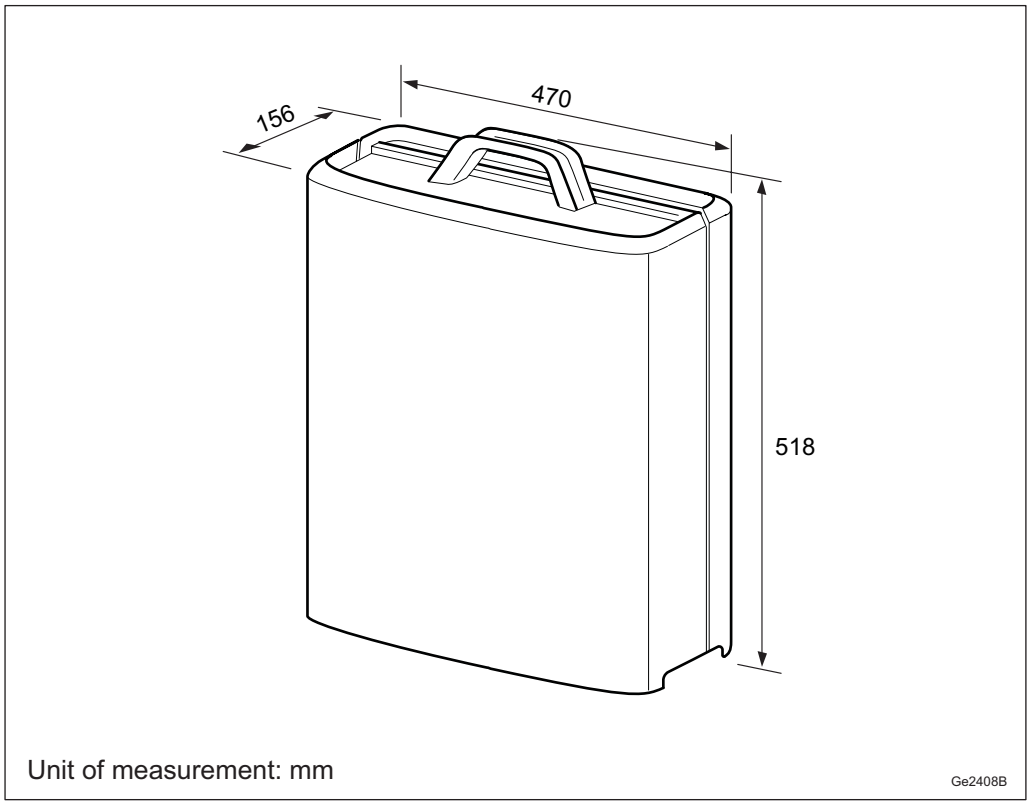


Figure 2 RRUS02 Height, Width, and Depth with Solar Shield

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.

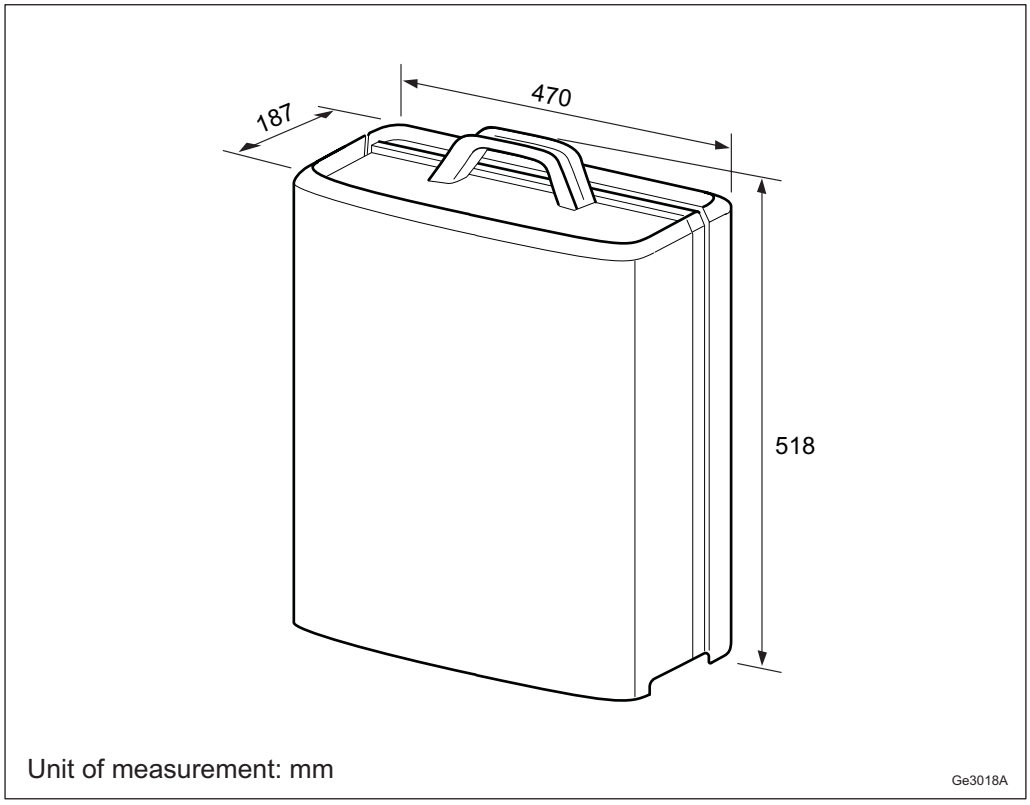


Figure 3 RRUS 12 Height, Width, and Depth with Solar Shield

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.

3.2.2 Outdoor Locations to Avoid

Despite that 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 is 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 ° 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.

3.3 Space Requirements

The RRUS can be installed one of the following:

- Single unit on a pole or mast
- Single unit on a wall
- Dual unit back-to-back on a pole or mast
- Dual unit back-to-back on a wall
- Triple unit on a pole or mast

Figure 4 shows the installation alternatives.

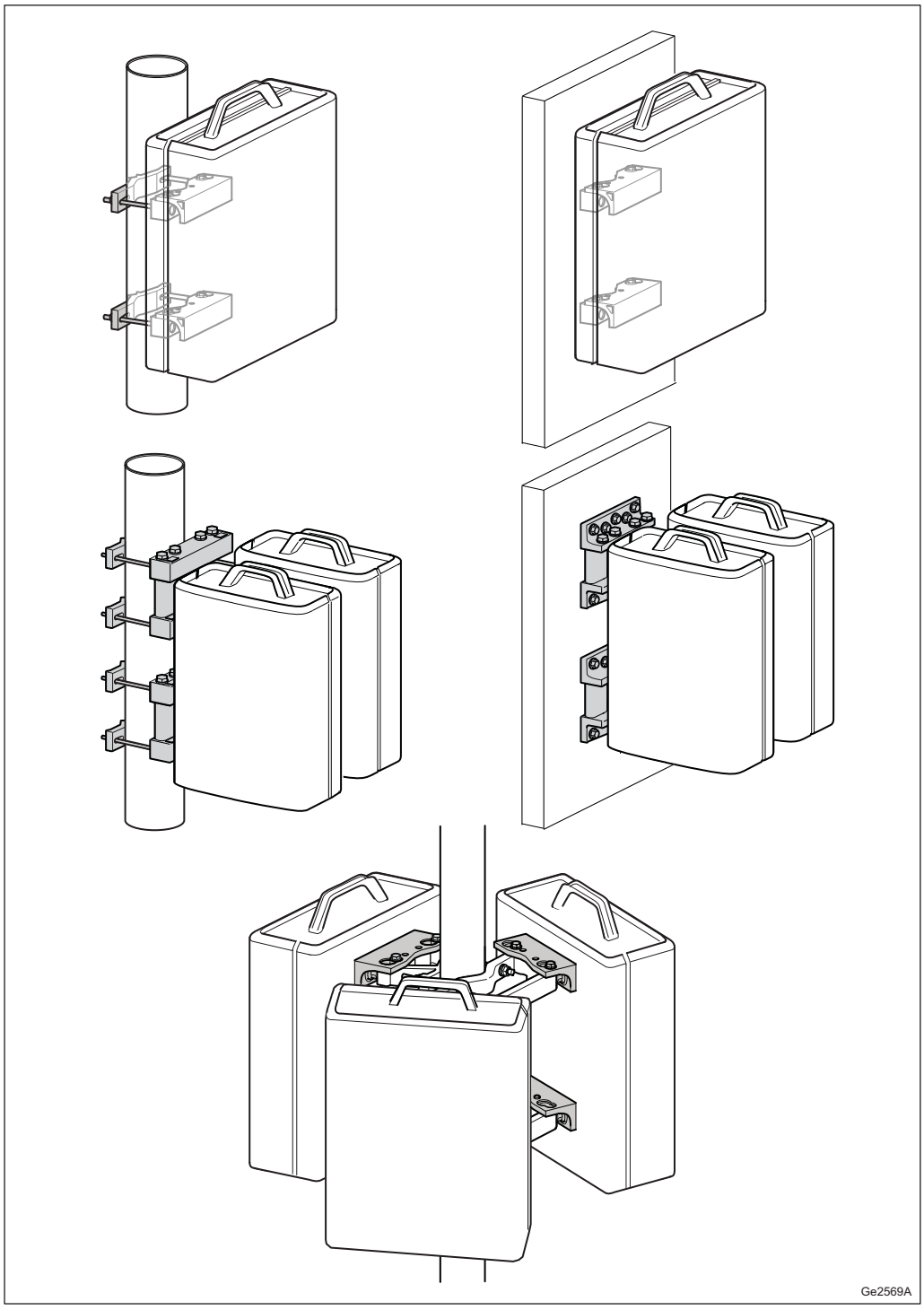


Figure 4 Installation Alternatives

The alternative pole or mast variants are shown in Figure 5 and are presented in Table 3.

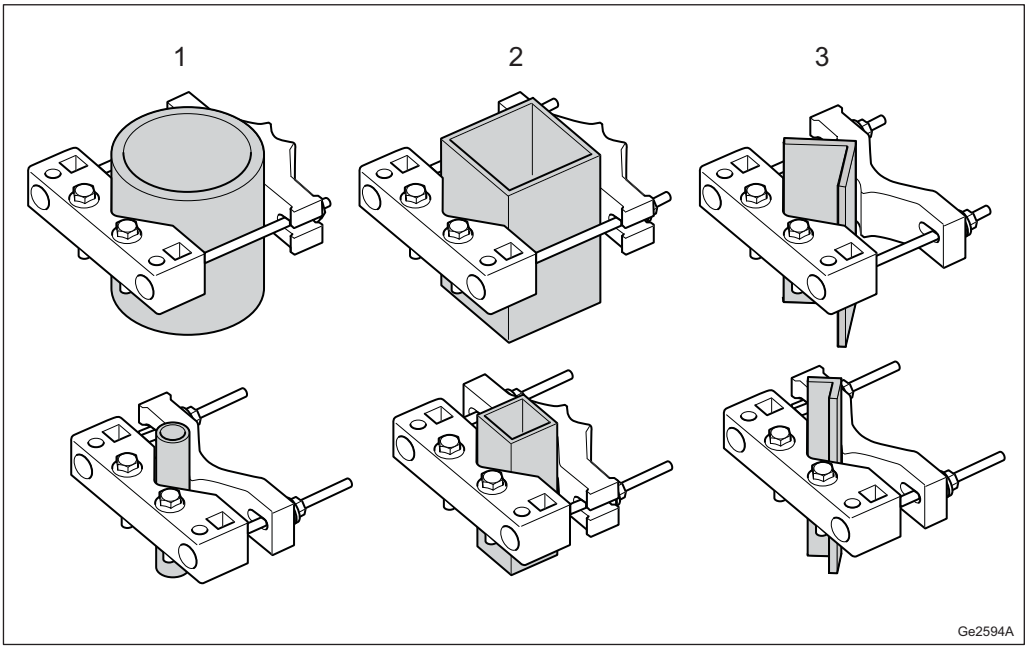


Figure 5 Alternative Pole or Mast Cross Sections

Table 3 Pole or Mast Dimensions

Cross Section	Minimum dimension (mm)	Maximum dimension (mm)
1. Circular	Ø25[(1)]	Ø120
2. Square	40x40	80x80
3. 90°	20x20[(2)]	55x55

(1) For triple unit installation, the minimum pole dimension is Ø50 mm
(2) For triple unit installation, the minimum pole dimension is 45x45 mm

Both wall and pole or mast installations can be indoors or outdoors. The wall must be even within 5 mm/m.

Pole or mast installations can be on monopoles, masts, or towers.

Note: If no other possibilities are available, under exceptional conditions, the RRUS may be installed horizontally with the front downwards. This installation alternative limits the power supply options and the maximum output power. Details regarding optional actions can be found in *Installing Remote Radio Units*.

Minimum distances to provide adequate working space and to ensure sufficient airflow can be seen in Figure 6.

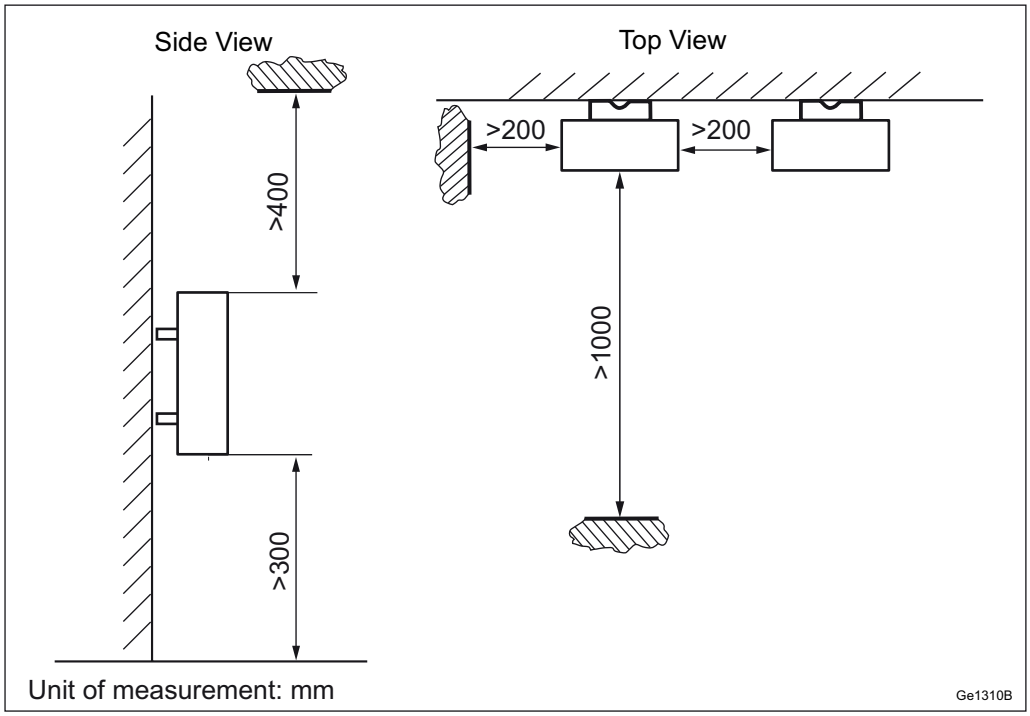


Figure 6 Space Requirements for Climate and Maintenance

3.4 Acoustic Noise

The RRUS does not generate acoustic noise.

3.5 Environmental Characteristics

This section contains RRUS operating environment data.

3.5.1 Operating Environment

The following are the values for the RRUS normal operating environment:

Temperature RRUS 02 B0(1)	-40 to +55 °C
Temperature RRUS 12 B3, Type B(1)	-40 to +55°C
Solar radiation	≤ 1,120 W/m²
Relative humidity	5 to 100%
Absolute humidity	0.26 to 40 g/m³

Maximum temperature change	1.0 °C/min
Maximum wind load at 50 m/s (pole installed single case)	430 N (front)

(1) Depending on product variant, 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 RRUS is cooled through natural convection. The heat dissipation values shown in Table 4 are meant to give an idea of heat dissipation when the unit is installed alone or around other RRUs. The values represent the maximum heat dissipation of an RRUS, taking into account optional equipment and future expansions.

Table 4 RRUS Heat Dissipation

Unit	Output Power (W)	Maximum Heat Dissipation (kW)
RRUS 02 B0	20	0.17
	40	0.20
	60	0.25
	80	0.30
	100	0.35
RRUS 12 B3	2x20	0.30
	2x40	0.40
	2x60	0.50

3.5.3 Vibration

This section contains information about the RRUS tolerance to vibration caused by seismic activity. The RRUS operates reliably during seismic activity as specified by test method IEC/EN 60 068-2-57.

The following are the values for the vibration tolerance:

Random vibration, normal operation	Maximum 0.05 m^2/s^3
Random vibration, exceptional operation	Maximum 0.1 m^2/s^3
Random vibration, non-destruction	Maximum 0.5 m^2/s^3
Random vibration, shock	Maximum 100 m/s^2

Non-destructive seismic exposure, maximum level of Required Response Spectrum (RRS)	50 m/s^2 within 2 to 5 Hz
Non-destructive seismic exposure, test frequency	1 to 35 Hz
Non-destructive seismic exposure, time history	Verteq II

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 Mains Supply Characteristics

This section describes the power supply requirements, power consumption, and fuse and circuit breaker recommendations for the RRUS.

Different power systems can supply power for multiple RRUSs if required.

3.6.1 DC Power Supply Characteristics

The power supply voltage for the RRUS is -48 V DC. The power supply requirements are shown in Table 5.

Table 5 RRUS DC Power Supply Requirements

Conditions	Values and Ranges
Nominal voltage	-48 V DC
Operating voltage range	-38.0 to -58.5 V DC
Non-destructive range	0 to -60 V DC

Fuse and Circuit Breaker Recommendations

Table 6 shows external fuse and circuit breaker recommendation for the RRUS.

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 609 34.

The RRUS 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 for not tripping the fuse or circuit breaker in case of 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 6 External RRUS 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)**
RRUS 02 B0	20	6	25	32
	40	9		
	60	12		
	80	15		
	100	15		
RRUS 12 B3	2x20	13		
	2x40	18		
	2x60	23		

(1) These fuse ratings can only be used if it is acceptable that fuses trip due to lightning or network transients.
(2) The recommended fuse rating takes into account that external fuses are not to trip due to lightning or network transients.
(3) The absolute maximum fuse class in accordance with RRUS design restrictions.

3.6.2 AC Power Supply Characteristics

The RRUS AC accepts 100 to 250 V AC if it is used together with the optional PSU. Table 7 shows the power supply requirements.

Table 7 RRUS AC Power Supply Requirements

Normal Voltage Range	**Tolerance Range**
100 to 250 V	90 to 275 V AC (1)
Connection	Phase-neutral
Frequency range	50 to 60 Hz
Voltage harmonics	< 10% at full load (2)

Normal Voltage Range	Tolerance Range
Shut-off allowance	At undervoltage or overvoltage
Inrush current peak	< 40 A
Inrush current duration	< 10 ms

(1) AC connected through a PSU AC
(2) Must comply with IEC 61000-3-2

Fuse and Circuit Breaker Recommendations

Table 8 shows external fuse and circuit breaker capabilities for the RRUS.

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 609 34.

The PSU AC has a built-in Class 1 (Type 1) SPD to protect the equipment in case of lightning and network transients. The recommended fuse or circuit breaker rating is therefore dimensioned for not tripping the fuse or circuit breaker in case of 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. The PSU AC is described in Section 4.4 on page 23.

Table 8 External RRUS Fuse and Circuit Breaker Recommendations

Unit (AC powered)	Output Power	Minimum Fuse Rating (1)	Fuse Rating Recommended for Reliable Operation (2)	Maximum Allowed Fuse Rating (3)
RRUS 02 B0	20 W	• 3 A (100 to 127 V AC) • 2 A (200 to 250 V AC)	32 A	32 A
	40 W	• 4 A (100 to 127 V AC) • 2 A (200 to 250 V AC)		
	60 W	• 5 A (100 to 127 V AC) • 3 A (200 to 250 V AC)		
	80 W	• 7 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
	100 W	• 7 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
RRUS 12 B3	2x20	• 7 A(100 to 127 V AC) • 3 A (200 to 250 V AC)		
	2x40	• 9 A (100 to 127 V AC) • 4 A (200 to 250 V AC)		
	2x60	• 11 A (100 to 127 V AC) • 6 A(200 to 250 V AC)		

(1) These fuse ratings can only be used if it is acceptable that fuses trip due to lightning or network transients.
(2) The recommended fuse rating takes into account that external fuses are not to trip due to lightning or network transients.
(3) The absolute maximum fuse class in accordance with RRUS design restrictions.

3.6.3 Power Consumption

This section contains information about the RRUS power consumption. The power consumption data listed in this section refer to normal operation during traffic.

The typical power consumption values are based on a realistic, typical traffic distribution that corresponds to an average output power of 40%. Cooling

conditions are based on an annual temperature distribution for the Frankfurt am Main (Germany) climate zone. Optional equipment is not included.

The high-load power consumption values correspond to 100% of the maximum output power. Cooling conditions are based on a statistical maximum temperature for the Frankfurt am Main (Germany) climate zone (+30 °C). Optional equipment is not included.

Table 9 shows RRUS power consumption.

Table 9 RRUS Power Consumption Values

Unit	Output Power (W)	Typical Power Consumption (1) (kW)	High Load Power Consumption (1) (kW)
RRUS 02 B0	20	0.15	0.19
	40	0.18	0.24
	60	0.23	0.31
	80	0.25	0.38
	100	0.29	0.45
RRUS 12 B3	2x20	0.25	0.34
	2x40	0.32	0.48
	2x60	0.40	0.62

(1) The power consumption values does not include power to optional external equipment such as RET and TMA.

3.7 System Characteristics

This section describes the system characteristics of the RBS.

3.7.1 RF Electromagnetic Exposure for RBS 6000

General information on RF Electromagnetic Fields (EMF) for RRUSs connected to an RBS 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

Information about available radio configurations can be found in *RBS Configurations*.

4 Hardware Architecture

This section describes the RRUS hardware structure regardless of configuration or frequency. The RRUS components are shown in Figure 7 and listed in Table 10.

Note: The supported configurations are described in *RBS Configurations*.

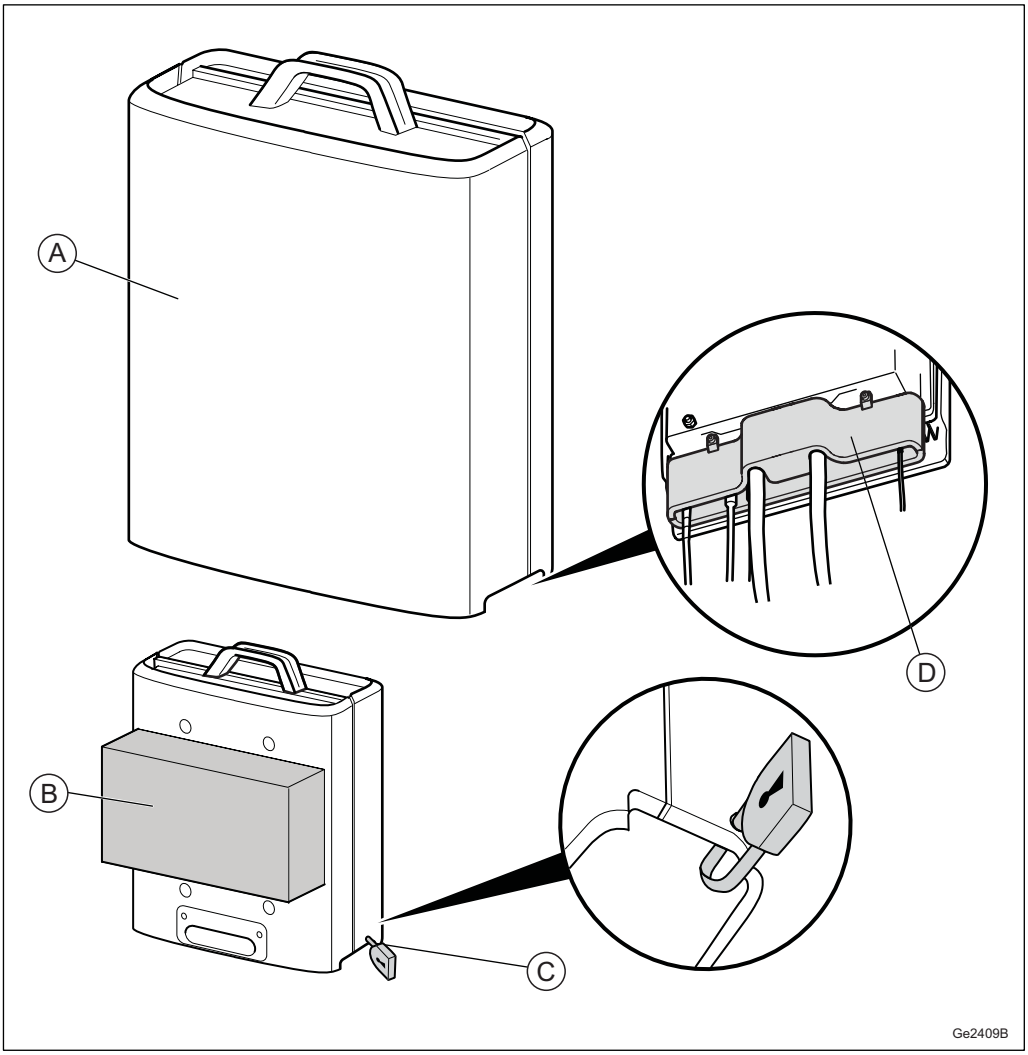


Figure 7 RRUS Components

Table 10 Key to RRUS Components

Position	Component
A	Solar shield
B	PSU AC (optional)

Position	Component
C	Hole for padlock (optional)
D	Vandal protection (optional)

4.1 RRUS Overview

The RRUS contains most of the radio processing hardware. The following sections describe the components inside the RRUS.

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 receivers for RX diversity
- RET receiver (the antenna system communication link)

4.1.2 PA

The Power Amplifier (PA) is the linear power amplifier for the RF carrier. The RRUS 02 has one PA. The RRUS 12 has two PAs, one for each branch

4.1.3 FU

The Filter Unit (FU) consists of band-pass filters and low-noise amplifiers.

In the RRUS, the FU also provides the following:

- Power and supervision for the ASC, 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 Solar Shield

The solar shield protects the RRUS from solar radiation. The solar shield is also part of the cooling design.

4.3 Optical Indicators and Buttons

The RRUS is equipped with optical indicators that show system status. The optical indicators are located on the overlay marking. Information about the behavior of the optical indicators and the maintenance button can be found in *Indicators, Buttons, and Switches*.

4.4 PSU AC (Optional)

The PSU is required for the AC power input option. The PSU converts RRUS input main power 100 - 250 V AC to -48 V DC and is installed on the back of the RRUS. Figure 8 shows the PSU and the connection interfaces are described in Page 23.

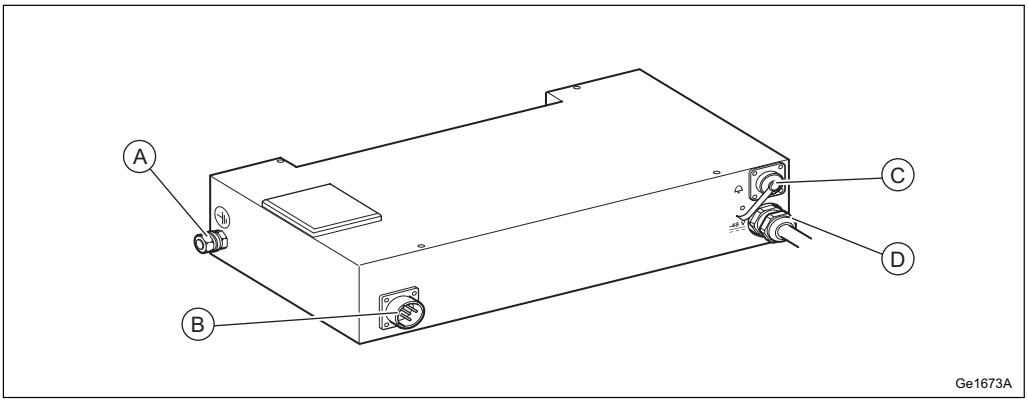


Figure 8 PSU AC

Table 11 PSU AC Connection Interfaces

Position	Interface
A	Grounding interface

Position	Interface
B	AC power interface
C	Interface for future use
D	DC power interface

For more information about PSU AC 02, see *PSU Description*.

4.5 RF Monitoring Port for RRUS (Optional)

The RF monitoring port can be used to monitor the RRUS downlink RF output power without interrupting service. The RF monitoring port components are shown in Figure 9 and described in Table 12.

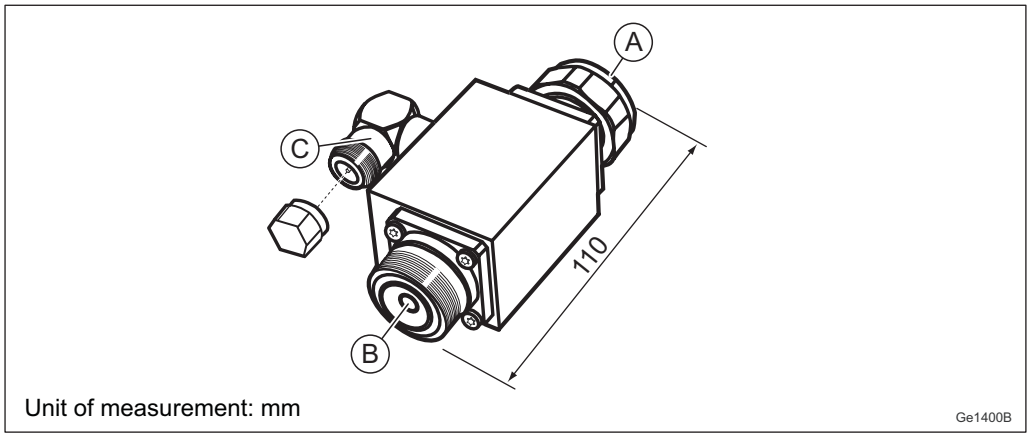


Figure 9 RF Monitoring Port

Table 12 RF Monitoring Port Connectors

Position	Interface
A	7/16 RF connector used for connecting to the A interface or the B interface
B	7/16 RF connector for connecting the RF cable
C	N-type RF connector for pairing with connector on monitoring equipment (including metal protective cap to be used when the interface is not in use)

The RF monitoring port is connected to the A or the B antenna interface on the connection interface panel at the bottom of the RRUS. The A and the B interfaces support bidirectional, RX/TX traffic, but only the TX direction can be monitored.

Using the RF monitoring port does not affect RRUS performance. RF leakage caused by antenna cables connected through the monitoring port does not

exceed that of a standard RF cable. Insertion loss between port A and port B is less than 0.2 dB.

4.6 Vandal Protection (Optional)

The vandal protection covers the connection interfaces and protects the interface from outer damage.

5 Connection Interfaces

This section contains information about the RRUS connection interfaces. The RRUS connection interfaces are shown in Figure 10 and listed in Table 13.

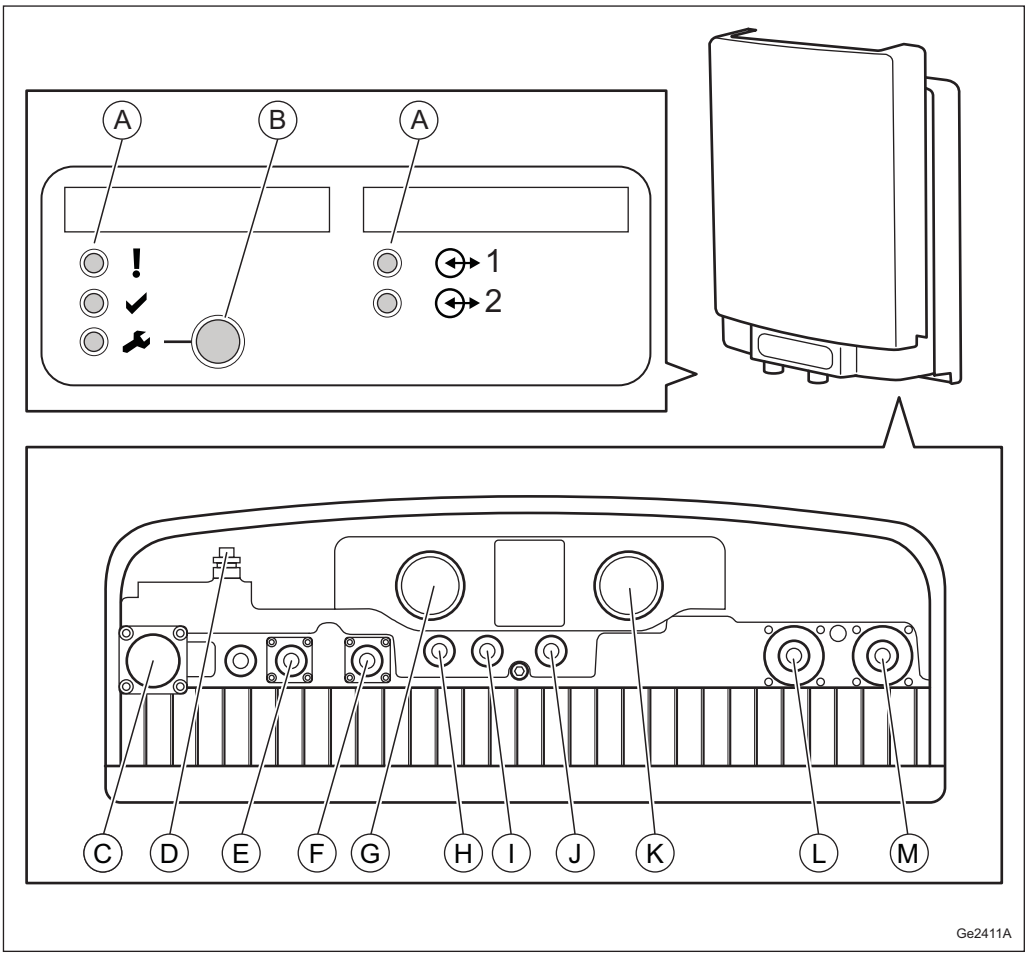


Figure 10 RRUS Connection Interfaces

Table 13 RRUS Connection Interfaces

Position	Description	Marking
A	Optical indicators	!, ✔, 🔧 ⊶1, ⊶2
B	Maintenance button	🔧

Position	Description	Marking
C	-48 V DC power supply	POWER
D	Grounding	⏚
E	ALD (used for a RET unit for example)	ALD
F	External alarm	🔔
G	Antenna A	A
H	RXA co-site	RXA Out
I	Cross connect RXA	RXA I/O
J	Cross connect RXB	RXB I/O
K	Antenna B	B (1) or B (2)
L	Optical cable 2	2
M	Optical cable 1	1

(1) Applicable for RRUS 02 only.
(2) Applicable for RRUS 12 only.

5.1 Position A, Optical Indicators

Optical indicators show the system status. More information about the optical indicators can be found in *Indicators, Buttons, and Switches*.

5.2 Position B, Maintenance Button

The maintenance button is located at the right of the 🔧 symbol.

More information about the maintenance button can be found in *Indicators, Buttons, and Switches*.

5.3 Position C, -48 V DC Power Supply Interface

The -48 V DC power connection is made through a connector. The connector accepts cables with various cross-sectional areas depending on the cable length. Table 14 and Table 15 show these cross-sectional diameter tolerances listed by cable length.

Table 14 -48 V DC Power Supply Cable Diameter Tolerances for RRUS 02

Cable Length (m)	Recommended Cross-Sectional Area of Each Conductor (mm^2)
0 to 60	6
60 to 100	10

Table 15 -48 V DC Power Supply Cable Diameter Tolerances for RRUS 12

Cable Length (m)	Recommended Cross-Sectional Area of Each Conductor (mm^2)
0 to 30	6
30 to 60	10 (1)
60 to 90	16
90 to 100	25

(1) The DC connector accepts a cross-sectional area of maximum 10 mm^2.

The power cable conductor has a wire for the 0 V conductor and a wire for the -48 V conductor. The wire color code for both is market dependent.

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 RRUS overvoltage and lightning protection does not function properly.

5.4 Position D, Grounding Interface

The RRUS must be grounded to protect it from overvoltage and lightning strikes. The grounding interface on the RRUS accepts a cable lug on a coated cable. The cable lug is connected to the RRUS using an M8 bolt as shown in Figure 11.

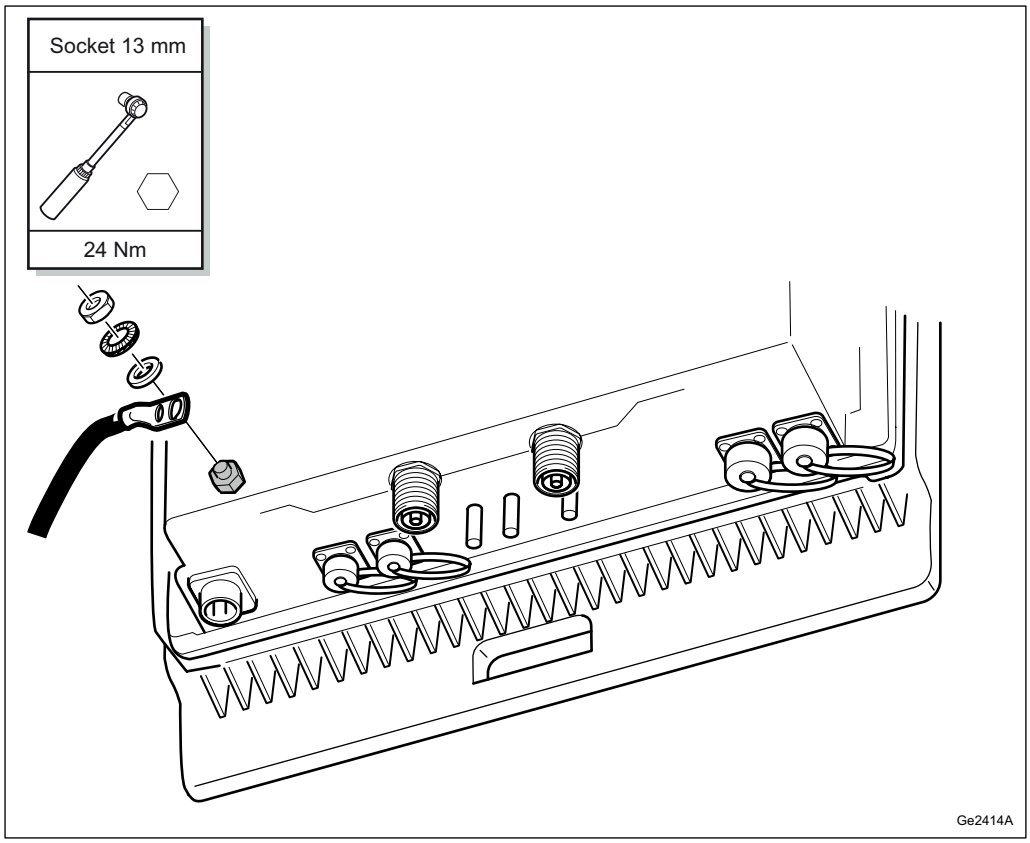


Figure 11 RRUS Grounding Interface

5.5 Position E, ALD Ctrl Interface

The ALD control (ALD Ctrl) connects an ALD (RET) cable to the RRUS for antenna system communication.

5.6 Position F, Ext Alarm Interface

Six external alarms can be connected to the RRUS external alarm port.

5.7 Position G and K, Antenna Interface

The antenna interfaces provide RRUS connections to antennas. RF cables connect the RRUS to the antenna.

The antenna connection interface characteristics of these cables are described in Table 16.

Table 16 RRUS Antenna Connection Interface Characteristics

Connector Type	RF Cable Type	Cable Connector Type
7/16 IEC-169-4 insert-receiver type	50 Ω coaxial	7/16 insert-type on both ends

Table 17 shows how to connect the antenna cables.

Table 17 RRUS Antenna Cable Connectors

RRUS Connectors	Antenna Connectors
A (Antenna A)	TX/RX
B ← (Antenna B)	RX
B (Antenna B)	TX/RX

5.8 Position I and H, RXA I/O and RXB I/O Interface

Figure 12 shows how to the RXA I/O and RXB I/O interface ports, used to cross connect the RRUS for antenna diversity.

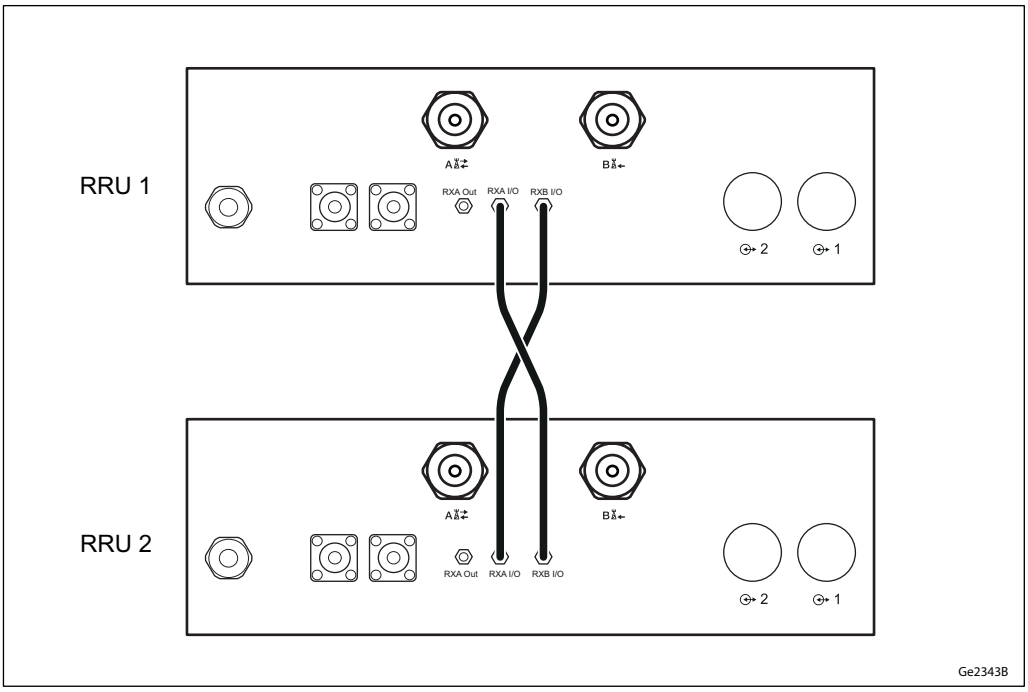


Figure 12 Cross Connecting RRUS

5.9 Position J, RXA Out Interface

Figure 13 shows the RXA Out interface port used to co-site RRUSs.

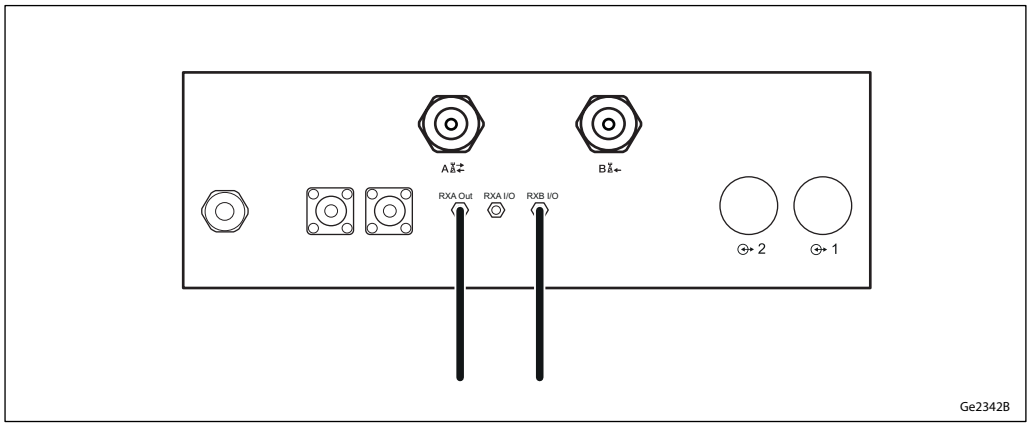


Figure 13 Co-siting RRUS

5.10 Position M and L, Interface for Optical Cable to Main Unit

The ⊕ 1 and ⊕ 2 interfaces provide connections to optical cables for traffic and timing signals between the RRUS and the main unit. An SFP is used to connect the optical cable to the RRUS.

5.11 Optional Equipment Interfaces

The equipment presented in this section is optional and can be ordered separately.

5.11.1 PSU AC (Optional)

The PSU (also called the PSU AC), shown in Figure 8, uses an AC power interface that is available from Ericsson. The AC cable is connected to the PSU with a contact on the cable. The AC connector is delivered with the PSU.

All cables must be shielded. The shielding must be grounded on both the PSU and the power supply equipment side with the site Main Earth Terminal (MET). Each power cable conductor can have a 1.5–4 mm² cross-sectional area.

Note: The wire color code in the external AC power supply cable is market-dependent.

5.11.2 RF Monitoring Port (Optional)

The optional RF monitoring port allows either periodic or continuous downlink RF output power monitoring without interrupting the RRUS service. The monitoring interface can be found on the optional RF monitoring port. The RF monitoring port can be placed on the antenna interface that is a transmitter port, which means A for RRUS 02 and A or B for RRUS 12.

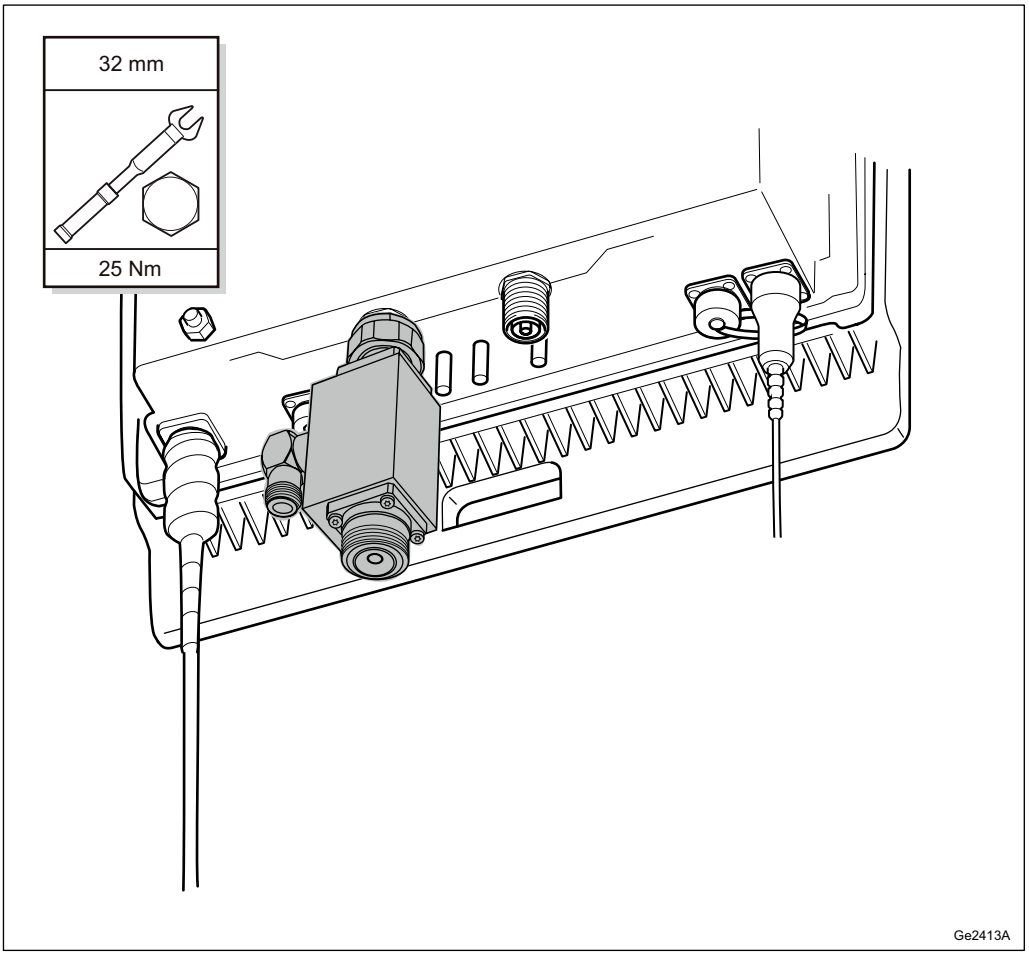


Figure 14 RF Monitoring Interface Connection

6 Standards, Regulations, and Dependability

This section presents a brief overview of standards, regulatory product approval, and declaration of conformity.

Declaration of Conformity

A signed Supplier's Declaration of Conformity (SDoC) for the European market is available on request.

6.1 Regulatory Approval

The RBS complies with the following market requirement:

- EC market requirements, R&TTE Directive1999/5/EC

  CE 0168 ⓘ Alert Mark (Class 2 equipment) Restrictions to use the apparatus may apply in some countries or geographical areas. Individual license to use the specific radio equipment may be required.

  Apparatus may include Radio Transceivers with support for frequency bands not allowed or not harmonized within the European Community (EC).

6.1.1 Safety Standards Compliance

In accordance with market requirements, the RBS complies with the following product safety standards and directives:

- IEC 60 950-1, Ed. 2 (worldwide)
- IEC 60 215 (worldwide)
- EN 60 215 (applicable for systems used in the EU)
- EN 60 950-1, Ed. 2 (applicable for systems used in the EU)

6.1.1.1 Outdoor Specific Safety Standards

In accordance with market requirements, the RRUS complies with the following product safety standards and directives:

- IEC 60950-22 (worldwide)
- EN 60950-22 (applicable for systems used in the EU)
- IEC 60529 (IP55) (worldwide)

- EN 60529 (IP55) (applicable for systems used in the EU)

6.1.2 EMC Standards Compliance

The RBS complies with the following standards regarding Electromagnetic Compatibility (EMC):

- 3GPP TS25.113 (worldwide)
- 3GPP TS36.113 (worldwide)
- 3GPP TS37.113 (worldwide)
- ETSI EN 301 489-1 (applicable for systems used in the EU)
- ETSI EN 301 489-8 (applicable for systems used in the EU)
- ETSI EN 301 489-23 (applicable for systems used in the EU)

6.1.3 Radio Standards Compliance

The RBS complies with the following standards regarding radio:

- 3GPP TS25.141 (worldwide)
- 3GPP TS36.141 (worldwide)
- 3GPP TS37.141 (worldwide)
- ETSI EN 301 502 (applicable for systems used in the EU)
- ETSI EN 301 908-1 (applicable for systems used in the EU)
- ETSI EN 301 908-3 (applicable for systems used in the EU)
- ETSI EN 301 908-14 (applicable for systems used in the EU)

6.1.4 Marking

To show compliance with legal requirements, the product is marked with the following:

- CE mark (applicable for systems used in the EU)

6.1.5 Type Approval Standards

The RRUS complies with EC requirements regarding radio performance. The product bears the CE mark to show compliance with the legal requirements of the relevant region.

6.1.6 RoHS

The RRUS complies with Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2002/95/EC).

6.2 Other Standards and Regulations

The standards and regulations in this section are not regulatory approved.

6.2.1 Dependability

The RRUS is designed for a MTBF of 50 years at 20°C (24-hour operation).

6.2.2 Spare Parts

This RRUS complies with the Ericsson Serviceability and Spare Parts Strategy.

6.2.3 Surface Quality

The surface quality of the RRUS is in accordance with Ericsson standard class A3.

6.2.4 Vandal Resistance

Unauthorized access is not possible without damaging the unit.

RRUS 32 B30

- WCS A+B blocks
  - TX = 2350 – 2360 MHz
  - RX = 2305 – 2315 MHz
- CPRI 2 ports x 10 Gbps
- Only use Ericsson supplied and approved SFPs
- 6 external alarm inputs
- Max wind load @ 50m/sec = 350N
- Breaker size = 20A, DC Power Consumption = 800W
- 200mm horizontal separation required for side by side mounting
- 200mm separation required from antenna backplane to radio
- 600mm/800mm vertical outdoor/indoor separation required
- Max DC cable size from squid to radio = 8AWG
  - Adapter is required for 2-wire connection
  - Shielded DC cable is required
- Max Ground cable size = 6AWG
- Dimensions (incl. handles, feet and sunshield)
  - Height: 27.2” (690 mm)
  - Width: 12.1” (306 mm)
  - Depth: 7.0” (178 mm)
- Weight, excl. mounting hardware = 53 lbs (24 kg)

Antennas

MultiPort Series

DATA SHEET

Twelve Port Multi-Band Antenna

TPA-65R-LCUUUU-H6

- Eight High Broadband ports covering PCS, AWS / AWS-3 and WCS bands (698-798 MHz, 824-896 MHz. & 1695-2360 MHz.)
- Four Low Band ports covering 700 MHz and 850 MHz bands
- Supports 8x8 MIMO in high band
- Excellent PIM Performance
- A multi-network solution in one radome
- Field replaceable, integrated AISG 2.0 compliant Remote Electrical Tilt (RET) system with independent tilt control of each freq band set
- Reduces tower loading
- Frees up space for tower mounted Remote Radio Heads
- All Band design simplifies radio assignments
- Single radome with twelve ports
- Sharp elevation beam eases network planning

Overview

The CCI 12-port Multi-Band Antenna Array is a 12-port antenna with eight high band ports that cover the full PCS, AWS / AWS-3 and WCS bands. In addition to the eight high band ports, the antenna includes two 700 MHz ports and two 850 MHz ports. The 12-port antenna is ready for 8x8 MIMO or dual 4x4 MIMO in high bands.
Modern networks demand high performance, consequently CCI has incorporated several new and innovative design techniques to provide an antenna with excellent side-lobe performance, sharp elevation beams, and high front to back ratio.
Multiple networks can now be connected to a single antenna, reducing tower loading and leasing expense, while decreasing deployment time and installation cost.
Full band capability for 700 MHz , Cellular 850 MHz, PCS 1900 MHz, AWS 1695/2180 MHz and WCS 2300 MHz coverage in a single enclosure.

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

- 8x8 MIMO and 4x4 MIMO on High bands
- 2x2 MIMO on 700 & 850 bands
- Adding additional capacity without adding additional antennas

SPECIFICATIONS

Twelve Port Multi-Band Antenna

TPA-65R-LCUUUU-H6

Electrical

Ports	2 Low Band Ports for 698-798 MHz		2 Low Band Ports for 824-896 MHz
Frequency Range	698-787 MHz	787-798 MHz	824-896 MHz
Gain Peak	14.3 dBi	13.9 dBi	14.6 dBi
Gain Average*	13.9 dBi	13.6 dBi	14.3 dBi
Azimuth Beamwidth (-3dB)	63°	67°	64°
Elevation Beamwidth (-3dB)	13.0°	12.1°	11.0°
Electrical Downtilt	0° to 10°	0° to 10°	0° to 10°
Elevation Sidelobes (1st Upper)	< -18 dB	< -19 dB	< -19 dB
Front-to-Back Ratio @180°	> 30 dB	> 32 dB	> 35 dB
Front-to-Back Ratio over ± 20°	> 30 dB	> 32 dB	> 33 dB
Cross-Polar Discrimination (at Peak)	> 25 dB	> 25 dB	> 25 dB
Cross-Polar Discrimination (at ± 60°)	> 20 dB	> 20 dB	> 20 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB	> 25 dB
Voltage Standing Wave Ratio(VSWR)	< 1.5:1	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc
Input Power Continuous Wave (CW)	500 watts	500 watts	500 watts
Polarization	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°
Input Impedance	50 ohms	50 ohms	50 ohms
Lightning Protection	DC Ground	DC Ground	DC Ground

**Per BASTA specification of Gain over all Tilts*
All specifications are subject to change without notice.

Ports	8 High Band Ports for 1695-2360 MHz			
Frequency Range	1850-1990 MHz	1695-1780/2110-2180 MHz		2305-2360 MHz
Gain Peak	15.9 dBi	15.2 dBi	16.4dBi	16.2 dBi
Gain Average*	15.3 dBi	14.5 dBi	15.8 dBi	15.5 dBi
Azimuth Beamwidth (-3dB)	61°	62°	61°	63°
Elevation Beamwidth (-3dB)	10.5°	11.8°	9.1°	8.3°
Electrical Downtilt	2° to 12°	2° to 12°	2° to 12°	2° to 12°
Elevation Sidelobes (1st Upper)	< -17 dB	< -15 dB	< -17 dB	< -15 dB
Front-to-Back Ratio @180°	> 35 dB	> 35 dB	> 35 dB	> 35 dB
Front-to-Back Ratio over ± 20°	> 32 dB	> 33 dB	> 34 dB	> 33 dB
Cross-Polar Discrimination (at Peak)	> 17 dB	> 20 dB	> 20 dB	> 25 dB
Cross-Polar Discrimination (at ± 60°)	> 17 dB	> 16 dB	> 17 dB	> 17 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 Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°
Input Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Lightning Protection	DC Ground	DC Ground	DC Ground	DC Ground

**Per BASTA specification of Gain over all Tilts*
All specifications are subject to change without notice.

SPECIFICATIONS

Twelve Port Multi-Band Antenna

TPA-65R-LCUUUU-H6

Mechanical

Dimensions (LxWxD)	71.2x11.8x11.6 in (1808x300x294 mm)
Survival Wind Speed	> 150 mph (> 241 kph)
Front Wind Load	203 lbs (901 N) @ 100 mph (161 kph)
Side Wind Load	199 lbs (887 N) @ 100 mph (161 kph)
Equivalent Flat Plate Area	7.9 ft^2 (0.7 m^2)
Weight	64.6 lbs (29.3 kg)
Connector	12 x 4.3-10 Female
Mounting Pole	2 to 5 in (5 to 12 cm)

** Weight excludes mounting and RET*

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 HAMPSHIRE STREET
Site No.: MA2312
DEWBERRY NO. 50048589
(Page 1 of 20)

SAI
22 Keewaydin Drive
Salem, NH 03079

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


N
Carlisle St
Tremont St
Cambridge St
Citizens
PHOTO 7
PHOTO 3
PHOTO 6
PHOTO 2
SITE LOCATION
PHOTO 9
PHOTO 1
PHOTO 8
Norfolk St
Columbia St
Lincoln St
Union Pl
PHOTO 4
PHOTO 5
Hampshire
at&t
CAMBRIDGE HAMPSHIRE STREET
Site No.: MA2312
288 Norfolk Street
Cambridge, MA 02139
(Page 2 of 20)
Dewberry


Actual View
Existing Canister
Existing Vent (Typ.)
Existing Canister
Existing Antenna (Typ.)
ONE WAY
STOP
at&t
CAMBRIDGE HAMPSHIRE STREET
Photo 1A
View Facing Northeast
From Norfolk Street
(Page 3 of 20)
Dewberry

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 1B

View Facing Northeast
From Norfolk Street
(Page 4 of 20)

Dewberry®

Actual View

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 2A

View Facing East
From Hampshire Street
(Page 5 of 20)

Dewberry®

Proposed View

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 2B

View Facing East
From Hampshire Street
(Page 6 of 20)

Dewberry®

Actual View

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 3A

View Facing South
From Norfolk Street
(Page 7 of 20)

Dewberry®

Proposed View

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 3B

View Facing South
From Norfolk Street
(Page 8 of 20)

Dewberry

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 4A

View Facing Northwest
From Elm Street
(Page 9 of 20)

Dewberry


Proposed View
Proposed Chimney (Typ.-2)
Proposed RF Barrier (Typ.)
at&t
CAMBRIDGE HAMPSHIRE STREET
Photo 4B
View Facing Northwest
From Elm Street
(Page 10 of 20)
Dewberry

Actual View

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 5A

View Facing Northwest
From Hampshire Street
(Page 11 of 20)

Dewberry

Proposed View

at&t

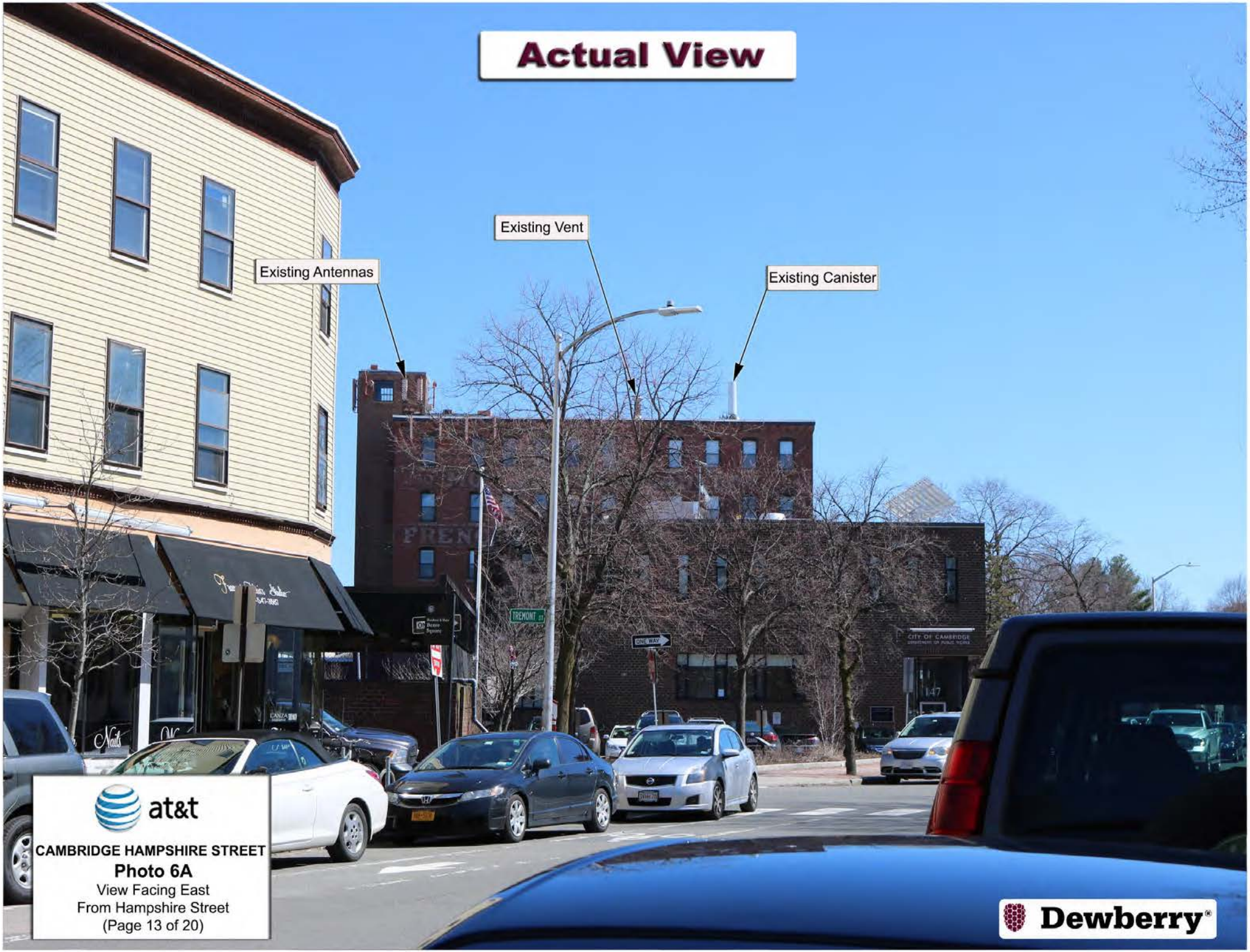
CAMBRIDGE HAMPSHIRE STREET

Photo 5B

View Facing Northwest
From Hampshire Street
(Page 12 of 20)

Dewberry

Actual View



at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 6A

View Facing East
From Hampshire Street
(Page 13 of 20)

Dewberry®


Proposed View
Proposed Chimney (Typ.-2)
Proposed Penthouse Mounted Antennas (Typ.-3)
Proposed Vertical/Horizontal Cable Tray
TREMONT ST
ONE WAY
CITY OF CAMBRIDGE
147
at&t
CAMBRIDGE HAMPSHIRE STREET
Photo 6B
View Facing East
From Hampshire Street
(Page 14 of 20)
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CAMBRIDGE HAMPSHIRE STREET

Photo 7A

View Facing South
From Norfolk Street
(Page 15 of 20)

Dewberry

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 7B

View Facing South
From Norfolk Street
(Page 16 of 20)

Dewberry®

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 8A

View Facing Northeast
From Norfolk Street
(Page 17 of 20)

Dewberry

at&t

CAMBRIDGE HAMPSHIRE STREET

Photo 8B

View Facing Northeast
From Norfolk Street
(Page 18 of 20)

Dewberry


Actual View
Existing Canister
at&t
CAMBRIDGE HAMPSHIRE STREET
Photo 9A
View Facing Northeast
From Tremont Street
(Page 19 of 20)
Dewberry


Proposed View
Proposed Ballast (Typ.-2)
Proposed RF Barrier (Typ.)
at&t
CAMBRIDGE HAMPSHIRE STREET
Photo 9B
View Facing Northeast
From Tremont Street
(Page 20 of 20)
Dewberry

RF Report

Proposed Cambridge PCS Facility

(Site MA2312 – 288 Norfolk Street)

January 26, 2018

TABLE OF CONTENTS

ATTACHMENTS

Exhibit 1: AT&T Current Coverage,
Exhibit 2: AT&T Proposed Coverage @ 60' 4"

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 in Cambridge for its Personal Communication Services. The proposed facility, to be located on the rooftop at 288 Norfolk Street, Cambridge, MA (Assessors' Map 85, Lot 76) (the "Site"), is needed to provide coverage for significant coverage gaps that exist in the Wellington-Harrington vicinity in Cambridge, 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 (the "Facility") consisting principally of the following elements:

- Six (6) panel antennas are proposed. Four (4) antennas will be mounted within two (2) faux chimneys ballast mounted on the roof and the remaining two (2) antennas will be façade mounted to the building below Nextel's existing antennas.

- Fifteen (15) radio-head units (RRUs) (five per sector) and (4) surge arrestors mounted on steel frames adjacent to the antennas.

- Fiber optic and DC power cables running from the radio-head units through cable trays across the roof to a vertical cable tray down the south facing wall to an equipment room in the basement.

- One GPS antenna, mounted to the cable tray.

- Electric and telephone utilities conduits.

3. Coverage and Capacity Objectives

AT&T provides digital cellular communications service using UMTS (also referred as 3G) technology in the 850 MHz and 1900 MHz frequency bands as allocated by the Federal Communications Commission ("FCC"). In addition, 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, and 2300 MHz frequencies under license from the FCC.

Regarding the 288 Norfolk Street site, AT&T has determined that significant coverage gaps exist in Cambridge in the Wellington-Harrington area (Targeted Coverage Area), particularly with respect to in- building coverage in the Cambridge area specifically along Hampshire Street and surrounding areas.

Wireless communications is no longer limited to just providing mobility for voice services. It has evolved into 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 288 Norfolk Street (MA2312) site:

1) Provide improved in-building and in-vehicle coverage on both UMTS and LTE 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 one other site appeared to satisfy AT&T's

coverage needs for the Central Square area. From both radio frequency coverage and zoning perspectives, the proposed site at 288 Norfolk Street was found to be superior.

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 East Cambridge Area of Cambridge from which to address the significant coverage gaps in the Targeted Coverage Area, other than the building located at 146 Hampshire Street. The location is a 50' church steeple located on the corner of Hampshire Street and Norfolk Street. The building is a church owned by the Mass Ave Baptist Church. This site would provide the coverage that AT&T's Radio Frequency experts are looking to achieve, however the proposed site at 288 Norfolk is superior due to its additional elevation and line of sight down Hampshire Street as well as the fact that it contains multiple existing wireless carriers equipment 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 in the Central Square area of Cambridge and the surrounding vicinity.

8. Statement of Certification

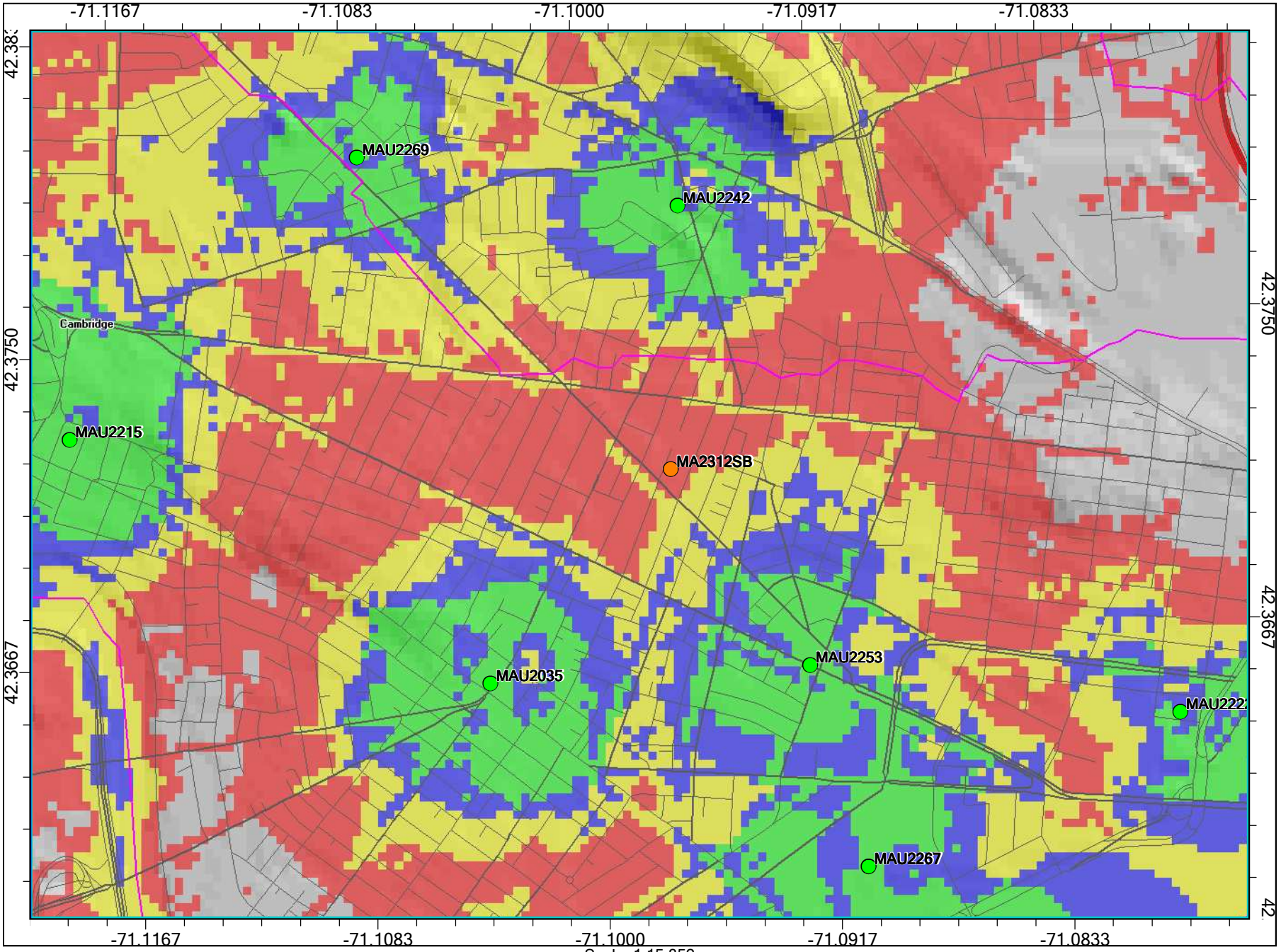
I certify to the best of my knowledge that the statements in this report are true and accurate.

1/29/18

Radu Alecsandru, RF Engineer
AT&T Mobility

Date

Current Coverage in Cambridge MA



Scale: 1:15,852

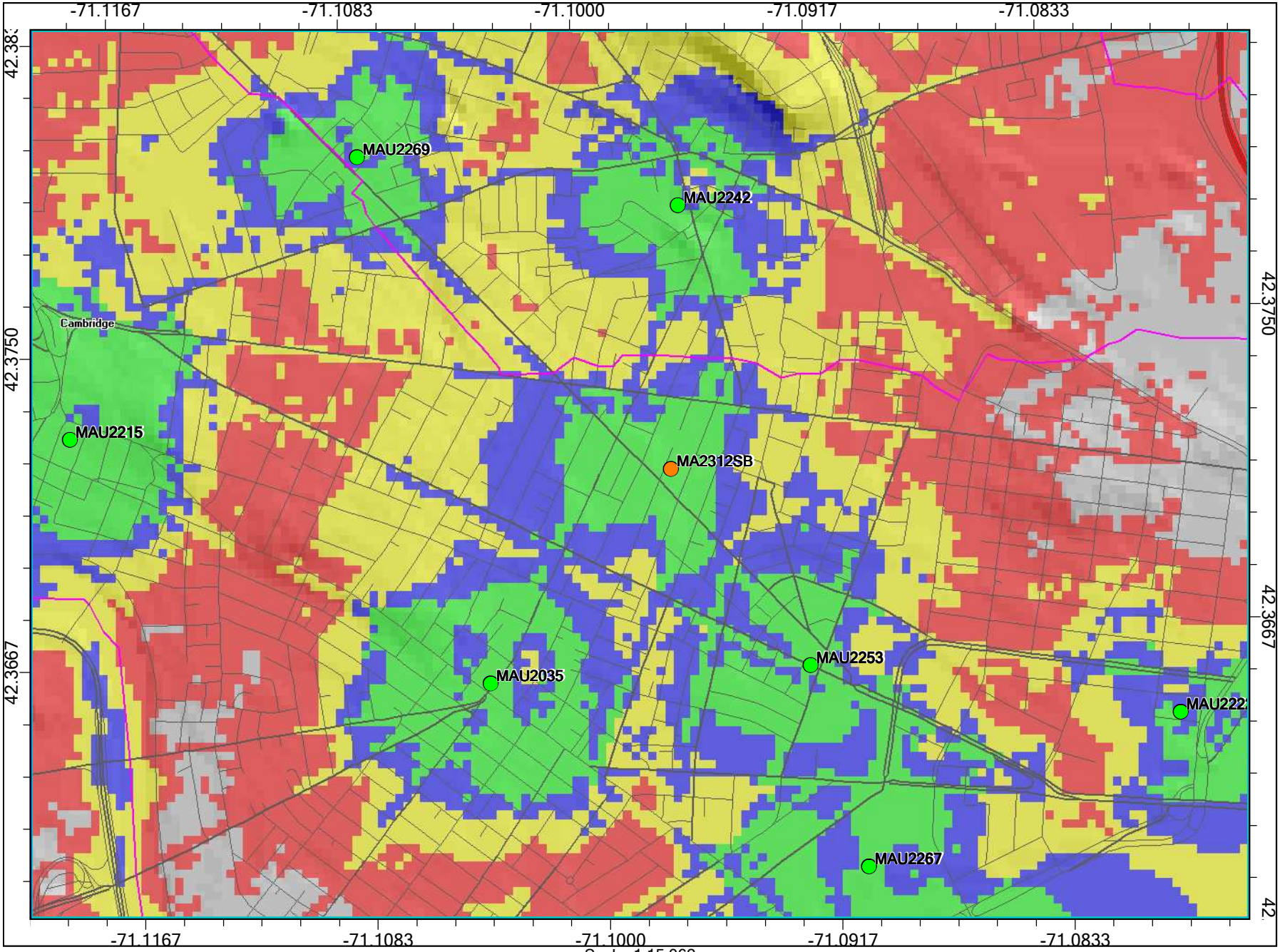
0 0.2 0.4miles

Green dots are current AT&T locations, and Orange dots are future AT&T locations.

Plots prepared by Deepak Rathore, RF Engineer - AT&T

5/29/2013

Proposed Coverage in Cambridge MA



Scale: 1:15,962

0 0.2 0.4miles

Green dots are current AT&T locations, and Orange dots are future AT&T locations.

Plots prepared by Deepak Rathore, RF Engineer - AT&T

5/29/2013

May 13, 2017

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

Applicant:	New Cingular Wireless PCS, LLC
Property Address:	288 Norfolk Street, Cambridge, MA
	Assessor's Map 85, Lot 76
Re:	Alternative Site Study

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

The undersigned hereby states the following in support of the application by New Cingular Wireless PCS, LLC to construct and operate a wireless communications facility at 288 Norfolk Street, Cambridge, MA (the "Site").

1. My name is Dan Bilezikian and I am a Site Acquisition Specialist for SAI Communications, Inc. I have been retained by AT&T to provide services for the purpose of obtaining approvals, leases, and licenses as well as performing other site acquisition and development tasks involved in building and installing wireless communication facilities. I have performed, and am performing, such services in connection with AT&T's proposed wireless communications facility located at the Site.

2. I have participated directly through my present and past employment in the development of hundreds of similar facilities, including wireless communications facilities collocated on and next to an existing structure such as the facility proposed for the Site. I have personally visited the site and the area surrounding the Site on several occasions. I submit this affidavit based on my personal knowledge of the Site and the surrounding area and based on my professional experience in the development of wireless communications facilities.

3. When AT&T's radio frequency experts identify an area within which a wireless communications installation is required to provide coverage to a significant gap in its coverage network, the area is illustrated upon a map and issued to the Site Acquisition Specialist. In this instance, the illustrated area is located directly in the center of the Site, 288 Norfolk Street.

4. Part of my site acquisition and development duties include identifying potential candidates within the area identified by AT&T's radio frequency experts. The candidate identification process includes reviewing the applicable zoning ordinance to identify areas within which the proposed use is allowed. Viable candidates consist of existing structures of sufficient height from which antenna installation can provide sufficient coverage, or lacking such a structure, parcels located within the narrowly defined search area upon which a tower may be constructed to a sufficient height. In order to be viable, a candidate must provide adequate coverage to the significant gap in AT&T's network. In addition, all viable candidates must have a willing landowner with whom commercially reasonable lease terms may be negotiated. Preference is given to locations that closely comply with local zoning ordinances, or in th event no viable candidates are determined to be located within such areas, to identify other potentially suitable locations, with preference given to existing structures.

5. In connection with this site, SAI Communications, Inc. and other firms have provided site acquisition services, including researching the area, identifying potential alternative candidates, and leasing the property at 288 Norfolk Street, Cambridge, MA.

6. The geographic area dfined by AT&T's radio frequency experts consist of parcels in the Wellington-Harrington area located within residential and non-residential districts, including the following districts: C-1, OS, BA.

7. After a search for alternative locations, only one other site appeared to satisfy AT&T's coverage needs for the area. The site, located at 146 Hampshire Street, is a 50' church steeple owned by the Mass Ave. Baptist Church. However, the 288 Norfolk Street site, which is located directly across from Hampshire Street, has three (3) existing carriers (Sprint/Nextel, T-Mobile, and Verizon) on the rooftop/façade of the building. Accordingly, AT&T determined it would be beneficial to attempt to co-locate there rather than the church steeple.

8. Based on my review of the zoning ordinance, my personal knowledge of the area, and the candidates approved by AT&T's radio frequency expert, the proposed Site is the best available and least obtrusive alternative to provide adequate coverage to this significant gap in AT&T's network coverage in the Wellington-Harrington area of Cambridge.

Sincerely,

Dan Bilezikian
Authorized Agent for New Cingular Wireless PCS, LLC ("AT&T")
SAI Communications, Inc.
125 Tremont St.
Rehoboth, MA 02769
401-368-0006

Dewberry

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

617.695.3400
617.695.3310 fax
www.dewberry.com

November 15, 2017
AT&T Mobility
550 Cochituate Road
Suites 13&14
Framingham, MA 01701

Re: MA2312 Cambridge Hampshire Street
288 Norfolk Street
Cambridge, MA 02139

To whom it may concern,

AT&T Mobility has proposed to install one (1) steel frame supporting two (2) antennas enclosed by (1) fiberglass chimney (Gamma sector), two (2) façade mounted antennas (Alpha sector), and one (1) 10'x10' ballast frame supporting two (2) antennas enclosed by one (1) fiberglass chimney (Beta sector) at the site referenced above. They have also proposed to install one enclosed steel frame supporting two (2) condenser units (Loading Dock). The proposed steel antenna frame will anchor directly into the existing roof. The proposed ballast frame will bear directly on the existing roof. The proposed façade mounted antennas will be anchored directly into the existing penthouse wall and the proposed steel condenser unit frame will be anchored directly into the existing loading dock roof.

Dewberry Engineers Inc. (Dewberry) has performed a structural analysis of the existing building structure for the proposed items listed above. The existing roof beams at the Loading Dock under the proposed steel condenser unit frame do not have sufficient capacity to support the proposed installation and will require additional reinforcement. Please refer to the latest construction drawings by Dewberry Engineers and the Structural Analysis dated 6/10/14 for details.

Dewberry has received an updated antenna design dated 08/03/17 where AT&T is proposing to install the following antennas in each sector Alpha, Beta, & Gamma:

Alpha, Beta, & Gamma:

- **(1x) Model #: OPA-65R-LCUU-H6 (72.0"x14.8"x7.4", 73 lbs. without RET/Mounting)**
- **(1x) Model #: TPA-65R-LCUUUU-H6 (72.0"x11.8"x11.6", 71 lbs. without RET/Mounting)**

Dewberry has evaluated the updated antenna design and concluded that the existing structural elements have adequate reserve capacity for the proposed antenna installation. For the antenna supporting steel frame design, refer to the previous Structural Analysis by Dewberry dated 03/31/14. Note that the antenna supporting steel frame designed in the 3/31/14 structural analysis was modified on 4/23/14 at the request of the Zoning Board to include only one (1) fiberglass chimney housing two (2) antennas and was addressed in the Structural Analysis by Dewberry dated 6/10/14. **This new structural analysis revision report is to reflect a revised fiberglass chimney frame, a new ballast frame, and a revised steel antenna support frame.** Any future antenna and equipment modifications to the proposed antenna supporting steel frames or ballast frames will require additional structural analysis and design.

Our assessment is based on the assumption that the existing building is in good condition and the original design and construction were performed in accordance with all applicable state and local building codes. If during construction any damage or deterioration is noticed on the building structure, Dewberry is to be notified to assess any deviation from the assumed condition.

If you have any questions, please do not hesitate to call me at 617-531-0742.

Sincerely,
Dewberry Engineers Inc.

Brenden Alexander, P. E.
Manager MEPS Engineering

Dewberry Engineers Inc.
Structural Calculation Summary Sheet

Job No:	50003936/50048589	**By:** JJC	**Date:** 11/14/17
Job Name:	Hampshire St., Site No.: MA2312	**Chkd:** BEA	**Date:** 11/15/17

Location: 288 Norfolk St., Cambridge, MA 02139
Client: AT&T

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

Brief Description:
1. Revision of fiberglass enclosure at Gamma Sector which is supported on a revised steel frame.
2. Proposed RRH ballast frame at Alpha Sector.
3. Revision of a fiberglass enclosure at Beta Sector and replacement of steel frame with a 10'x10' ballast frame.
4. Existing building is a 5 story office building with masonry bearing walls and timber framing.
5. Information for analysis from multiple site visits and previous Structural Analysis by Dewberry dated 3/31/14 and 6/10/14.

Basic Criteria:
1. IBC 2009
2. 780 CMR - MA Amendments to the IBC
3. TIA-222-G-4
4. AISC 14th Ed.

Design/Analysis Summary:
1. The proposed enclosures at Beta and Gamma Sector are to be 52" long x 44" wide x 78" tall fiberglass enclosures constructed as shown in the latest associated Dewberry construction drawings.1
2. The existing structural elements have sufficient capacity to support the proposed loading.
3. Design and analysis based on wind load and dead load design checks for normal bending stresses and shear.

Dewberry®

Job Number	50048589
Made by:	JJC
Date:	11/6/17
Checked by:	BEA
Date:	11/15/17

Cambridge Hampshire St. - Design Wind Load r6

R:\50003936\50048589 - Cambridge Hampshire Street\Adm\Reports\Structural\Rev. 6 - Move Beta & Gamma\50048589 - Struct. Calc. r6.xlsx

Wind Loading per TIA/222-G Standard

General Information from TIA-222-G-4

Item	Value	Description	Reference
V_{max} =	105.00	Cambridge, MA	*780 CMR MA Amendments to IBC*
K_d =	0.95	Wind Direction Probability Factor	*Table 2-2*
Class	II	Structure Classification	*Table 2-1*
I =	1.00	Importance Factor	*Table 2-3*
z = h =	67.30	ft. (A.G.L.)	*Centerline of Flue*
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 =	0.88	$= 2.01(z/z_g)^{(2/a)}$	*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. 2.6.7*

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

Design Wind Forces:

Section 2.6.9.6

$q_z = 0.00256(K_z)(K_{zt})(K_d)(V^2)(I)$ = 23.7 psf

where: K_z = 0.88, K_{zt} = 1.00, K_d = 0.95, V_{max} = 105.00 mph, I = 1.00

Section 2.6.9.2

$F_a = q_z * G_h * (EPA)_a$

F_a = 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)*

Element Definition:

Description	Dimensions (in.)			Weight (lb)
	W	D	H	
Prop. FRP Flue	52.00	44.00	90.00	-
RRUS-12	18.50	7.50	20.40	-

Wind Loading:

Members	Dimensions (ft.)			Area $(A_a)_n$ (Normal) (sf)	Area $(A_a)_t$ (Side) (sf)	Aspect Ratio (front)	Aspect Ratio (side)	C_a (front) Table 2-8	C_a (side) Table 2-8
	Width (Normal)	Depth (Tangent)	Height (or span)						
Prop. FRP Flue	4.33	3.67	7.50	32.48	27.53	1.73	2.04	1.20	1.20
RRUS-12	1.54	0.63	1.70	2.62	1.07	1.10	2.70	1.20	1.21

Members	Length/ No. of Supports	Gravity Load Per Support (lb)	$F_{(a)n}$ (lb) (Normal)	$F_{(a)t}$ (lb) (Tangent)	$F_{(a)n}$ (lb) (Normal) (per support)	$F_{(a)t}$ (lb) (Tangent) (per support)
Prop. FRP Flue	1.00	-	**785.05**	**665.39**	**785.05**	**665.39**
RRUS-12	1.00	-	**63.29**	**26.08**	**63.29**	**26.08**

Beta Sector Wind Loads

- Wind Loads are at a 30° angle from the support frame. For STAAD, wind loads are converted into X & Z components:

$P_{w\,3.66'}$ =	0.665 k	→	X component = *sin(30) =	0.333 k
		→	Z component = *cos(30) =	0.576 k
$P_{w\,4.33'}$ =	0.785 k	→	X component = -*cos(30) =	0.68 k
		→	Z component = -*sin(30) =	0.393 k

Dewberry

Job Number	50048589
Made by:	JJC
Date:	11/15/17
Checked by:	BEA
Date:	11/15/17

Riverside Rehab - Ballast Calculation

R:\50003936\50048589 - Cambridge Hampshire Street\Adm\Reports\Structural\Rev. 6 - Move Beta & Gamma\50048589 - Struct. Calc. r6.xlsx

Dead Load of Antenna Mount

Item	Quantity	Dimensions (ft.) L	W	H	Weight		Total Weight (lb)		
Antennas	2	-	-	-	51.00	lb. ea.	102.00	*	
RRUS	5	-	-	-	52.00	lb. ea.	260.00		
Surge	4	-	-	-	20.00	lb. ea.	80.00		
Fiberglass Flue	1	4.33	3.66	9.00	3.00	lb/ft^2	431.46	*	
FRP L4x4x3/8	6	9.00	-	-	2.07	lb/ft	111.78	*	
	4	4.33	-	-	2.07	lb/ft	35.85	*	
	4	3.66	-	-	2.07	lb/ft	30.30	*	
	2	3.75	-	-	2.07	lb/ft	15.53	*	
L3x3x1/4	2	3.66	-	-	5.40	lb/ft	39.53	*	
STD 3.5 Pipe	1	10.00	-	-	9.10	lb/ft	91.00	*	
C10x15.3	2	10.00	-	-	15.30	lb/ft	306.00		857.45
	2	8.33	-	-	15.30	lb/ft	254.90		
	3	2.88	-	-	15.30	lb/ft	132.19		
L2.5x2.5x1/4	4	2.50	-	-	4.10	lb/ft	41.00		
Misc. hardware	1	-	-	-	50.00	lb. ea.	50.00		
						Σ Total Weight =	1982	lbs	
						P_{DL} =	**1.98**	**kips**	

Required Ballast for Antenna Mount

Overturning Moment, M_{OT}

$P_w = \Sigma F_{(a)n}$ = 0.79 kips *(Flue Wind Load)*

x = 5.50 ft *(Center of flue to base of mount)*

$M_{OT} = P_w * x$

M_{OT} = 4.32 kip-ft

Resisting Moment, M_R

P_{DL} = 1.12 kips *Total Resisting DL, excludes all marked with an **

y = 5 ft *0.5 * Base Width*

$M_R = P_{DL} * y$

M_R = 5.62 kip-ft

Factor of Safety Check

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

F.S. = 1.30 > 1.5

FAIL, (Add'l Ballast Req'd)

Ballast Calculation

$F.S. = 1.5 = (P_{DL} + P_B)* y / M_{OT}$

$P_B = (1.5 * M_{OT} / y) - P_{DL}$

P_B = 171 lb *Total Ballast Req'd*

Total Dead Load (psf) for Exist. Roof Check

Total Dead Load (psf) = 2152.54 lb / (10' x 10') **21.5 psf**

Dewberry

Job Number	50048589
Made by:	JJC
Date:	11/15/17
Checked by:	BEA
Date:	11/15/17

Cambridge Hampshire St - RRH Ballast Frame

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Dead Load of Support Equip. Rack

Item	Quantity	Weight		Total Weight (lb)
RRUS-11	1	55.60	lb. ea.	50.60
RRUS-12	1	67.00	lb. ea.	50.00
RRUS-32	3	51.00	lb. ea.	153.00
RT-RRU5HD	1	282.00	lb. ea.	282.00

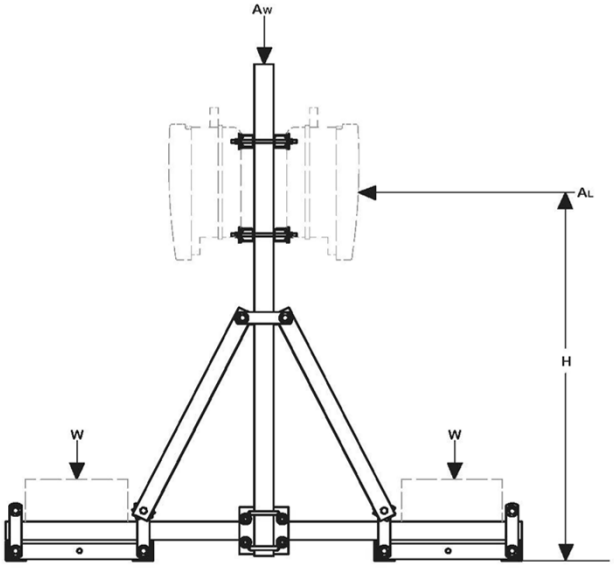
Σ Total Weight =	536	lb
P_{DL} =	**0.54**	**kips**

Wind Load on Support Equip. Rack

- Use wind load from the three RRH's with the largest area:

A_L = 190 lbs

Calculate Required Ballast for Support Equip. Rack



Ballast Equation:

W = Ballast Weight Per Tray

$$W = \frac{(A_L * H * 1.5) - (A_W * 2.625)}{4.5}$$

A_L =	0.19 k	*Total Wind Load*
A_W =	0.54 k	*Total Dead Load*
H =	4.0 ft	*Equipment CL A.R.L*
W =	**-62 lbs**	**Per Tray**

Total Ballast Weight = **0.0 lbs** ***(minimum)***

Total Dead Load (DL_T) = **0.540 k**

Total Dead Load (DL_T) = **23.8 psf**

(If P_B < 0, $DL_T = P_{DL}$ otherwise $DL_T = P_{DL} + 2P_B$)

Dewberry®

Job Number	50048589
Made by:	JJC
Date:	11/6/17
Checked by:	BEA
Date:	11/15/17

Cambridge Hampshire St. - Design Loads

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Dead Loads for STAAD

- STAAD to calculate self weight of frame
- (2x) 51 lb antennas per mounting pole *(assumed @ center of pole)*
- 3.66' x 4.33' x 7.5' tall fiberglass flue per mounting pole, say 3 psf = 360 lbs total
- Misc. support equipment:

RRUS =	51 lbs	*(each)*
A2 Module =	22 lbs	*(each)*
Surge Protect. =	20 lbs	*(each)*

(quantity & configuration varies by location, see sketches)

Existing Roof Dead Load

- Assume 15 psf for existing roof dead load (includes decking, waterproofing, insulation, suspended fixtures)

Snow/Roof Live Load

- For exist. roof check, use the greater value of Live Load (Design) or Snow Load (Calculated)

Roof Live Load = 30 psf *(Assumed)*

Snow Load =

$p_f = 0.7C_eC_tI_sp_g$ *(Chapter 7, ASCE 7-05)*

where:

C_e = 0.9 I_s = 1

C_t = 1 p_g = 45 $lb/ft.^2$

p_f = 28.35 psf

Since Roof Live Load > Snow Load, Use =	30.00	lb/ft²

Dewberry®

Job Number	50048589
Made by:	JJC
Date:	11/14/17
Checked by:	BEA
Date:	11/15/17

Cambridge Hampshire St. - Typical Column Post Down - r6

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Design Typical Post Down Over Exist. Columns

- Antenna mounts will post down directly over existing 9"x9" columns into existing 9"x12" beams
- Assume existing timber is southern pine

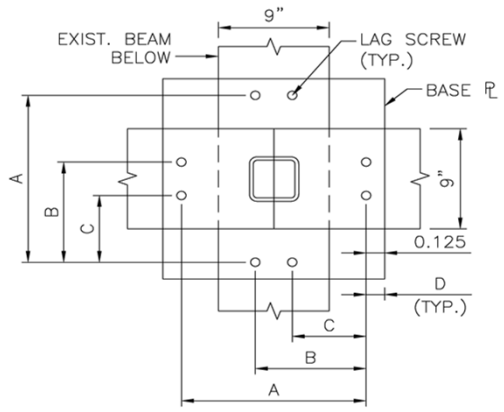
Max. Loading from STAAD

- Gamma Frame, Node #19, Load Case #5 = DL + WL (N/S) controls

$F_{x\,(max.)}$ = 0.963 k
$F_{z\,(max.)}$ = 0.300 k → $(F_x^2+F_z^2)^{0.5}$ = F_r = 1009 lbs *(Resultant Lateral Force)*

$M_{x\,(max.)}$ = 0.129 k-ft.
$M_{z\,(max.)}$ = 0.224 k-ft. → $M_{max.}$ = 0.224 k-ft

Post Down Details



Lag Screw Dimensions:

Dia. (D) = 0.75 in. T = 4.5 in. *(Table L2, NDS 2005)*
Length = 9 in.

Base Plate Geometry:

A = 15.0 in. Length = 18.0 in.
B = 9.0 in. Width = 18.0 in.
C = 6.0 in. # Screws (n) = 8
D = 1.5 in.

Max. Shear Per Lag Screw

- Resultant lateral force (shear) assumed equally divided amongst all lag screws

$Z_{max.}$ = (F_r / n) = 126.08 lbs

Max. Tension Per Lag Screw

- Tension (eccentric) due to max. moment:

$$M_{max} = T_{ecc.}A + \left(\frac{B}{A}\right)T_{ecc.}B + \left(\frac{C}{A}\right)T_{ecc.}C \quad \rightarrow \quad T_{ecc.} = 0.12 \text{ k}$$

$W_{max.}$ = $T_{ecc.}$ = 120 lbs *(per 2x screws)*

Design Typical Post Down Over Exist. Columns (cont'd)

Allowable Loads (per lag screw)

Allowable Tension ($W_{allow.}$) = $T(1800G^{3/2}D^{3/4})C_d$ where: C_d = 0.9 *(duration factor, permanent)*

= 2396.45 lbs G = 0.55 *(spec. grav. southern pine)*

Allowable Shear ($Z_{allow.}$) = ZC_dC_g where: C_d = 0.9 *(duration factor, permanent)*

= 757.32 lbs C_g = 0.93 *(group factor, calc'd)*

Z = 904.8 *(Yield Mode III_m)*

Check Tension/Shear (per lag screw)

Allowable Tension = 2396 lbs Max. Tension = 60 lbs

Allowable Shear = 757 lbs Max. Shear = 126 lbs

$$\frac{W_{max.}}{W_{allow.}} + \frac{Z_{max.}}{Z_{allow.}} \leq 1$$

$$\frac{60 \text{ lbs}}{2396 \text{ lbs}} + \frac{126 \text{ lbs}}{757 \text{ lbs}} = \mathbf{0.19 < 1.0, OK}$$

Dewberry

Job Number	50048589
Made by:	JJC
Date:	11/6/17
Checked by:	BEA
Date:	11/15/17

Hampshire St. Site No.: MA2312 - Lateral Design Values

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Yield Limit Equations for Single Shear - NDS 2005

Input Variables:

D =	0.75	in.	*(diameter of fastener)*
F_{yb} =	45000	psi	*(dowel bending yield strength)*
F_{em} =	2950	psi	*(Table 11.3.2 - main member dowel bearing strength)*
F_{es} =	87000	psi	*(side member dowel bearing strength)*
L_m =	8.5	in.	*(main member dowel bearing length)*
L_s =	0.5	in.	*(side member dowel bearing length)*
θ =	0		*(angle of load to grain)*

Calc'd Terms:

R_e =	0.0339	= F_{em}/F_{es}
R_t =	17.00	= L_m/L_s
k_θ =	1.00	= 1 + 0.25(θ/90)

Mode	R_d	*(reduction term)*
I_m	4.0	= $4k_\theta$
I_s	4.0	= $4k_\theta$
II	3.6	= $3.6k_\theta$
III_m	3.2	= $3.2k_\theta$
III_s	3.2	= $3.2k_\theta$
IV	3.2	= $3.2k_\theta$

$$k_1 = \frac{\sqrt{R_e + 2R_e^2\left(1 + R_t + R_t^2\right) + R_t^2 R_e^3} - R_e\left(1 + R_t\right)}{\left(1 + R_e\right)}$$

k_1 = 0.2479

$$k_2 = -1 + \sqrt{2\left(1 + R_e\right) + \frac{2F_{yb}\left(1 + 2R_e\right)D^2}{3F_{em}L_m^2}}$$

k_2 = 0.4671

$$k_3 = -1 + \sqrt{\frac{2\left(1 + R_e\right)}{R_e} + \frac{2F_{yb}\left(2 + R_e\right)D^2}{3F_{em}L_s^2}}$$

k_3 = 9.3699

Yield Limit Modes (Z):

Mode	Equation				
I_m	$Z = \frac{DL_mF_{em}}{R_d}$	Z =	4701.6	lbs	
I_s	$Z = \frac{DL_sF_{es}}{R_d}$	Z =	8156.3	lbs	
II	$Z = \frac{k_1DL_sF_{es}}{R_d}$	Z =	2246.6	lbs	
III_m	$Z = \frac{k_2DL_mF_{em}}{\left(1 + 2R_e\right)R_d}$	Z =	904.8	lbs	**<<< Controls**
III_s	$Z = \frac{k_3DL_sF_{em}}{\left(2 + R_e\right)R_d}$	Z =	1592.6	lbs	
IV	$Z = \frac{D^2}{R_d}\sqrt{\frac{2F_{em}F_{yb}}{3\left(1 + R_e\right)}}$	Z =	1626.3	lbs	

Dewberry

Job Number	50048589
Made by:	JJC
Date:	11/6/17
Checked by:	BEA
Date:	11/15/17

Hampshire St. Site No.: MA2312 - Lateral Design Values

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Group Action Factor - NDS 2005

Input Variables:

D =	0.5	in.	*(diameter of fastener)*
n =	2		*(# of fasteners in a row*
E_m =	1500000	psi	*(main member mod. of elas.)*
E_s =	2.9E+07	psi	*(side member mod. of elas.)*
A_m =	108	$in.^2$	*(x-section area of main member)*
A_s =	9	$in.^2$	*(Σ of x-section area of side members)*
s =	15	in.	*(center to center spacing)*

Notes:

- Case where the most conservative value for C_g is generated will be used
- Area of beam = 9"x12"
- Area of baseplate = 1/2"x18"
- maximum spacing = 15"

Calc'd Terms:

R_{ea} = 0.621 → $min.\left[\frac{E_s A_s}{E_m A_m} or \frac{E_m A_m}{E_s A_s}\right]$

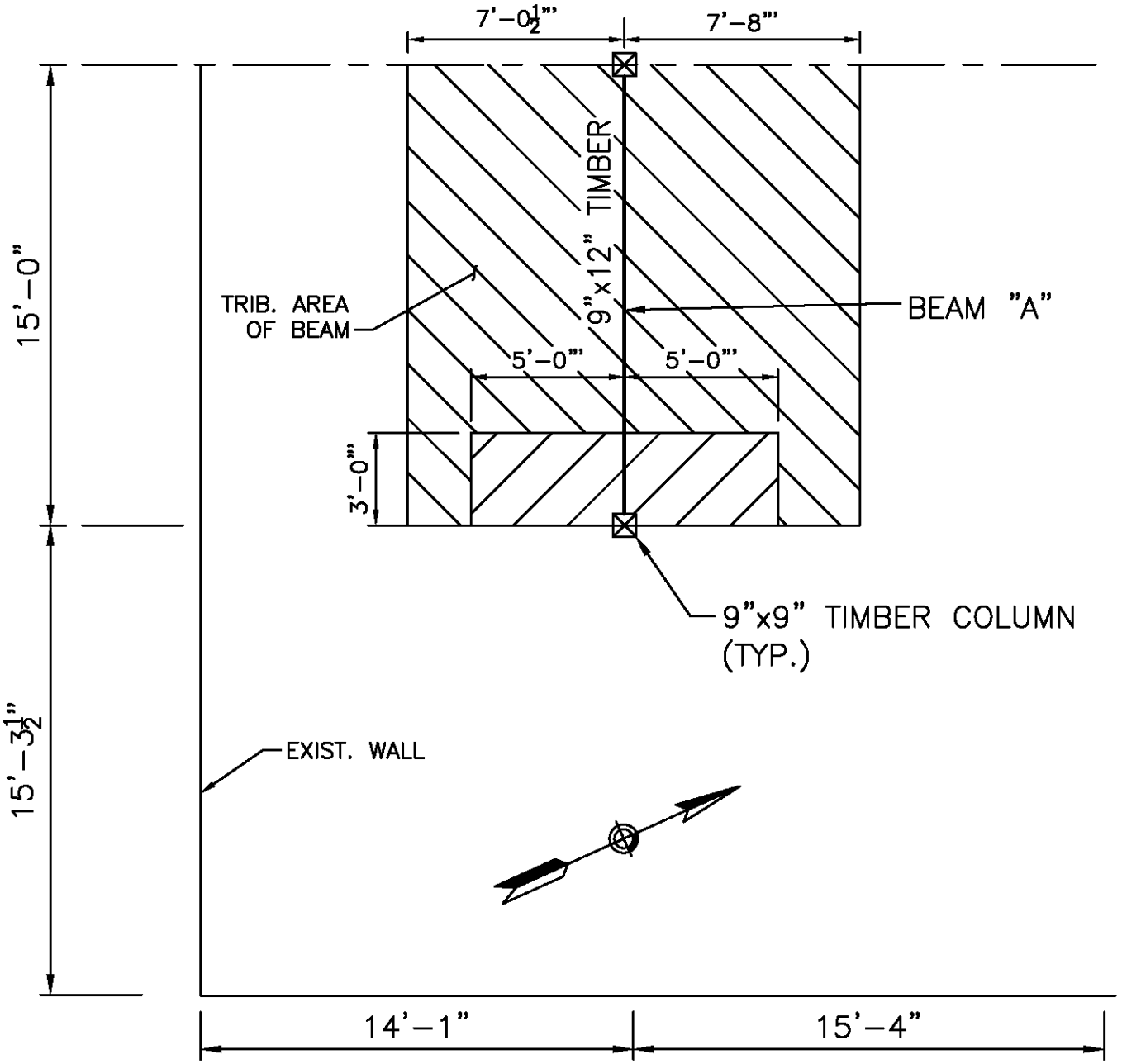
y = 95459.4 → $270{,}000D^{1.5}$

u = 1.007 → $1+\gamma\frac{s}{2}\left[\frac{1}{E_m A_m}+\frac{1}{E_s A_s}\right]$

m = 0.887 → $u-\sqrt{u^2-1}$

Group Action Factor (C_g):

$$C_g=\left[\frac{m\left(1-m^{2n}\right)}{n\left[\left(1+R_{ea}m^n\right)\left(1+m\right)-1+m^{2n}\right]}\right]\left[\frac{1+R_{ea}}{1-m}\right]$$ = 0.93



BETA SECTOR – EXIST. ROOF FRAMING PLAN

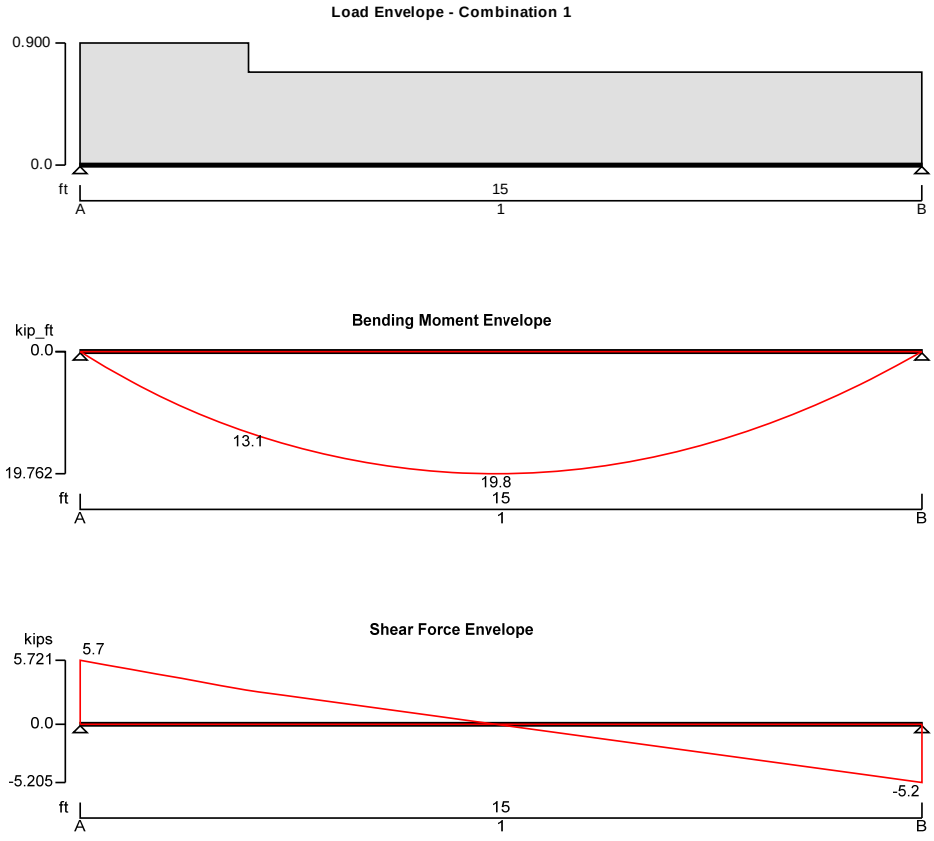
Tekla Tedds Dewberry	Project: Cambridge Hampshire Street				Job Ref.: 50048589	
	Section: Beta Sector Existing Roof Check – Beam A				Sheet no./rev.: 1	
	Calc. by: JJC	Date: 11/14/2017	Chk'd by:	Date:	App'd by:	Date:

WOOD BEAM ANALYSIS & DESIGN (NDS)

STRUCTURAL WOOD BEAM ANALYSIS & DESIGN (NDS)

In accordance with the ANSI/AF&PA NDS-2012 using the ASD method

TEDDS calculation version 1.7.03



Applied loading

Beam loads

	Dead self weight of beam × 1
Dead	Dead full UDL 221 lb/ft
Snow	Snow full UDL 441 lb/ft
Ballast Frame	Dead partial UDL 215 lb/ft from 0.00 in to 36.00 in

Load combinations

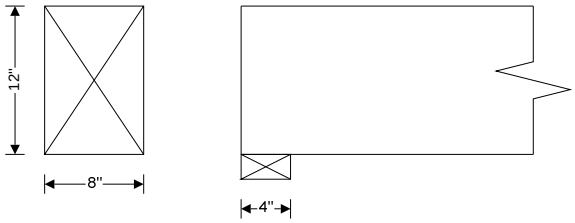
Conservatively Assume Full Ballast DL

Load combination 1	Support A	Dead × 1.00
		Snow × 1.00
	Span 1	Dead × 1.00
		Snow × 1.00
	Support B	Dead × 1.00

Snow × 1.00

Analysis results

Maximum moment	M_{max} = **19762** lb_ft	M_{min} = **0** lb_ft
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **19762** lb_ft	
Maximum shear	F_{max} = **5720** lb	F_{min} = **-5205** lb
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **5720** lb	
Total load on member	W_{tot} = **10925** lb	
Reaction at support A	R_{A_max} = **5720** lb	R_{A_min} = **5720** lb
Unfactored dead load reaction at support A	R_{A_Dead} = **2413** lb	
Unfactored snow load reaction at support A	R_{A_Snow} = **3307** lb	
Reaction at support B	R_{B_max} = **5205** lb	R_{B_min} = **5205** lb
Unfactored dead load reaction at support B	R_{B_Dead} = **1897** lb	
Unfactored snow load reaction at support B	R_{B_Snow} = **3308** lb	



Sawn lumber section details

Nominal breadth of sections	b_{nom} = **8** in
Full-sawn breadth of sections	b = **8** in
Nominal depth of sections	d_{nom} = **12** in
Full-sawn depth of sections	d = **12** in
Number of sections in member	N = **1**
Overall breadth of member	b_b = N × b = **8** in
Species, grade and size classification	Southern Pine, No.1 grade, 5" x 5" and larger
Bending parallel to grain	F_b = **1350** lb/in^2
Tension parallel to grain	F_t = **900** lb/in^2
Compression parallel to grain	F_c = **825** lb/in^2
Compression perpendicular to grain	F_{c_perp} = **375** lb/in^2
Shear parallel to grain	F_v = **165** lb/in^2
Modulus of elasticity	E = **1500000** lb/in^2
Modulus of elasticity, stability calculations	E_{min} = **550000** lb/in^2
Mean shear modulus	G_{def} = E / 16 = **93750** lb/in^2

Member details

Service condition	**Dry**
Length of span	L_{s1} = **15** ft
Length of bearing	L_b = **4** in
Load duration	**Two months**

Section properties

Cross sectional area of member	A = N × b × d = **96.00** in^2

Section modulus	$S_x = N \times b \times d^2 / 6 =$ **192.00** in^3
	$S_y = d \times (N \times b)^2 / 6 =$ **128.00** in^3
Second moment of area	$I_x = N \times b \times d^3 / 12 =$ **1152.00** in^4
	$I_y = d \times (N \times b)^3 / 12 =$ **512.00** in^4

Adjustment factors

Load duration factor - Table 2.3.2	$C_D =$ **1.15**
Temperature factor - Table 2.3.3	$C_t =$ **1.00**
Size factor for bending - Table 4D	$C_{Fb} =$ **1.00**
Size factor for tension - Table 4D	$C_{Ft} =$ **1.00**
Size factor for compression - Table 4D	$C_{Fc} =$ **1.00**
Flat use factor - Table 4D	$C_{fu} =$ **1.00**
Incising factor for modulus of elasticity - Table 4.3.8	
	$C_{iE} =$ **1.00**
Incising factor for bending, shear, tension & compression - Table 4.3.8	
	$C_i =$ **1.00**
Incising factor for perpendicular compression - Table 4.3.8	
	$C_{ic\_perp} =$ **1.00**
Repetitive member factor - cl.4.3.9	$C_r =$ **1.00**
Bearing area factor - cl.3.10.4	$C_b =$ **1.00**
Depth-to-breadth ratio	$d_{nom} / (N \times b_{nom}) =$ **1.50**
- Beam is fully restrained	
Beam stability factor - cl.3.3.3	$C_L =$ **1.00**

Bearing perpendicular to grain - cl.3.10.2

Design compression perpendicular to grain	$F_{c\_perp}' = F_{c\_perp} \times C_t \times C_i \times C_b =$ **375** lb/in^2
Applied compression stress perpendicular to grain	$f_{c\_perp} = R_{A\_max} / (N \times b \times L_b) =$ **179** lb/in^2
	$f_{c\_perp} / F_{c\_perp}' =$ **0.477**

PASS - Design compressive stress exceeds applied compressive stress at bearing

Strength in bending - cl.3.3.1

Design bending stress	$F_b' = F_b \times C_D \times C_t \times C_L \times C_{Fb} \times C_i \times C_r =$ **1552** lb/in^2
Actual bending stress	$f_b = M / S_x =$ **1235** lb/in^2
	$f_b / F_b' =$ **0.796**

PASS - Design bending stress exceeds actual bending stress

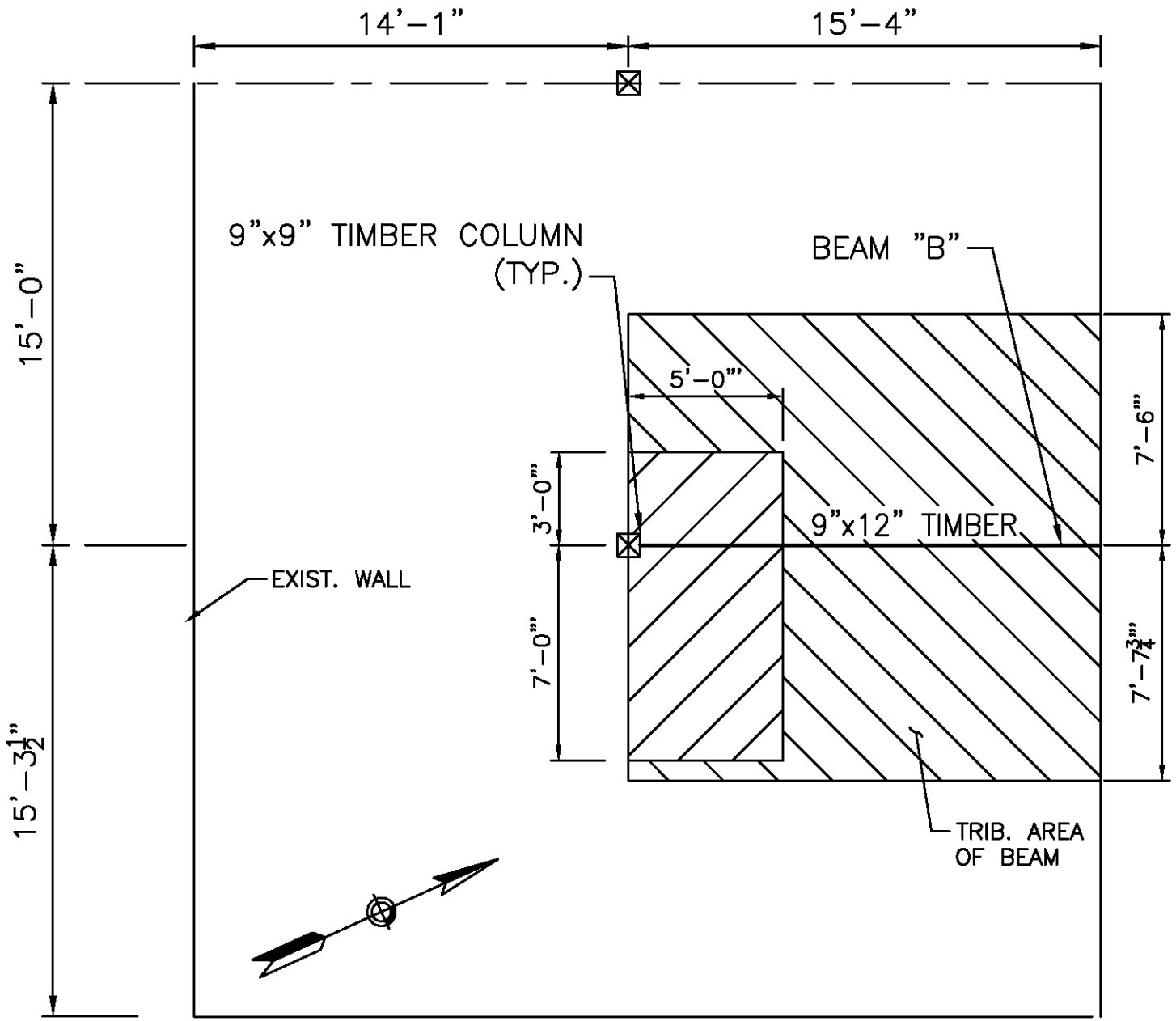
Strength in shear parallel to grain - cl.3.4.1

Design shear stress	$F_v' = F_v \times C_D \times C_t \times C_i =$ **190** lb/in^2
Actual shear stress - eq.3.4-2	$f_v = 3 \times F / (2 \times A) =$ **89** lb/in^2
	$f_v / F_v' =$ **0.471**

PASS - Design shear stress exceeds actual shear stress

Deflection - cl.3.5.1

Modulus of elasticity for deflection	$E' = E \times C_{ME} \times C_t \times C_{iE} =$ **1500000** lb/in^2
Design deflection	$\delta_{adm} = 0.003 \times L_{s1} =$ **0.540** in
Total deflection	$\delta_{b\_s1} =$ **0.465** in
	$\delta_{b\_s1} / \delta_{adm} =$ **0.861**



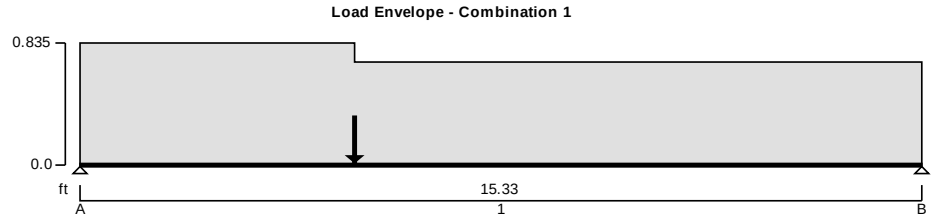
BETA SECTOR – EXIST. ROOF FRAMING PLAN

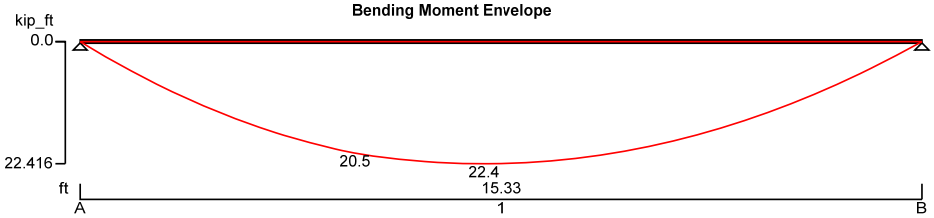
WOOD BEAM ANALYSIS & DESIGN (NDS)

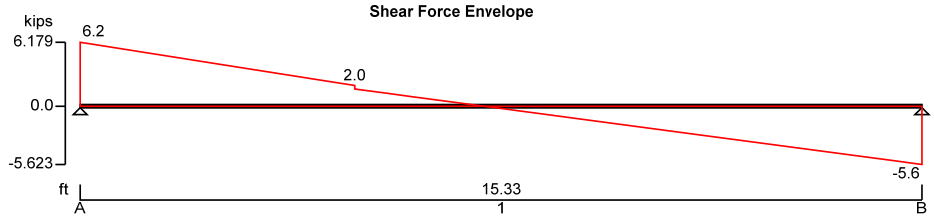
STRUCTURAL WOOD BEAM ANALYSIS & DESIGN (NDS)

In accordance with the ANSI/AF&PA NDS-2012 using the ASD method

TEDDS calculation version 1.7.03







Applied loading

Beam loads

	Dead self weight of beam × 1
Dead	Dead full UDL 227 lb/ft
Snow	Snow full UDL 455 lb/ft
Ballast (just frame)	Dead partial UDL 130 lb/ft from 0.00 in to 60.00 in
Ballast Point Load (RRH's)	Dead point load 340 lb at 60.00 in

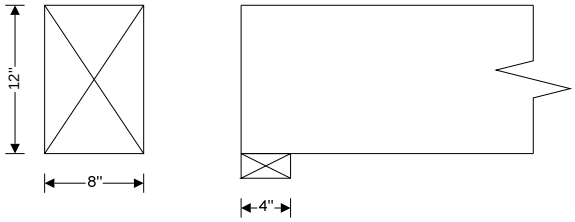
Load combinations

Load combination 1	Support A	Dead × 1.00
		Snow × 1.00
	Span 1	Dead × 1.00
		Snow × 1.00

	Support B	Dead × 1.00
		Snow × 1.00

Analysis results

Maximum moment	M_{max} = **22416** lb_ft	M_{min} = **0** lb_ft
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **22416** lb_ft	
Maximum shear	F_{max} = **6179** lb	F_{min} = **-5623** lb
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **6179** lb	
Total load on member	W_{tot} = **11803** lb	
Reaction at support A	R_{A_max} = **6179** lb	R_{A_min} = **6179** lb
Unfactored dead load reaction at support A	R_{A_Dead} = **2692** lb	
Unfactored snow load reaction at support A	R_{A_Snow} = **3488** lb	
Reaction at support B	R_{B_max} = **5623** lb	R_{B_min} = **5623** lb
Unfactored dead load reaction at support B	R_{B_Dead} = **2136** lb	
Unfactored snow load reaction at support B	R_{B_Snow} = **3488** lb	



Sawn lumber section details

Nominal breadth of sections	b_{nom} = **8** in
Full-sawn breadth of sections	b = **8** in
Nominal depth of sections	d_{nom} = **12** in
Full-sawn depth of sections	d = **12** in
Number of sections in member	N = **1**
Overall breadth of member	b_b = N × b = **8** in
Species, grade and size classification	Southern Pine, No.1 grade, 5" x 5" and larger
Bending parallel to grain	F_b = **1350** lb/in^2
Tension parallel to grain	F_t = **900** lb/in^2
Compression parallel to grain	F_c = **825** lb/in^2
Compression perpendicular to grain	F_{c_perp} = **375** lb/in^2
Shear parallel to grain	F_v = **165** lb/in^2
Modulus of elasticity	E = **1500000** lb/in^2
Modulus of elasticity, stability calculations	E_{min} = **550000** lb/in^2
Mean shear modulus	G_{def} = E / 16 = **93750** lb/in^2

Member details

Service condition	**Dry**
Length of span	L_{s1} = **15.33** ft
Length of bearing	L_b = **4** in
Load duration	**Two months**

Section properties

Cross sectional area of member — $A = N \times b \times d =$ **96.00** in^2

Section modulus — $S_x = N \times b \times d^2 / 6 =$ **192.00** in^3

$S_y = d \times (N \times b)^2 / 6 =$ **128.00** in^3

Second moment of area — $I_x = N \times b \times d^3 / 12 =$ **1152.00** in^4

$I_y = d \times (N \times b)^3 / 12 =$ **512.00** in^4

Adjustment factors

Load duration factor - Table 2.3.2 — $C_D =$ **1.15**

Temperature factor - Table 2.3.3 — $C_t =$ **1.00**

Size factor for bending - Table 4D — $C_{Fb} =$ **1.00**

Size factor for tension - Table 4D — $C_{Ft} =$ **1.00**

Size factor for compression - Table 4D — $C_{Fc} =$ **1.00**

Flat use factor - Table 4D — $C_{fu} =$ **1.00**

Incising factor for modulus of elasticity - Table 4.3.8

$C_{iE} =$ **1.00**

Incising factor for bending, shear, tension & compression - Table 4.3.8

$C_i =$ **1.00**

Incising factor for perpendicular compression - Table 4.3.8

$C_{ic\_perp} =$ **1.00**

Repetitive member factor - cl.4.3.9 — $C_r =$ **1.00**

Bearing area factor - cl.3.10.4 — $C_b =$ **1.00**

Depth-to-breadth ratio — $d_{nom} / (N \times b_{nom}) =$ **1.50**

- Beam is fully restrained

Beam stability factor - cl.3.3.3 — $C_L =$ **1.00**

Bearing perpendicular to grain - cl.3.10.2

Design compression perpendicular to grain — $F_{c\_perp}' = F_{c\_perp} \times C_t \times C_i \times C_b =$ **375** lb/in^2

Applied compression stress perpendicular to grain — $f_{c\_perp} = R_{A\_max} / (N \times b \times L_b) =$ **193** lb/in^2

$f_{c\_perp} / F_{c\_perp}' =$ **0.515**

PASS - Design compressive stress exceeds applied compressive stress at bearing

Strength in bending - cl.3.3.1

Design bending stress — $F_b' = F_b \times C_D \times C_t \times C_L \times C_{Fb} \times C_i \times C_r =$ **1552** lb/in^2

Actual bending stress — $f_b = M / S_x =$ **1401** lb/in^2

$f_b / F_b' =$ **0.902**

PASS - Design bending stress exceeds actual bending stress

Strength in shear parallel to grain - cl.3.4.1

Design shear stress — $F_v' = F_v \times C_D \times C_t \times C_i =$ **190** lb/in^2

Actual shear stress - eq.3.4-2 — $f_v = 3 \times F / (2 \times A) =$ **97** lb/in^2

$f_v / F_v' =$ **0.509**

PASS - Design shear stress exceeds actual shear stress

Deflection - cl.3.5.1

Modulus of elasticity for deflection — $E' = E \times C_{ME} \times C_t \times C_{iE} =$ **1500000** lb/in^2

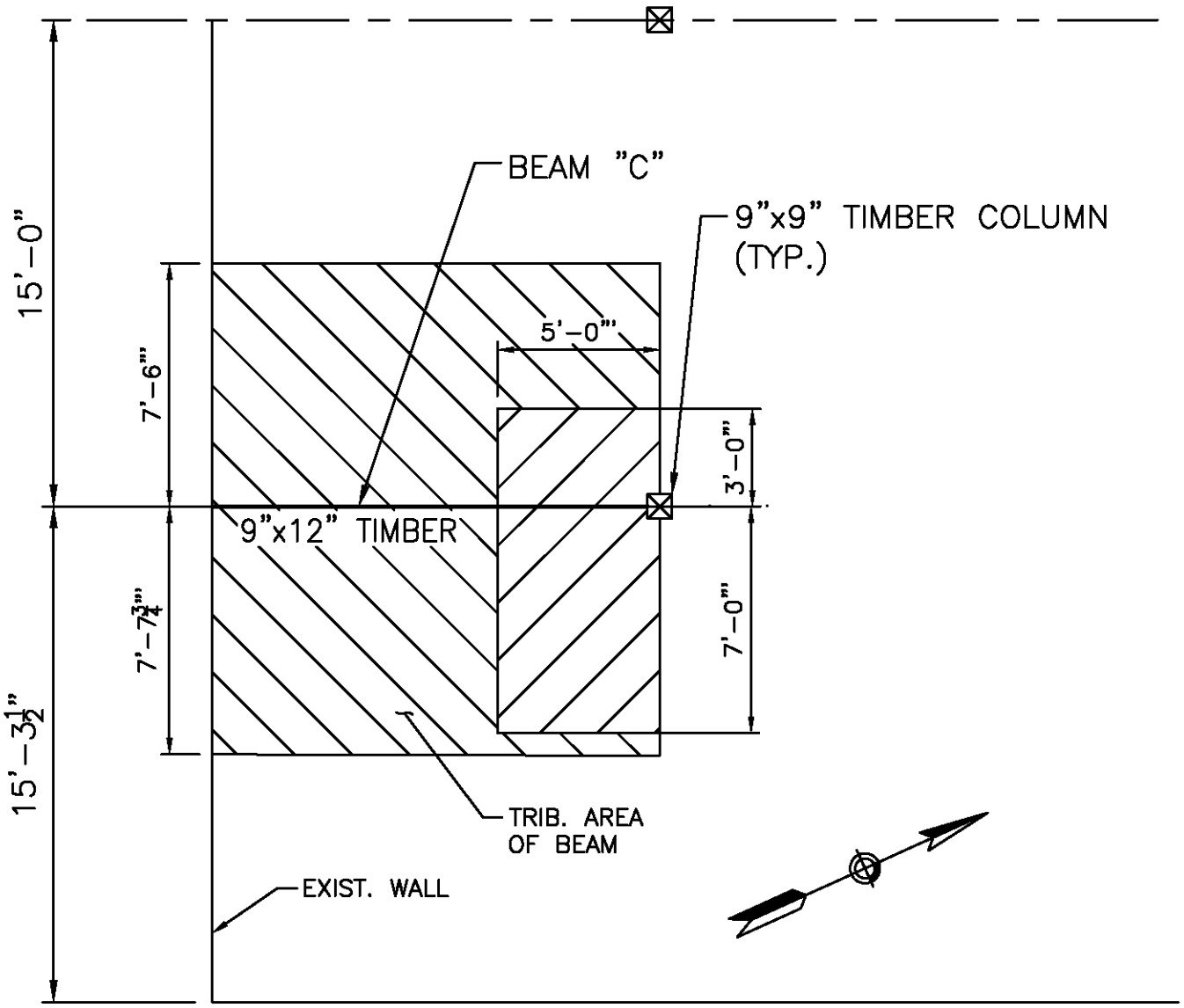
Design deflection — $\delta_{adm} = 0.003 \times L_{s1} =$ **0.552** in

Total deflection

δ_{b_s1} = **0.551** in

δ_{b_s1} / δ_{adm} = **0.998**

PASS - Total deflection is less than design deflection



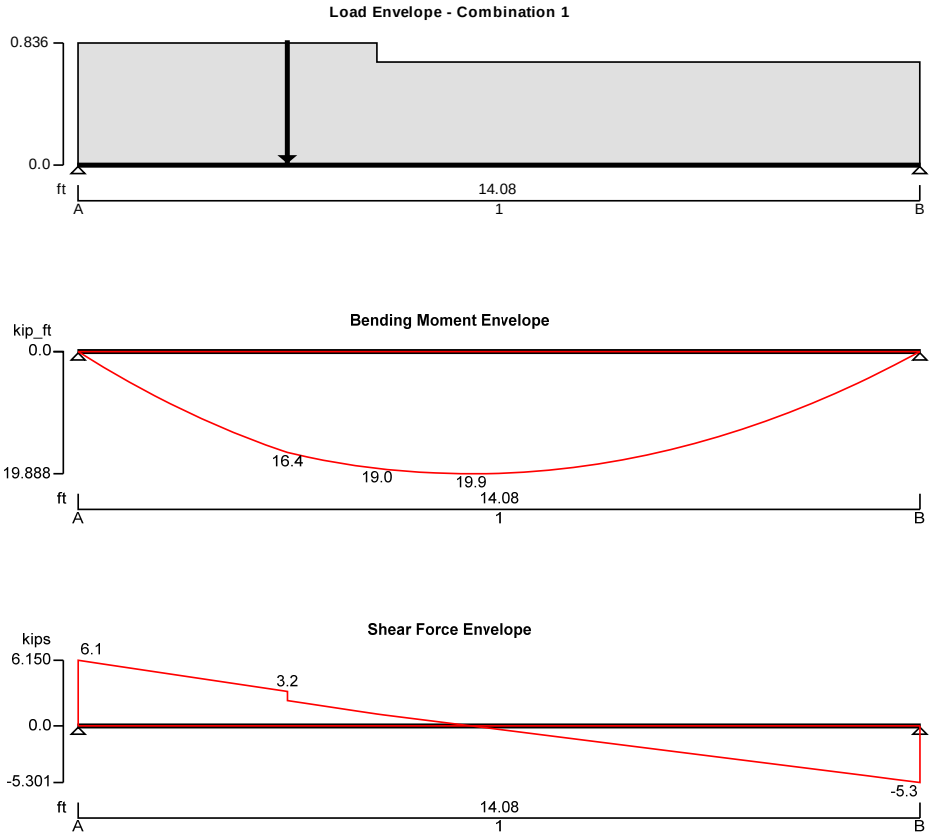
BETA SECTOR – EXIST. ROOF FRAMING PLAN

WOOD BEAM ANALYSIS & DESIGN (NDS)

STRUCTURAL WOOD BEAM ANALYSIS & DESIGN (NDS)

In accordance with the ANSI/AF&PA NDS-2012 using the ASD method

TEDDS calculation version 1.7.03



Applied loading

Beam loads

	Dead self weight of beam × 1
Dead	Dead full UDL 228 lb/ft
Snow	Snow full UDL 455 lb/ft
Ballast (just the frame)	Dead partial UDL 130 lb/ft from 0.00 in to 60.00 in
Ballast Point Load (Pipe Mount)	Dead point load 855 lb at 42.00 in

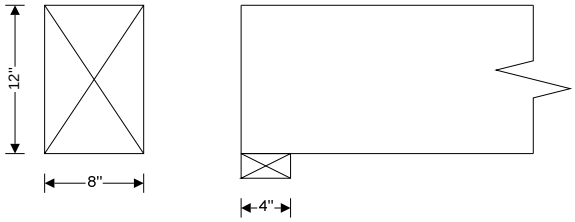
Load combinations

Load combination 1	Support A	Dead × 1.00
		Snow × 1.00
	Span 1	Dead × 1.00
		Snow × 1.00

	Support B	Dead × 1.00
		Snow × 1.00

Analysis results

Maximum moment	M_{max} = **19888** lb_ft	M_{min} = **0** lb_ft
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **19888** lb_ft	
Maximum shear	F_{max} = **6150** lb	F_{min} = **-5301** lb
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **6150** lb	
Total load on member	W_{tot} = **11450** lb	
Reaction at support A	R_{A_max} = **6150** lb	R_{A_min} = **6150** lb
Unfactored dead load reaction at support A	R_{A_Dead} = **2946** lb	
Unfactored snow load reaction at support A	R_{A_Snow} = **3203** lb	
Reaction at support B	R_{B_max} = **5301** lb	R_{B_min} = **5301** lb
Unfactored dead load reaction at support B	R_{B_Dead} = **2097** lb	
Unfactored snow load reaction at support B	R_{B_Snow} = **3203** lb	



Sawn lumber section details

Nominal breadth of sections	b_{nom} = **8** in
Full-sawn breadth of sections	b = **8** in
Nominal depth of sections	d_{nom} = **12** in
Full-sawn depth of sections	d = **12** in
Number of sections in member	N = **1**
Overall breadth of member	b_b = N × b = **8** in
Species, grade and size classification	Southern Pine, No.1 grade, 5" x 5" and larger
Bending parallel to grain	F_b = **1350** lb/in^2
Tension parallel to grain	F_t = **900** lb/in^2
Compression parallel to grain	F_c = **825** lb/in^2
Compression perpendicular to grain	F_{c_perp} = **375** lb/in^2
Shear parallel to grain	F_v = **165** lb/in^2
Modulus of elasticity	E = **1500000** lb/in^2
Modulus of elasticity, stability calculations	E_{min} = **550000** lb/in^2
Mean shear modulus	G_{def} = E / 16 = **93750** lb/in^2

Member details

Service condition	**Dry**
Length of span	L_{s1} = **14.08** ft
Length of bearing	L_b = **4** in
Load duration	**Two months**

Section properties

Cross sectional area of member — $A = N \times b \times d =$ **96.00** in^2

Section modulus — $S_x = N \times b \times d^2 / 6 =$ **192.00** in^3

$S_y = d \times (N \times b)^2 / 6 =$ **128.00** in^3

Second moment of area — $I_x = N \times b \times d^3 / 12 =$ **1152.00** in^4

$I_y = d \times (N \times b)^3 / 12 =$ **512.00** in^4

Adjustment factors

Load duration factor - Table 2.3.2 — $C_D =$ **1.15**

Temperature factor - Table 2.3.3 — $C_t =$ **1.00**

Size factor for bending - Table 4D — $C_{Fb} =$ **1.00**

Size factor for tension - Table 4D — $C_{Ft} =$ **1.00**

Size factor for compression - Table 4D — $C_{Fc} =$ **1.00**

Flat use factor - Table 4D — $C_{fu} =$ **1.00**

Incising factor for modulus of elasticity - Table 4.3.8

$C_{iE} =$ **1.00**

Incising factor for bending, shear, tension & compression - Table 4.3.8

$C_i =$ **1.00**

Incising factor for perpendicular compression - Table 4.3.8

$C_{ic\_perp} =$ **1.00**

Repetitive member factor - cl.4.3.9 — $C_r =$ **1.00**

Bearing area factor - cl.3.10.4 — $C_b =$ **1.00**

Depth-to-breadth ratio — $d_{nom} / (N \times b_{nom}) =$ **1.50**

- Beam is fully restrained

Beam stability factor - cl.3.3.3 — $C_L =$ **1.00**

Bearing perpendicular to grain - cl.3.10.2

Design compression perpendicular to grain — $F_{c\_perp}' = F_{c\_perp} \times C_t \times C_i \times C_b =$ **375** lb/in^2

Applied compression stress perpendicular to grain — $f_{c\_perp} = R_{A\_max} / (N \times b \times L_b) =$ **192** lb/in^2

$f_{c\_perp} / F_{c\_perp}' =$ **0.512**

PASS - Design compressive stress exceeds applied compressive stress at bearing

Strength in bending - cl.3.3.1

Design bending stress — $F_b' = F_b \times C_D \times C_t \times C_L \times C_{Fb} \times C_i \times C_r =$ **1552** lb/in^2

Actual bending stress — $f_b = M / S_x =$ **1243** lb/in^2

$f_b / F_b' =$ **0.801**

PASS - Design bending stress exceeds actual bending stress

Strength in shear parallel to grain - cl.3.4.1

Design shear stress — $F_v' = F_v \times C_D \times C_t \times C_i =$ **190** lb/in^2

Actual shear stress - eq.3.4-2 — $f_v = 3 \times F / (2 \times A) =$ **96** lb/in^2

$f_v / F_v' =$ **0.506**

PASS - Design shear stress exceeds actual shear stress

Deflection - cl.3.5.1

Modulus of elasticity for deflection — $E' = E \times C_{ME} \times C_t \times C_{iE} =$ **1500000** lb/in^2

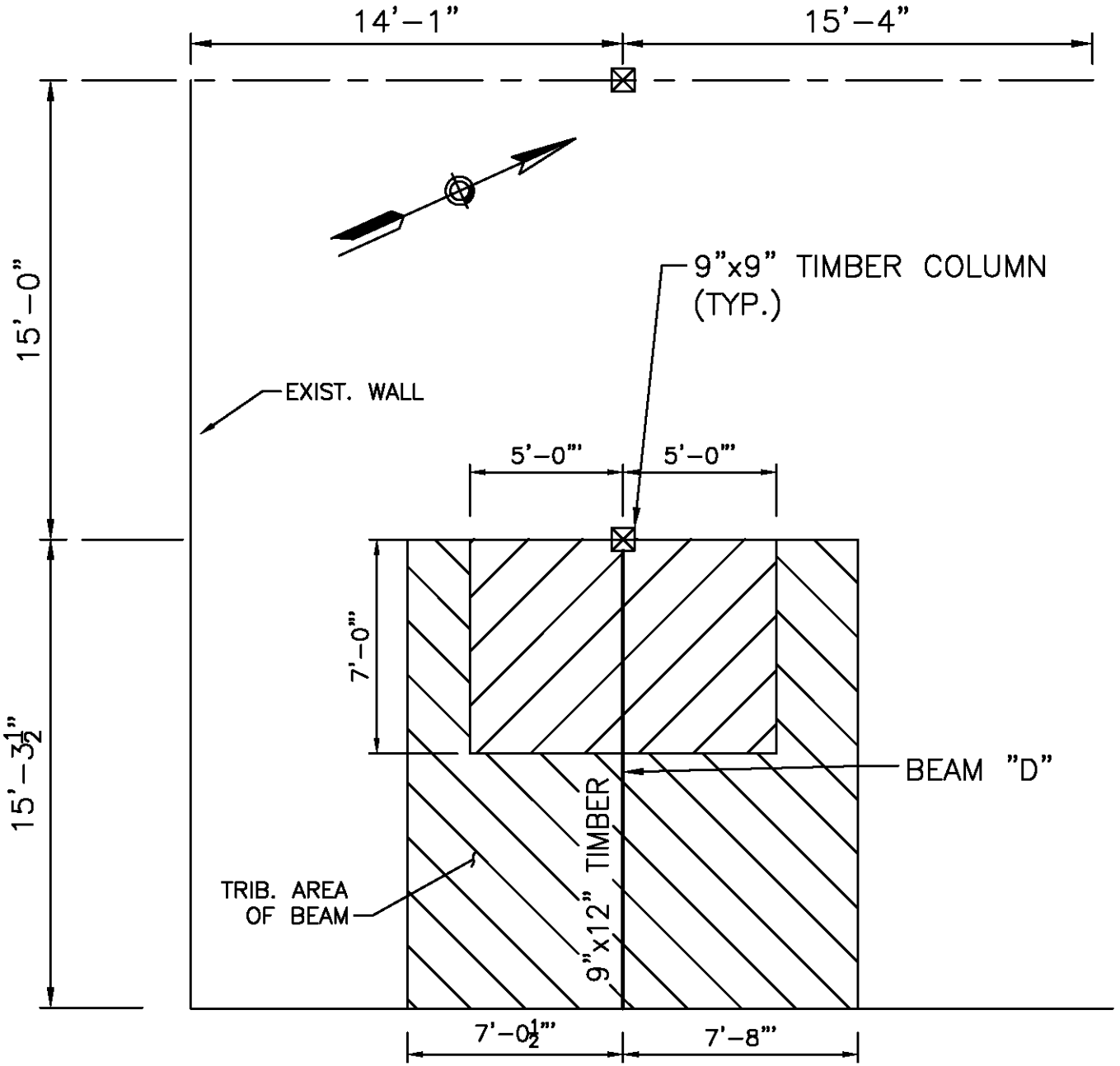
Design deflection — $\delta_{adm} = 0.003 \times L_{s1} =$ **0.507** in

Total deflection

δ_{b_s1} = **0.414** in

δ_{b_s1} / δ_{adm} = **0.817**

PASS - Total deflection is less than design deflection



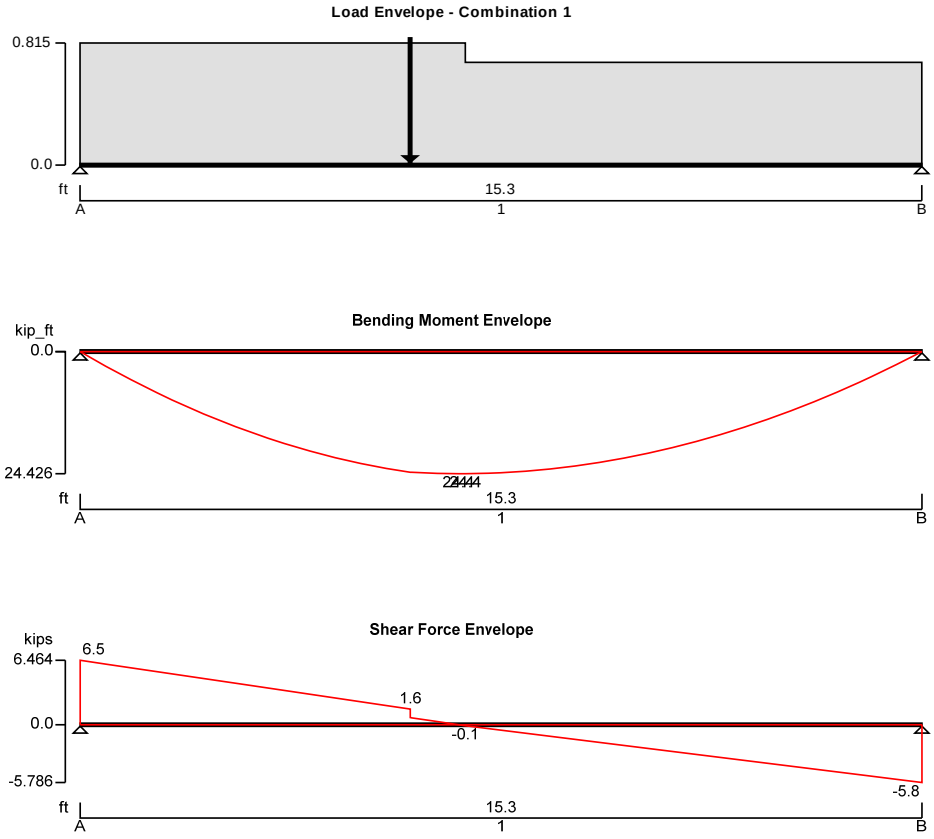
BETA SECTOR – EXIST. ROOF FRAMING PLAN

WOOD BEAM ANALYSIS & DESIGN (NDS)

STRUCTURAL WOOD BEAM ANALYSIS & DESIGN (NDS)

In accordance with the ANSI/AF&PA NDS-2012 using the ASD method

TEDDS calculation version 1.7.03



Applied loading

Beam loads

	Dead self weight of beam × 1
Dead	Dead full UDL 221 lb/ft
Snow	Snow full UDL 441 lb/ft
Ballast (just the frame)	Dead partial UDL 130 lb/ft from 0.00 in to 84.00 in
Ballast Point Load (Pipe Mount)	Dead point load 855 lb at 72.00 in

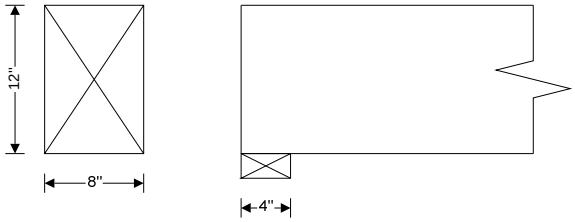
Load combinations

Load combination 1	Support A	Dead × 1.00
		Snow × 1.00
	Span 1	Dead × 1.00
		Snow × 1.00

	Support B	Dead × 1.00
		Snow × 1.00

Analysis results

Maximum moment	M_{max} = **24426** lb_ft	M_{min} = **0** lb_ft
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **24426** lb_ft	
Maximum shear	F_{max} = **6464** lb	F_{min} = **-5786** lb
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **6464** lb	
Total load on member	W_{tot} = **12251** lb	
Reaction at support A	R_{A_max} = **6464** lb	R_{A_min} = **6464** lb
Unfactored dead load reaction at support A	R_{A_Dead} = **3091** lb	
Unfactored snow load reaction at support A	R_{A_Snow} = **3374** lb	
Reaction at support B	R_{B_max} = **5786** lb	R_{B_min} = **5786** lb
Unfactored dead load reaction at support B	R_{B_Dead} = **2413** lb	
Unfactored snow load reaction at support B	R_{B_Snow} = **3374** lb	



Sawn lumber section details

Nominal breadth of sections	b_{nom} = **8** in
Full-sawn breadth of sections	b = **8** in
Nominal depth of sections	d_{nom} = **12** in
Full-sawn depth of sections	d = **12** in
Number of sections in member	N = **1**
Overall breadth of member	b_b = N × b = **8** in
Species, grade and size classification	Southern Pine, No.1 grade, 5" x 5" and larger
Bending parallel to grain	F_b = **1350** lb/in^2
Tension parallel to grain	F_t = **900** lb/in^2
Compression parallel to grain	F_c = **825** lb/in^2
Compression perpendicular to grain	F_{c_perp} = **375** lb/in^2
Shear parallel to grain	F_v = **165** lb/in^2
Modulus of elasticity	E = **1500000** lb/in^2
Modulus of elasticity, stability calculations	E_{min} = **550000** lb/in^2
Mean shear modulus	G_{def} = E / 16 = **93750** lb/in^2

Member details

Service condition	**Dry**
Length of span	L_{s1} = **15.3** ft
Length of bearing	L_b = **4** in
Load duration	**Two months**

Section properties

Cross sectional area of member	$A = N \times b \times d =$ **96.00** in^2
Section modulus	$S_x = N \times b \times d^2 / 6 =$ **192.00** in^3
	$S_y = d \times (N \times b)^2 / 6 =$ **128.00** in^3
Second moment of area	$I_x = N \times b \times d^3 / 12 =$ **1152.00** in^4
	$I_y = d \times (N \times b)^3 / 12 =$ **512.00** in^4

Adjustment factors

Load duration factor - Table 2.3.2	$C_D =$ **1.15**
Temperature factor - Table 2.3.3	$C_t =$ **1.00**
Size factor for bending - Table 4D	$C_{Fb} =$ **1.00**
Size factor for tension - Table 4D	$C_{Ft} =$ **1.00**
Size factor for compression - Table 4D	$C_{Fc} =$ **1.00**
Flat use factor - Table 4D	$C_{fu} =$ **1.00**
Incising factor for modulus of elasticity - Table 4.3.8	
	$C_{iE} =$ **1.00**
Incising factor for bending, shear, tension & compression - Table 4.3.8	
	$C_i =$ **1.00**
Incising factor for perpendicular compression - Table 4.3.8	
	$C_{ic\_perp} =$ **1.00**
Repetitive member factor - cl.4.3.9	$C_r =$ **1.00**
Bearing area factor - cl.3.10.4	$C_b =$ **1.00**
Depth-to-breadth ratio	$d_{nom} / (N \times b_{nom}) =$ **1.50**
- Beam is fully restrained	
Beam stability factor - cl.3.3.3	$C_L =$ **1.00**

Bearing perpendicular to grain - cl.3.10.2

Design compression perpendicular to grain	$F_{c\_perp}' = F_{c\_perp} \times C_t \times C_i \times C_b =$ **375** lb/in^2
Applied compression stress perpendicular to grain	$f_{c\_perp} = R_{A\_max} / (N \times b \times L_b) =$ **202** lb/in^2
	$f_{c\_perp} / F_{c\_perp}' =$ **0.539**

PASS - Design compressive stress exceeds applied compressive stress at bearing

Strength in bending - cl.3.3.1

Design bending stress	$F_b' = F_b \times C_D \times C_t \times C_L \times C_{Fb} \times C_i \times C_r =$ **1552** lb/in^2
Actual bending stress	$f_b = M / S_x =$ **1527** lb/in^2
	$f_b / F_b' =$ **0.983**

PASS - Design bending stress exceeds actual bending stress

Strength in shear parallel to grain - cl.3.4.1

Design shear stress	$F_v' = F_v \times C_D \times C_t \times C_i =$ **190** lb/in^2
Actual shear stress - eq.3.4-2	$f_v = 3 \times F / (2 \times A) =$ **101** lb/in^2
	$f_v / F_v' =$ **0.532**

PASS - Design shear stress exceeds actual shear stress

Deflection - cl.3.5.1

Modulus of elasticity for deflection	$E' = E \times C_{ME} \times C_t \times C_{iE} =$ **1500000** lb/in^2
Design deflection	$\delta_{adm} = 0.003 \times L_{s1} =$ **0.551** in

Total deflection

δ_{b_s1} = **0.589** in

δ_{b_s1} / δ_{adm} = **1.069**

FAIL - Total deflection exceeds design deflection

Allowable Deflection = L/180 (Roof Member not supporting ceiling)

Allowable Deflection = 15.3ft x 12in/ft / 180 = 1.02"

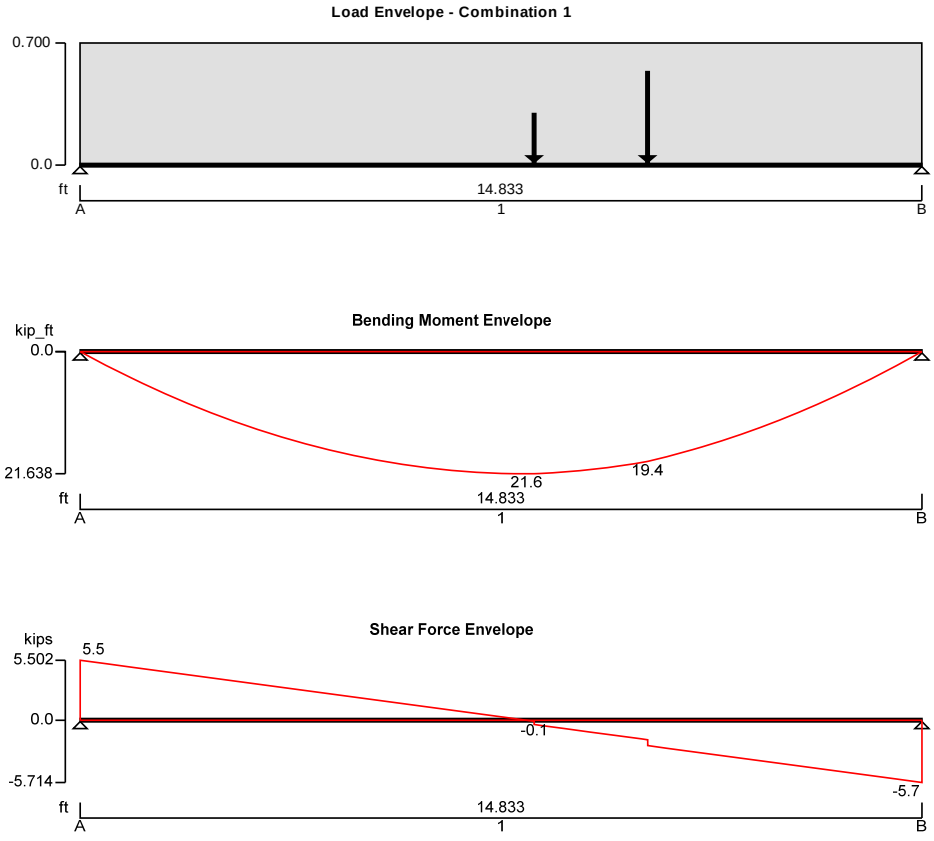
1.02" > 0.59" --->> **Deflection O.K.**

WOOD BEAM ANALYSIS & DESIGN (NDS)

STRUCTURAL WOOD BEAM ANALYSIS & DESIGN (NDS)

In accordance with the ANSI/AF&PA NDS-2012 using the ASD method

TEDDS calculation version 1.7.03



Applied loading

Beam loads

	Dead self weight of beam × 1	
Dead	Dead full UDL 227 lb/ft	
Snow	Snow full UDL 455 lb/ft	
Ballast Frame	Dead point load 540 lb at 120.00 in	
Condenser Units	Dead point load 300 lb at 96.00 in	200 lb/each; assume 1.5 in A_T

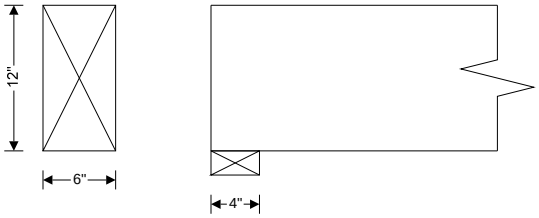
Load combinations

Load combination 1	Support A	Dead × 1.00
		Snow × 1.00
	Span 1	Dead × 1.00
		Snow × 1.00

	Support B	Dead × 1.00
		Snow × 1.00

Analysis results

Maximum moment	M_{max} = **21638** lb_ft	M_{min} = **0** lb_ft
Design moment	M = max(abs(M_{max}),abs(M_{min})) = **21638** lb_ft	
Maximum shear	F_{max} = **5502** lb	F_{min} = **-5714** lb
Design shear	F = max(abs(F_{max}),abs(F_{min})) = **5714** lb	
Total load on member	W_{tot} = **11216** lb	
Reaction at support A	R_{A_max} = **5502** lb	R_{A_min} = **5502** lb
Unfactored dead load reaction at support A	R_{A_Dead} = **2127** lb	
Unfactored snow load reaction at support A	R_{A_Snow} = **3375** lb	
Reaction at support B	R_{B_max} = **5714** lb	R_{B_min} = **5714** lb
Unfactored dead load reaction at support B	R_{B_Dead} = **2339** lb	
Unfactored snow load reaction at support B	R_{B_Snow} = **3375** lb	



Sawn lumber section details

Nominal breadth of sections	b_{nom} = **6** in
Full-sawn breadth of sections	b = **6** in
Nominal depth of sections	d_{nom} = **12** in
Full-sawn depth of sections	d = **12** in
Number of sections in member	N = **1**
Overall breadth of member	b_b = N × b = **6** in
Species, grade and size classification	Southern Pine, No.1 grade, 5" x 5" and larger
Bending parallel to grain	F_b = **1350** lb/in^2
Tension parallel to grain	F_t = **900** lb/in^2
Compression parallel to grain	F_c = **825** lb/in^2
Compression perpendicular to grain	F_{c_perp} = **375** lb/in^2
Shear parallel to grain	F_v = **165** lb/in^2
Modulus of elasticity	E = **1500000** lb/in^2
Modulus of elasticity, stability calculations	E_{min} = **550000** lb/in^2
Mean shear modulus	G_{def} = E / 16 = **93750** lb/in^2

Member details

Service condition	**Dry**
Length of span	L_{s1} = **14.833** ft
Length of bearing	L_b = **4** in
Load duration	**Two months**

Section properties

Cross sectional area of member	$A = N \times b \times d =$ **72.00** in^2
Section modulus	$S_x = N \times b \times d^2 / 6 =$ **144.00** in^3
	$S_y = d \times (N \times b)^2 / 6 =$ **72.00** in^3
Second moment of area	$I_x = N \times b \times d^3 / 12 =$ **864.00** in^4
	$I_y = d \times (N \times b)^3 / 12 =$ **216.00** in^4

Adjustment factors

Load duration factor - Table 2.3.2	$C_D =$ **1.15**
Temperature factor - Table 2.3.3	$C_t =$ **1.00**
Size factor for bending - Table 4D	$C_{Fb} =$ **1.00**
Size factor for tension - Table 4D	$C_{Ft} =$ **1.00**
Size factor for compression - Table 4D	$C_{Fc} =$ **1.00**
Flat use factor - Table 4D	$C_{fu} =$ **1.00**
Incising factor for modulus of elasticity - Table 4.3.8	
	$C_{iE} =$ **1.00**
Incising factor for bending, shear, tension & compression - Table 4.3.8	
	$C_i =$ **1.00**
Incising factor for perpendicular compression - Table 4.3.8	
	$C_{ic\_perp} =$ **1.00**
Repetitive member factor - cl.4.3.9	$C_r =$ **1.00**
Bearing area factor - cl.3.10.4	$C_b =$ **1.00**
Depth-to-breadth ratio	$d_{nom} / (N \times b_{nom}) =$ **2.00**
- Beam is fully restrained	
Beam stability factor - cl.3.3.3	$C_L =$ **1.00**

Bearing perpendicular to grain - cl.3.10.2

Design compression perpendicular to grain	$F_{c\_perp}' = F_{c\_perp} \times C_t \times C_i \times C_b =$ **375** lb/in^2
Applied compression stress perpendicular to grain	$f_{c\_perp} = R_{B\_max} / (N \times b \times L_b) =$ **238** lb/in^2
	$f_{c\_perp} / F_{c\_perp}' =$ **0.635**

PASS - Design compressive stress exceeds applied compressive stress at bearing

Strength in bending - cl.3.3.1

Design bending stress	$F_b' = F_b \times C_D \times C_t \times C_L \times C_{Fb} \times C_i \times C_r =$ **1552** lb/in^2
Actual bending stress	$f_b = M / S_x =$ **1803** lb/in^2
	$f_b / F_b' =$ **1.161**

FAIL - Design bending stress is less than actual bending stress

Actual member size is 7"W x 12"H; Member in calculation is 6"W x 12"H

Sx = 1/6 * 7 * 12^2 = 168 in^2

fb = M / Sx = 21638 lb-ft / 168 in^3 = 1546 psi

b / Fb' = 0.996 -->>**Flexure is O.K.**

Strength in shear parallel to grain - cl.3.4.1

Design shear stress	$F_v' = F_v \times C_D \times C_t \times C_i =$ **190** lb/in^2
Actual shear stress - eq.3.4-2	$f_v = 3 \times F / (2 \times A) =$ **119** lb/in^2
	$f_v / F_v' =$ **0.627**

PASS - Design shear stress exceeds actual shear stress

Deflection - cl.3.5.1

Modulus of elasticity for deflection	$E' = E \times C_{ME} \times C_t \times C_{iE}$ = **1500000** lb/in^2
Design deflection	$\delta_{adm} = 0.003 \times L_{s1}$ = **0.534** in
Total deflection	δ_{b_s1} = **0.656** in
	$\delta_{b\_s1} / \delta_{adm}$ = **1.228**

FAIL - Total deflection exceeds design deflection

Job Information

	Engineer	Checked	Approved
Name:	JJC		
Date:	11/6/17		

Project ID	
Project Name	

Structure Type	SPACE FRAME

Number of Nodes	18	Highest Node	27
Number of Elements	23	Highest Beam	40

Number of Basic Load Cases	3
Number of Combination Load Cases	4

Included in this printout are data for:

All	The Whole Structure

Included in this printout are results for load cases:

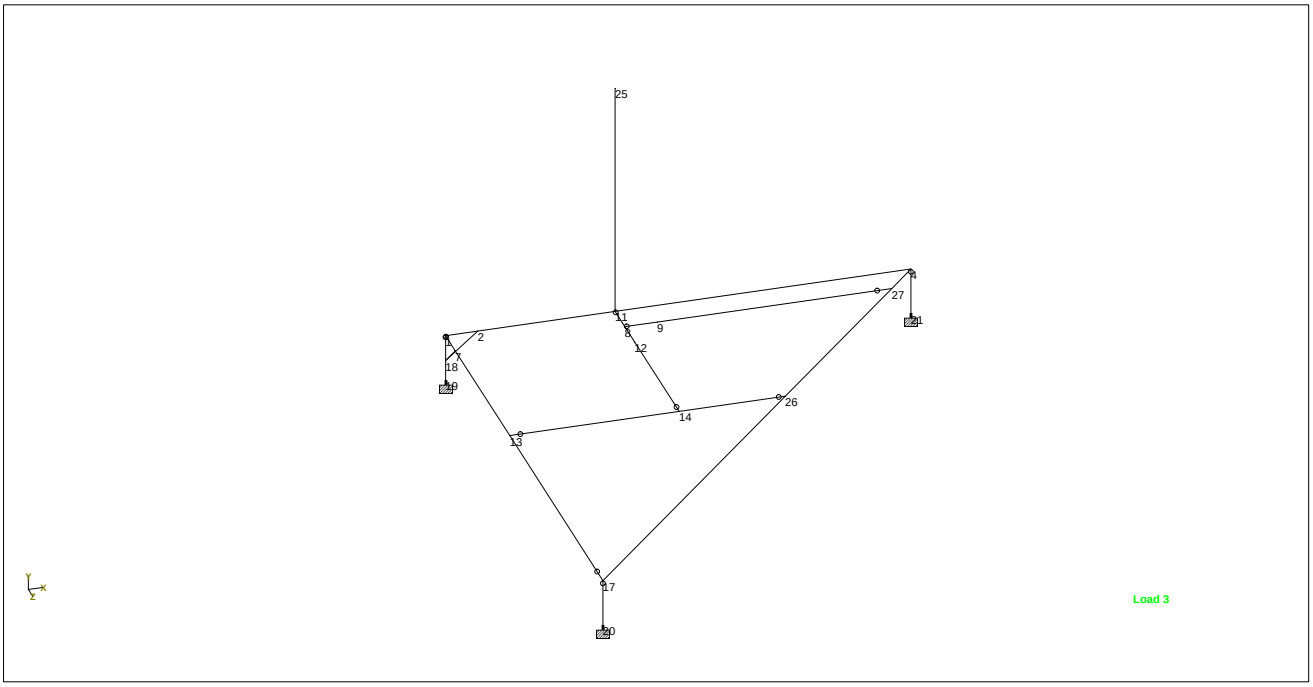
Type	L/C	Name
Primary	1	DEAD
Primary	2	WIND (N/S)
Primary	3	WIND (E/W)
Combination	4	DL + WL (+N/S)
Combination	5	DL + WL (+N/S)
Combination	6	DL + WL (+E/W)
Combination	7	DL + WL (-E/W)

Nodes

Node	X (ft)	Y (ft)	Z (ft)
1	0.000	0.000	0.000
2	1.000	0.000	0.000
4	14.417	0.000	0.000
7	0.000	0.000	1.000
8	5.250	0.000	1.000
9	6.250	0.000	1.000
11	5.250	0.000	0.000
12	5.250	0.000	2.000
13	0.000	0.000	6.560
14	5.250	0.000	6.560
17	0.000	0.000	16.083
18	0.000	-0.833	0.000
19	0.000	-1.500	0.000

Nodes Cont...

Node	X (ft)	Y (ft)	Z (ft)
26	8.537	0.000	6.560
27	13.521	0.000	1.000



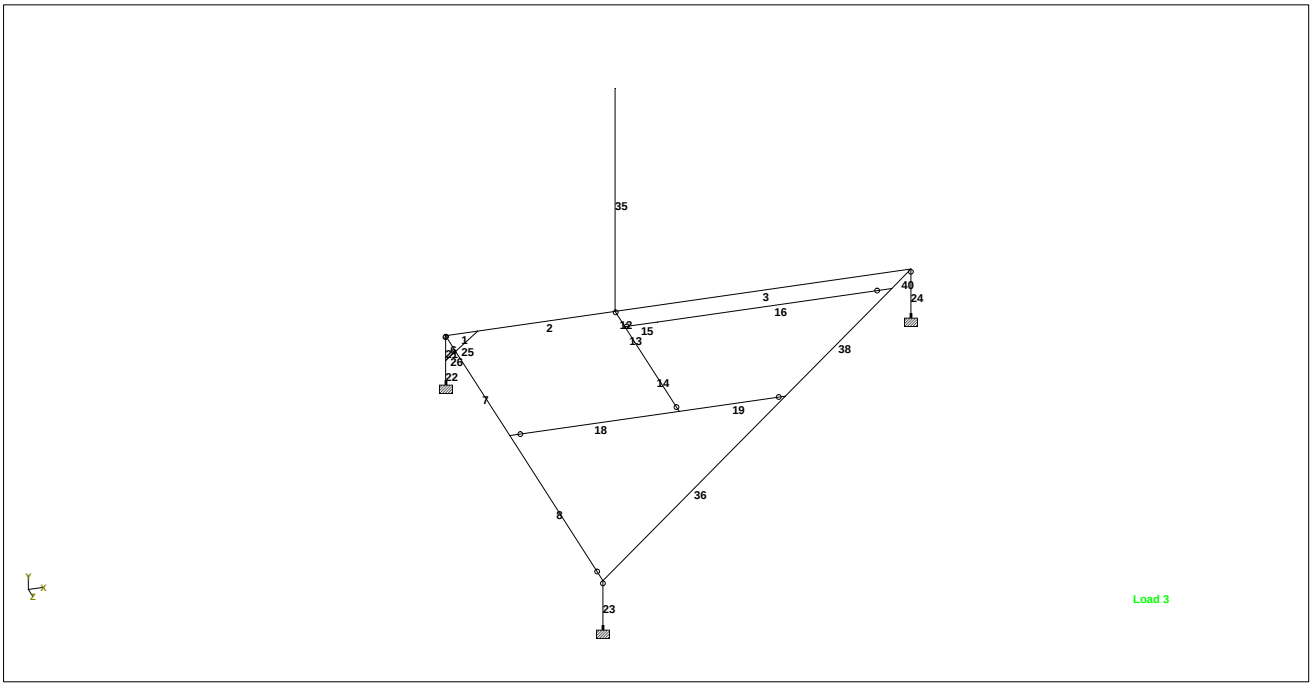
Nodes

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
1	1	2	1.000	1	0
2	2	11	4.250	1	0
3	11	4	9.167	1	0
6	1	7	1.000	1	0
7	7	13	5.560	1	0
8	13	17	9.523	1	0
12	11	8	1.000	2	0
13	8	12	1.000	2	0
14	12	14	4.560	2	0
15	8	9	1.000	2	0
16	9	27	7.271	2	0
18	13	14	5.250	6	0
19	14	26	3.287	6	0
21	1	18	0.833	3	0

Beams Cont...

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
22	18	19	0.667	3	0
23	17	20	1.500	3	0
24	4	21	1.500	3	0
25	18	2	1.301	4	0
26	18	7	1.301	4	0
35	11	25	7.500	5	0
36	17	26	12.789	1	0
38	26	27	7.467	1	0
40	27	4	1.343	1	0



Beams

Section Properties

Prop	Section	Area (in^2)	I_{yy} (in^4)	I_{zz} (in^4)	J (in^4)	Material
1	W12X26	7.650	17.300	204.000	0.285	STEEL
2	W8X10	2.960	2.090	30.800	0.035	STEEL
3	HSST4X4X0.313	4.100	9.140	9.140	14.848	STEEL
4	L30304	1.440	1.982	0.506	0.031	STEEL
5	PIPS35	2.500	4.520	4.520	9.043	STEEL
6	W10X26	7.610	14.100	144.000	0.385	STEEL

Materials

Mat	Name	E (kip/in^2)	ν	Density (kip/in^3)	α (/°F)
1	STEEL	29E+3	0.300	0.000	6E -6
2	STAINLESSSTEEL	28E+3	0.300	0.000	10E -6
3	ALUMINUM	10E+3	0.330	0.000	13E -6
4	CONCRETE	3.15E+3	0.170	0.000	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)
19	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
20	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
21	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
6	1	Fixed	Fixed	Fixed	Fixed	Pin	Pin
8	17	Fixed	Fixed	Fixed	Fixed	Pin	Pin
12	11	Fixed	Fixed	Fixed	Fixed	Pin	Pin
14	14	Fixed	Fixed	Fixed	Fixed	Pin	Pin
15	8	Fixed	Fixed	Fixed	Fixed	Pin	Pin
16	27	Fixed	Fixed	Fixed	Fixed	Pin	Pin
18	13	Fixed	Fixed	Fixed	Fixed	Pin	Pin
19	26	Fixed	Fixed	Fixed	Fixed	Pin	Pin
21	1	Fixed	Fixed	Fixed	Fixed	Pin	Pin
23	17	Fixed	Fixed	Fixed	Fixed	Pin	Pin
24	4	Fixed	Fixed	Fixed	Fixed	Pin	Pin

Primary Load Cases

Number	Name	Type
1	DEAD	Dead
2	WIND (N/S)	Wind
3	WIND (E/W)	Wind

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
4	DL + WL (+N/S)	1	DEAD	1.00
		2	WIND (N/S)	1.00
5	DL + WL (+N/S)	1	DEAD	1.00
		2	WIND (N/S)	-1.00
6	DL + WL (+E/W)	1	DEAD	1.00
		3	WIND (E/W)	1.00
7	DL + WL (-E/W)	1	DEAD	1.00
		3	WIND (E/W)	-1.00

1 DEAD : Beam Loads

Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
14	CON kip	GY	-0.071	1.924	-	-	-
18	CON kip	GY	-0.073	1.000	-	-	-
	CON kip	GY	-0.071	1.667	-	-	-
	CON kip	GY	-0.073	2.917	-	-	-
	CON kip	GY	-0.071	3.584	-	-	-
19	CON kip	GY	-0.073	1.000	-	-	-
	CON kip	GY	-0.071	1.667	-	-	-
	CON kip	GY	-0.073	2.917	-	-	-
35	CON kip	GY	-0.332	0.500	-	-	-
	CON kip	GY	-0.146	3.250	-	-	-
	CON kip	GY	-0.332	6.500	-	-	-

1 DEAD : Selfweight

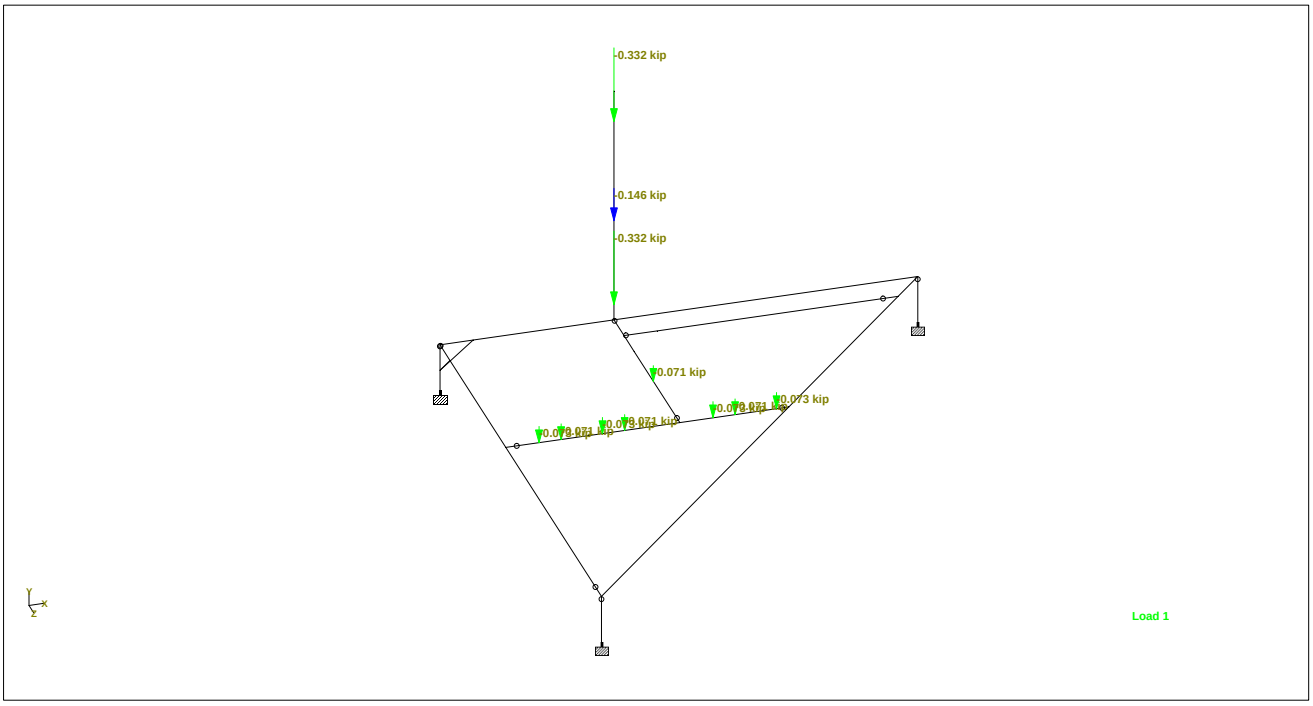
Direction	Factor	Assigned Geometry
Y	-1.000	ALL

2 WIND (N/S) : Beam Loads

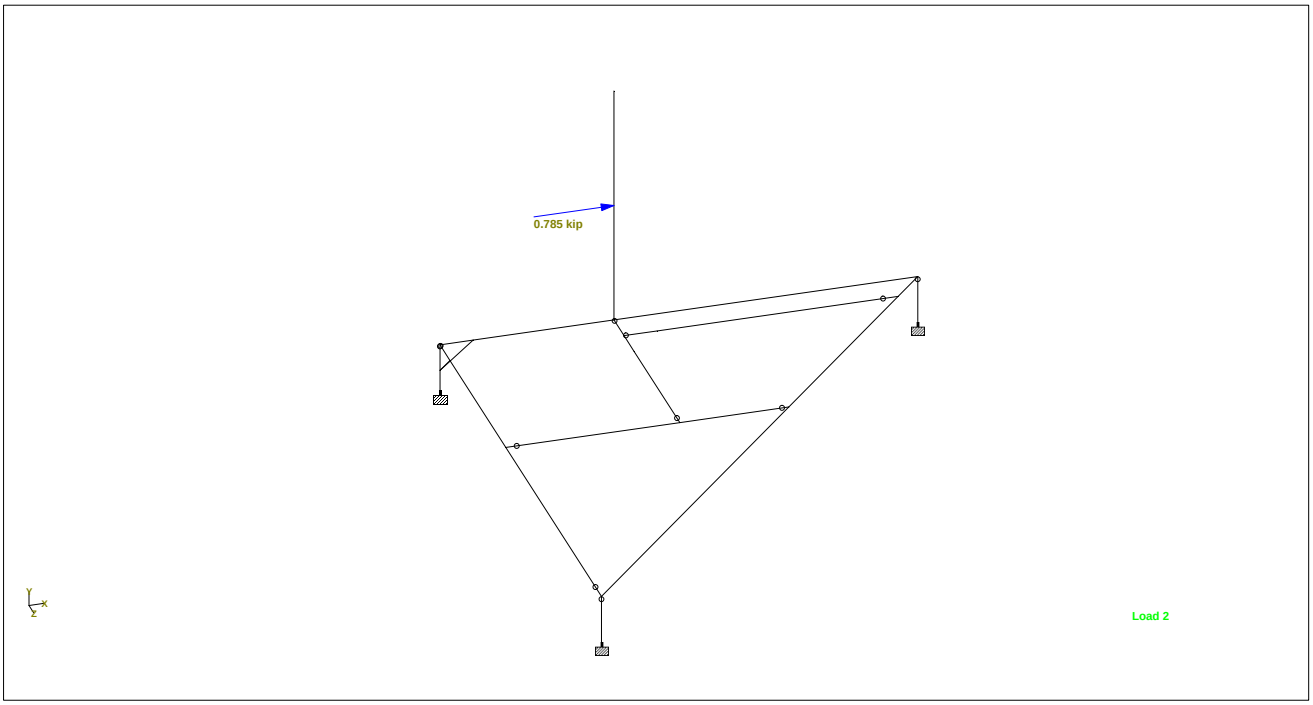
Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
35	CON kip	GX	0.785	3.750	-	-	-

3 WIND (E/W) : Beam Loads

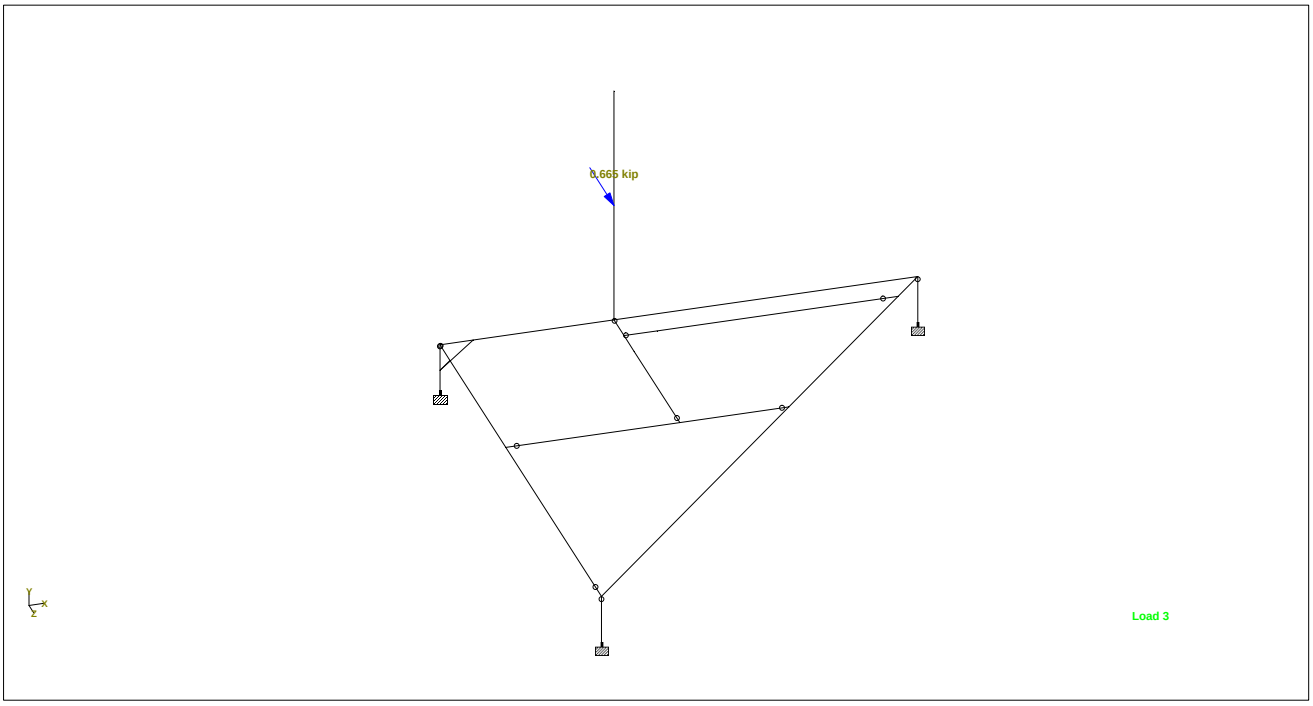
Beam	Type	Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
35	CON kip	GZ	0.665	3.750	-	-	-



Dead Load



Wind N/S



Wind E/W

Reactions

Node	L/C	Horizontal FX (kip)	Vertical FY (kip)	Horizontal FZ (kip)	Moment MX (kip-ft)	Moment MY (kip-ft)	Moment MZ (kip-ft)
19	1:DEAD	0.456	1.376	0.354	-0.089	-0.000	0.197
	2:WIND (N/S)	-0.507	-0.225	0.055	0.040	0.002	0.421
	3:WIND (E/W)	-0.156	-0.192	-0.378	-0.287	0.380	-0.050
	4:DL + WL (+N/	-0.051	1.151	0.409	-0.049	0.002	0.618
	5:DL + WL (+N/	0.963	1.601	0.299	-0.129	-0.002	-0.224
	6:DL + WL (+E/	0.300	1.184	-0.024	-0.376	0.380	0.147
	7:DL + WL (-E/\	0.612	1.568	0.732	0.198	-0.381	0.247
20	1:DEAD	-0.177	0.804	-0.157	-0.235	0.002	0.265
	2:WIND (N/S)	-0.071	-0.003	0.024	0.035	0.002	0.106
	3:WIND (E/W)	0.070	0.172	-0.140	-0.210	0.163	-0.105
	4:DL + WL (+N/	-0.248	0.801	-0.133	-0.199	0.004	0.371
	5:DL + WL (+N/	-0.106	0.807	-0.180	-0.270	-0.000	0.159
	6:DL + WL (+E/	-0.107	0.976	-0.297	-0.445	0.165	0.160
	7:DL + WL (-E/\	-0.247	0.632	-0.017	-0.025	-0.162	0.370
21	1:DEAD	-0.279	1.068	-0.197	-0.296	0.000	0.420
	2:WIND (N/S)	-0.207	0.228	-0.078	-0.118	0.003	0.311
	3:WIND (E/W)	0.086	0.020	-0.147	-0.221	-0.301	-0.129
	4:DL + WL (+N/	-0.487	1.296	-0.276	-0.413	0.003	0.731
	5:DL + WL (+N/	-0.072	0.840	-0.119	-0.178	-0.003	0.108
	6:DL + WL (+E/	-0.193	1.088	-0.344	-0.517	-0.301	0.290

Reaction Checked in Excel Calculations. See attached

Reactions Cont...

		Horizontal	Vertical	Horizontal	Moment		
Node	L/C	FX (kip)	FY (kip)	FZ (kip)	MX (kip-ft)	MY (kip-ft)	MZ (kip-ft)
	7:DL + WL (-E/	-0.365	1.048	-0.050	-0.075	0.301	0.549

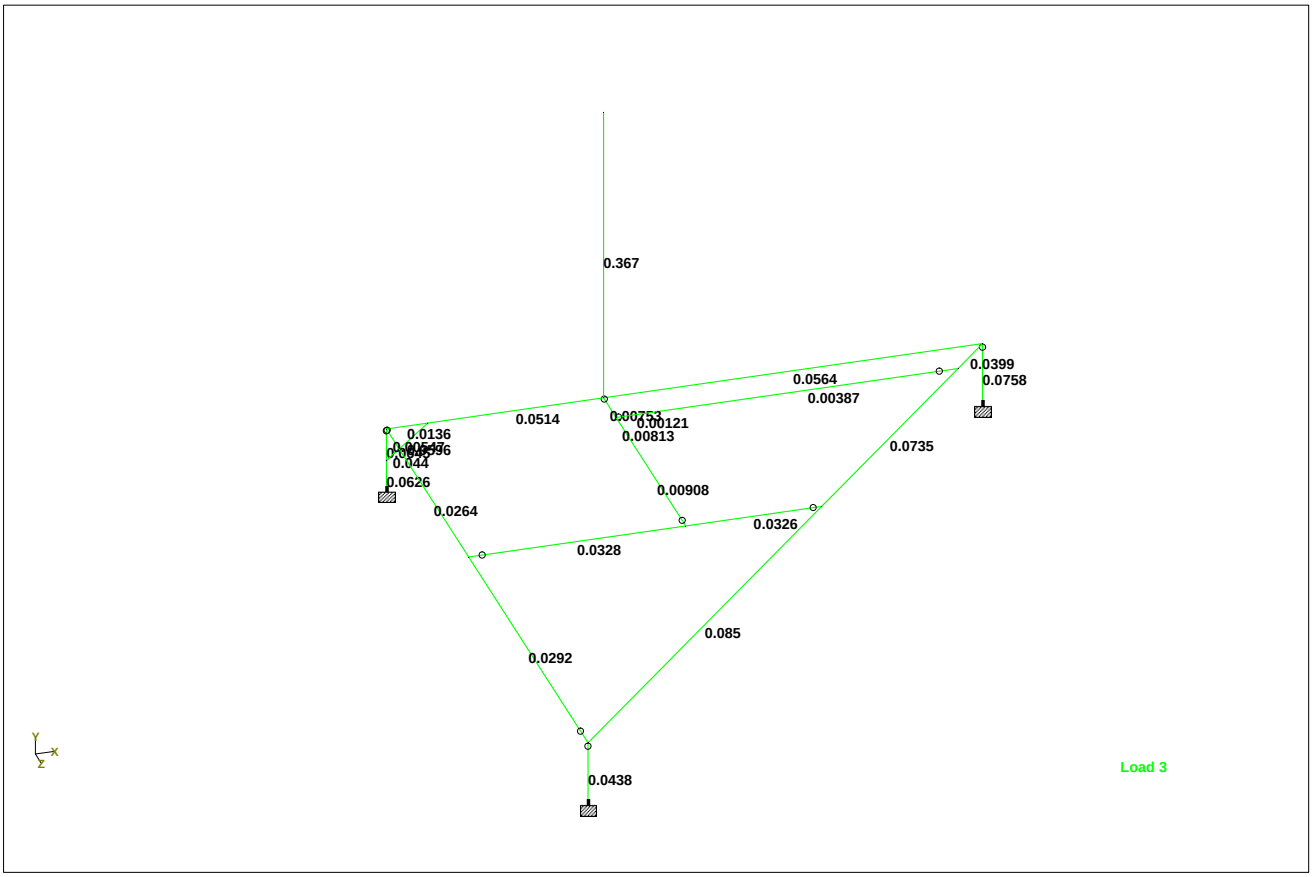
Utilization Ratio

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)
1	W12X26	W12X26	0.014	1.000	0.014			7.650	204.000	17.300	0.300
2	W12X26	W12X26	0.051	1.000	0.051			7.650	204.000	17.300	0.300
3	W12X26	W12X26	0.056	1.000	0.056			7.650	204.000	17.300	0.300
6	W12X26	W12X26	0.005	1.000	0.005			7.650	204.000	17.300	0.300
7	W12X26	W12X26	0.026	1.000	0.026			7.650	204.000	17.300	0.300
8	W12X26	W12X26	0.029	1.000	0.029			7.650	204.000	17.300	0.300
12	W8X10	W8X10	0.008	1.000	0.008			2.960	30.800	2.090	0.043
13	W8X10	W8X10	0.008	1.000	0.008			2.960	30.800	2.090	0.043
14	W8X10	W8X10	0.009	1.000	0.009			2.960	30.800	2.090	0.043
15	W8X10	W8X10	0.001	1.000	0.001			2.960	30.800	2.090	0.043
16	W8X10	W8X10	0.004	1.000	0.004			2.960	30.800	2.090	0.043
18	W10X26	W10X26	0.033	1.000	0.033			7.610	144.000	14.100	0.402
19	W10X26	W10X26	0.033	1.000	0.033			7.610	144.000	14.100	0.402
21	HSST4X4X0	HSST4X4X0	0.065	1.000	0.065			4.100	9.140	9.140	15.300
22	HSST4X4X0	HSST4X4X0	0.063	1.000	0.063			4.100	9.140	9.140	15.300
23	HSST4X4X0	HSST4X4X0	0.044	1.000	0.044			4.100	9.140	9.140	15.300
24	HSST4X4X0	HSST4X4X0	0.076	1.000	0.076			4.100	9.140	9.140	15.300
25	L30304	L30304	0.060	1.000	0.060			1.440	0.493	1.996	0.030
26	L30304	L30304	0.044	1.000	0.044			1.440	0.493	1.996	0.030
35	PIPS35	PIPS35	0.367	1.000	0.367			2.500	4.520	4.520	9.040
36	W12X26	W12X26	0.085	1.000	0.085			7.650	204.000	17.300	0.300
38	W12X26	W12X26	0.074	1.000	0.074			7.650	204.000	17.300	0.300
40	W12X26	W12X26	0.040	1.000	0.040			7.650	204.000	17.300	0.300

Failed Members

No Failed Members -->> O.K.

There is no data of this type.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0.0758
0.0564
0.00387
0.0514
0.00753
0.00121
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0.0136
0.044
0.0626
0.0735
0.00908
0.0264
0.0326
0.0328
0.085
0.0292
0.0438
Load 3

Unity Check

Job Information

	Engineer	Checked	Approved
Name:	JJC		
Date:	11/14/17		

Project ID	
Project Name	

Structure Type	SPACE FRAME

Number of Nodes	16	Highest Node	16
Number of Elements	27	Highest Beam	31
Number of Plates	4	Highest Plate	26

Number of Basic Load Cases	5
Number of Combination Load Cases	6

Included in this printout are data for:

All	The Whole Structure

Included in this printout are results for load cases:

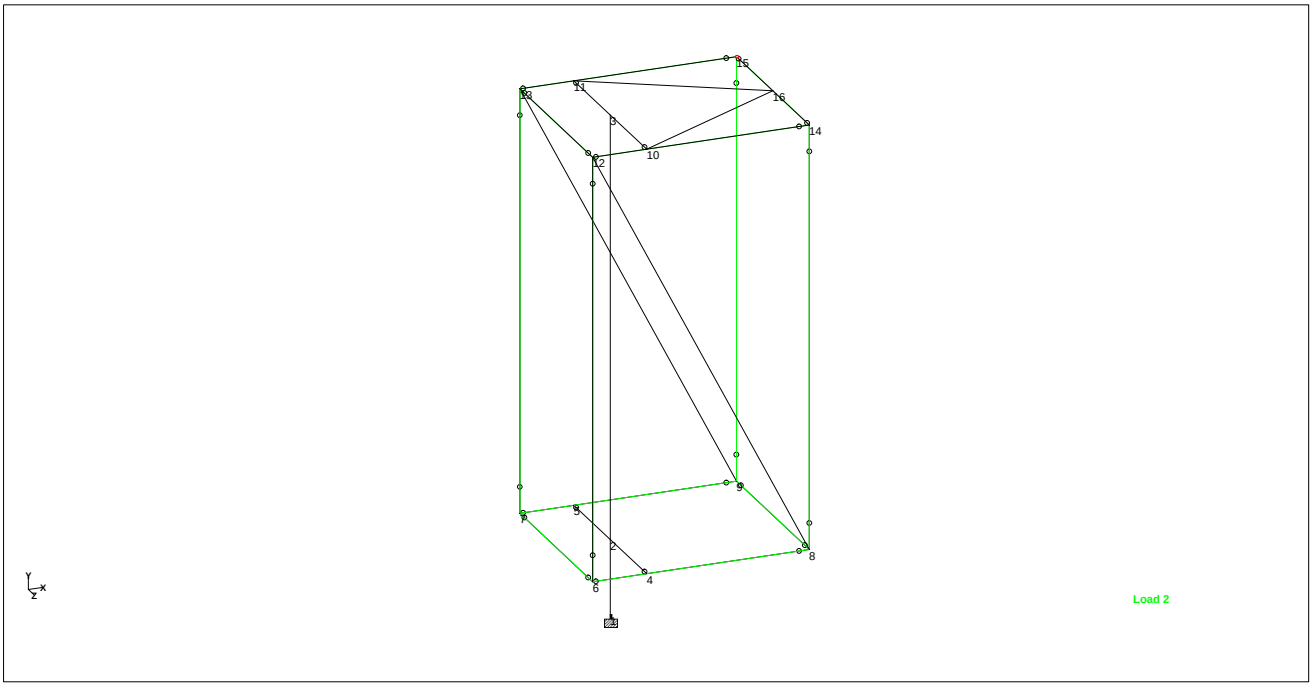
Type	L/C	Name
Primary	1	DEAD
Primary	2	WIND 1
Primary	3	WIND 2
Primary	4	WIND 1S
Primary	5	WIND 2S
Combination	6	DL + WL1
Combination	7	DL + WL2
Combination	8	1.2DL + 1.6WL1
Combination	9	1.2DL + 1.6WL2
Combination	10	DL + WL1S
Combination	11	DL + WL2S

Nodes

Node	X (ft)	Y (ft)	Z (ft)
1	0.000	0.000	0.000
2	0.000	1.500	0.000
3	0.000	10.000	0.000
4	0.000	1.500	1.830
5	0.000	1.500	-1.830
6	-1.080	1.500	1.830
7	-1.080	1.500	-1.830
8	3.250	1.500	1.830

Nodes Cont...

Node	X (ft)	Y (ft)	Z (ft)
12	-1.080	10.000	1.830
13	-1.080	10.000	-1.830
14	3.250	10.000	1.830
15	3.250	10.000	-1.830
16	3.250	10.000	0.000



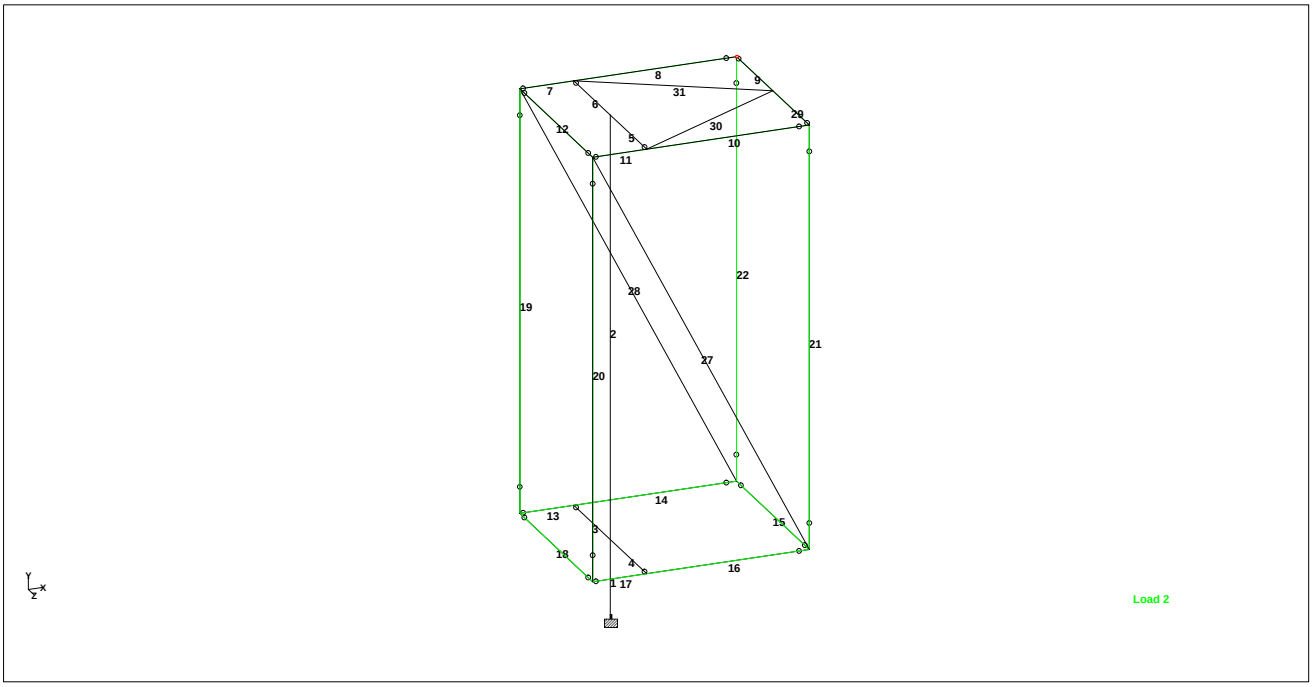
Nodes

Beams

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
1	1	2	1.500	4	0
2	2	3	8.500	4	0
3	2	5	1.830	2	0
4	4	2	1.830	2	0
5	10	3	1.830	2	0
6	3	11	1.830	2	0
7	13	11	1.080	3	315
8	11	15	3.250	3	315
9	15	16	1.830	3	315
10	14	10	3.250	3	315
11	10	12	1.080	3	315

Beams Cont...

Beam	Node A	Node B	Length (ft)	Property	β (degrees)
12	12	13	3.660	3	315
13	7	5	1.080	3	315
14	5	9	3.250	3	315
15	9	8	3.660	3	315
16	8	4	3.250	3	315
17	4	6	1.080	3	315
18	6	7	3.660	3	315
19	7	13	8.500	3	315
20	6	12	8.500	3	45
21	8	14	8.500	3	135
22	9	15	8.500	3	225
27	12	8	9.539	3	0
28	13	9	9.539	3	0
29	16	14	1.830	3	315
30	10	16	3.730	3	0
31	16	11	3.730	3	0



Beams

Plates

Plate	Node A	Node B	Node C	Node D	Property
23	13	12	6	7	1
24	12	14	8	6	1
25	14	15	9	8	1
26	15	13	7	9	1

Section Properties

Prop	Section	Area (in^2)	I_{yy} (in^4)	I_{zz} (in^4)	J (in^4)	Material
2	L30304 LD	2.880	21.846	2.488	0.060	STEEL
3	L40406	2.860	6.943	1.774	0.137	FIBERGLASS
4	PIPS40	2.960	6.820	6.820	13.635	STEEL

Plate Thickness

Prop	Node A (in)	Node B (in)	Node C (in)	Node D (in)	Material
1	0.250	0.250	0.250	0.250	FIBERGLASS

Materials

Mat	Name	E (kip/in^2)	ν	Density (kip/in^3)	α (/°F)
1	STEEL	29E+3	0.300	0.000	6E -6
2	STAINLESSSTEEL	28E+3	0.300	0.000	10E -6
3	ALUMINUM	10E+3	0.330	0.000	13E -6
4	FIBERGLASS	2.8E+3	0.350	0.000	4.400
5	CONCRETE	3.15E+3	0.170	0.000	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)
1	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
3	5	Fixed	Fixed	Fixed	Pin	Pin	Pin
4	4	Fixed	Fixed	Fixed	Pin	Pin	Pin
5	10	Fixed	Fixed	Fixed	Pin	Pin	Pin
6	11	Fixed	Fixed	Fixed	Pin	Pin	Pin
7	13	Fixed	Fixed	Fixed	Pin	Pin	Pin
8	15	Fixed	Fixed	Fixed	Pin	Pin	Pin
9	15	Fixed	Fixed	Fixed	Pin	Pin	Pin
10	14	Fixed	Fixed	Fixed	Pin	Pin	Pin
11	12	Fixed	Fixed	Fixed	Pin	Pin	Pin
12	12	Fixed	Fixed	Fixed	Pin	Pin	Pin
12	13	Fixed	Fixed	Fixed	Pin	Pin	Pin
13	7	Fixed	Fixed	Fixed	Pin	Pin	Pin
14	9	Fixed	Fixed	Fixed	Pin	Pin	Pin
15	9	Fixed	Fixed	Fixed	Pin	Pin	Pin
15	8	Fixed	Fixed	Fixed	Pin	Pin	Pin
16	8	Fixed	Fixed	Fixed	Pin	Pin	Pin
17	6	Fixed	Fixed	Fixed	Pin	Pin	Pin
18	6	Fixed	Fixed	Fixed	Pin	Pin	Pin
18	7	Fixed	Fixed	Fixed	Pin	Pin	Pin
19	7	Fixed	Fixed	Fixed	Pin	Pin	Pin
19	13	Fixed	Fixed	Fixed	Pin	Pin	Pin
20	6	Fixed	Fixed	Fixed	Pin	Pin	Pin
20	12	Fixed	Fixed	Fixed	Pin	Pin	Pin
21	8	Fixed	Fixed	Fixed	Pin	Pin	Pin
21	14	Fixed	Fixed	Fixed	Pin	Pin	Pin
22	9	Fixed	Fixed	Fixed	Pin	Pin	Pin
22	15	Fixed	Fixed	Fixed	Pin	Pin	Pin
29	14	Fixed	Fixed	Fixed	Pin	Pin	Pin

Primary Load Cases

Number	Name	Type
1	DEAD	Dead
2	WIND 1	Wind
3	WIND 2	Wind
4	WIND 1S	Wind
5	WIND 2S	Wind

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
6	DL + WL1	1	DEAD	1.00
		2	WIND 1	1.00
7	DL + WL2	1	DEAD	1.00
		3	WIND 2	1.00
8	1.2DL + 1.6WL1	1	DEAD	1.20
		2	WIND 1	1.60
9	1.2DL + 1.6WL2	1	DEAD	1.20
		3	WIND 2	1.60
10	DL + WL1S	1	DEAD	1.00
		4	WIND 1S	1.00
11	DL + WL2S	1	DEAD	1.00
		5	WIND 2S	1.00

1 DEAD : Beam Loads

Beam	Type		Direction	Fa	Da (ft)	Fb	Db	Ecc. (ft)
2	CON	kip	GY	-0.146	3.000	-	-	-

1 DEAD : Selfweight

Direction	Factor	Assigned Geometry
Y	-1.000	ALL

2 WIND 1 : Plate Loads

Plate	Type		Direction	Fa	Fb	X1 (ft)	Y1 (ft)	X2 (ft)	Y2 (ft)
24	CON	kip	GZ	-0.393	-	0.000	0.000	-	-
25	CON	kip	GX	-0.680	-	0.000	0.000	-	-

3 WIND 2 : Plate Loads

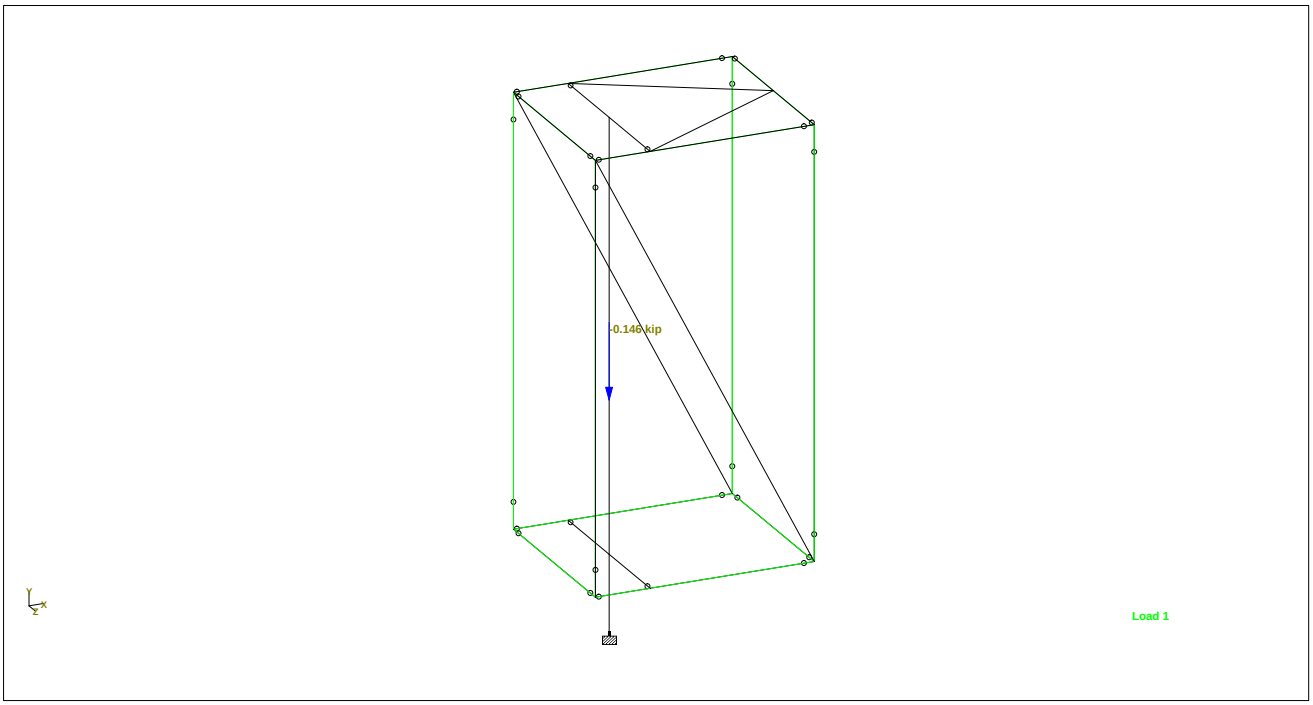
Plate	Type		Direction	Fa	Fb	X1 (ft)	Y1 (ft)	X2 (ft)	Y2 (ft)
23	CON	kip	GX	0.680	-	0.000	0.000	-	-
26	CON	kip	GZ	0.393	-	0.000	0.000	-	-

4 WIND 1S : Plate Loads

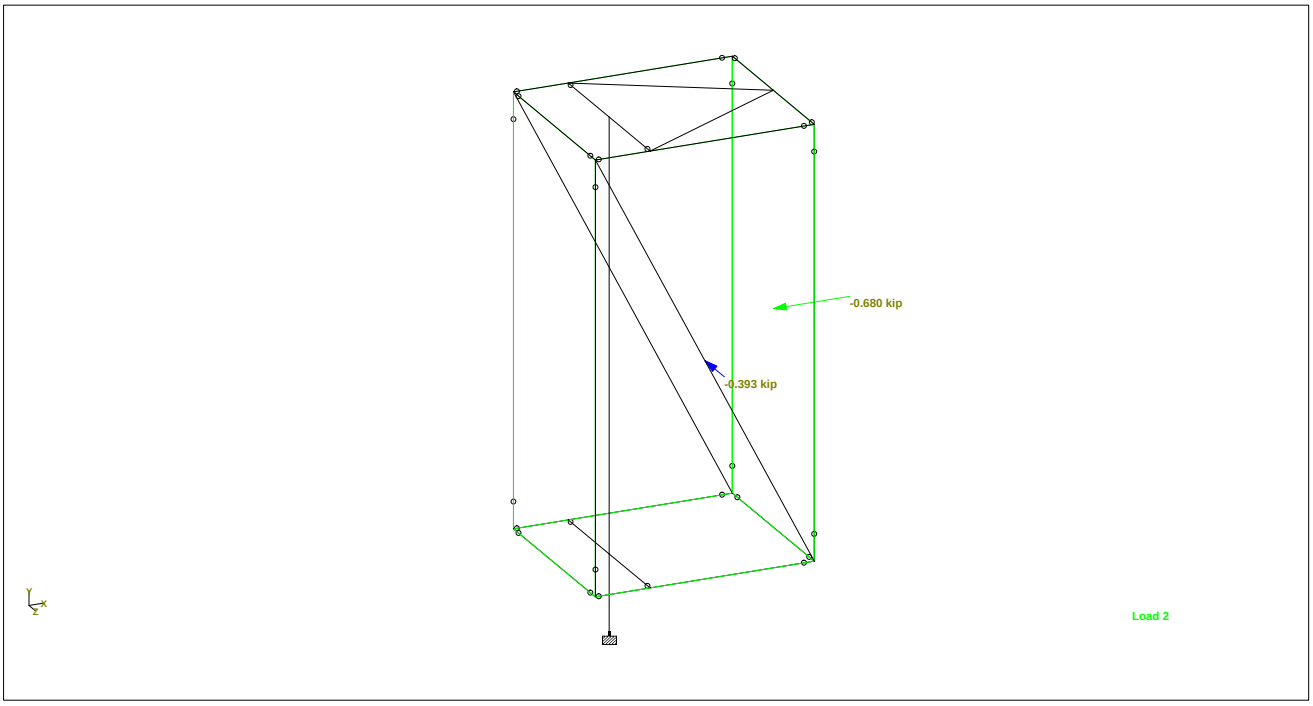
Plate	Type	Direction	Fa	Fb	X1 (ft)	Y1 (ft)	X2 (ft)	Y2 (ft)
24	CON kip	GZ	-0.106	-	0.000	0.000	-	-
25	CON kip	GX	-0.127	-	0.000	0.000	-	-

5 WIND 2S : Plate Loads

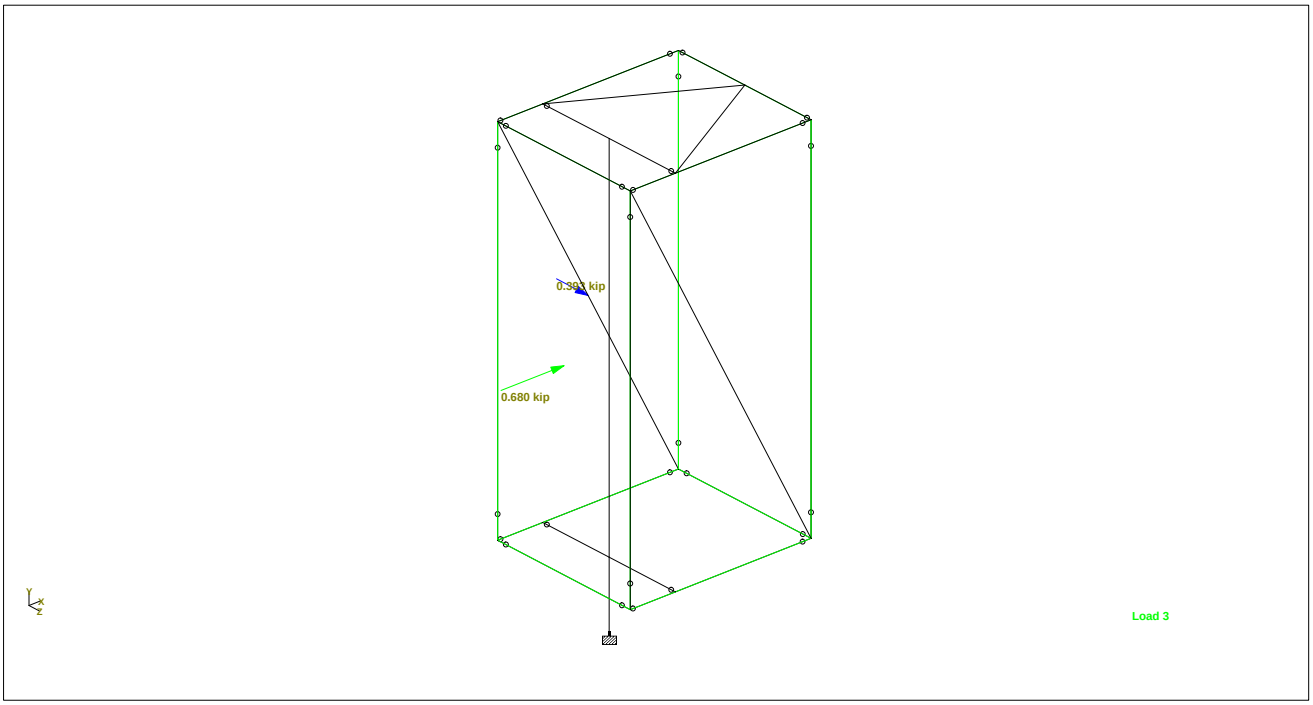
Plate	Type	Direction	Fa	Fb	X1 (ft)	Y1 (ft)	X2 (ft)	Y2 (ft)
23	CON kip	GX	0.127	-	0.000	0.000	-	-
26	CON kip	GZ	0.106	-	0.000	0.000	-	-



Dead Load



Wind 1



Wind 2

Beam Force Detail Summary

Sign convention as diagrams:- positive above line, negative below line except Fx where positive is compression. Distance d is given from beam end A.

				Axial	Shear		Torsion	Bending	
	Beam	L/C	d (ft)	Fx (kip)	Fy (kip)	Fz (kip)	Mx (kip-ft)	My (kip-ft)	Mz (kip-ft)
Max Fx	7	9:1.2DL + 1.6W	0.000	**0.381**	-0.077	-0.142	0.000	0.000	0.000
Min Fx	31	9:1.2DL + 1.6W	0.000	**-0.187**	0.005	0.000	0.000	0.000	0.000
Max Fy	17	9:1.2DL + 1.6W	0.000	0.260	**0.093**	0.395	0.000	-0.426	0.100
Min Fy	13	8:1.2DL + 1.6W	1.080	-0.034	**-0.093**	-0.395	-0.000	-0.426	0.100
Max Fz	17	9:1.2DL + 1.6W	0.000	0.260	0.093	**0.395**	0.000	-0.426	0.100
Min Fz	13	8:1.2DL + 1.6W	1.080	-0.034	-0.093	**-0.395**	-0.000	-0.426	0.100
Max Mx	28	9:1.2DL + 1.6W	0.000	-0.067	0.005	-0.001	**0.000**	0.005	0.008
Min Mx	27	8:1.2DL + 1.6W	0.000	-0.057	0.005	0.001	**-0.000**	-0.005	0.008
Max My	13	3:WIND 2	1.080	0.158	0.035	0.175	-0.000	**0.189**	-0.038
Min My	13	8:1.2DL + 1.6W	1.080	-0.034	-0.093	-0.395	-0.000	**-0.426**	0.100
Max Mz	13	8:1.2DL + 1.6W	1.080	-0.034	-0.093	-0.395	-0.000	-0.426	**0.100**
Min Mz	13	3:WIND 2	1.080	0.158	0.035	0.175	-0.000	0.189	**-0.038**

FRP L4x4x3/8

A= 2.84 in^2
Sx = 1.5 in^3

Tension: $\frac{16.5 \text{ ksi} * 2.84 \text{ in}^2}{4 \text{ SF}}$ = **11.72 kips** > 0.381 kips **O.K.**

Compression: $\frac{25.5 \text{ ksi} * 2.84 \text{ in}^2}{3 \text{ SF}}$ = **24.14 kips** > 0.381 kips **O.K.**

Flexure: $\frac{24.0 \text{ ksi} * 1.50 \text{ in}^3}{2.5 \text{ SF}}$ = **1.20** k-ft > 0.426 k-ft **O.K.**

Node Displacement Summary

	Node	L/C	X (in)	Y (in)	Z (in)	Resultant (in)	rX (rad)	rY (rad)	rZ (rad)
Max X	13	11:DL + WL2S	**0.401**	0.047	0.098	0.416	0.001	-0.002	-0.004
Min X	15	4:WIND 1S	**-0.223**	0.058	-0.170	0.287	-0.001	0.001	0.002
Max Y	14	4:WIND 1S	-0.160	**0.083**	-0.170	0.248	-0.001	0.001	0.002
Min Y	8	11:DL + WL2S	0.008	**-0.174**	0.112	0.207	0.001	-0.001	-0.003
Max Z	15	11:DL + WL2S	0.401	-0.149	**0.170**	0.461	0.001	-0.001	-0.004
Min Z	14	10:DL + WL1S	0.018	-0.008	**-0.170**	0.171	-0.001	0.001	-0.000
Max rX	3	5:WIND 2S	0.191	0.000	0.114	0.223	**0.001**	-0.001	-0.002
Min rX	3	4:WIND 1S	-0.191	0.000	-0.114	0.223	**-0.001**	0.001	0.002
Max rY	5	10:DL + WL1S	-0.005	-0.022	-0.006	0.023	0.000	**0.003**	0.002
Min rY	4	11:DL + WL2S	0.008	-0.022	0.006	0.024	0.000	**-0.003**	-0.002
Max rZ	5	4:WIND 1S	-0.010	-0.015	-0.006	0.019	0.000	0.003	**0.002**
Min rZ	3	11:DL + WL2S	0.369	-0.001	0.114	0.386	0.001	-0.001	**-0.005**
Max Rst	15	11:DL + WL2S	0.401	-0.149	0.170	**0.461**	0.001	-0.001	-0.004

Δ_{ALL}= 9 ft * 12in/ft * 0.01 = 1.02 in > 0.46 in **O.K.**

Beam Combined Axial and Bending Stresses Summary

			Max Comp			Max Tens		
Beam	L/C	Length (ft)	Stress (ksi)	d (ft)	Corner	Stress (ksi)	d (ft)	Corner
1	6:DL + WL1	1.500	16.353	0.000		-15.811	0.000	
	7:DL + WL2	1.500	20.010	0.000		-19.468	0.000	
	8:1.2DL + 1.6W	1.500	26.764	0.000		-26.113	0.000	
	9:1.2DL + 1.6W	1.500	31.156	0.000		-30.505	0.000	
2	6:DL + WL1	8.500	10.216	0.000		-9.872	0.000	
	7:DL + WL2	8.500	14.233	0.000		-13.889	0.000	
	8:1.2DL + 1.6W	8.500	17.066	0.000		-16.653	0.000	
	9:1.2DL + 1.6W	8.500	21.890	0.000		-21.476	0.000	
3	6:DL + WL1	1.830	6.521	0.000	3	-3.276	0.000	1
	7:DL + WL2	1.830	0.998	0.000	1	-1.481	0.000	3
	8:1.2DL + 1.6W	1.830	9.429	0.000	3	-4.787	0.000	1
	9:1.2DL + 1.6W	1.830	2.051	0.000	1	-3.375	0.000	3
4	6:DL + WL1	1.830	1.695	1.830	1	-1.770	1.830	3
	7:DL + WL2	1.830	6.558	1.830	3	-3.373	1.830	1
	8:1.2DL + 1.6W	1.830	3.047	1.830	1	-3.787	1.830	3
	9:1.2DL + 1.6W	1.830	9.538	1.830	3	-5.063	1.830	1
5	6:DL + WL1	1.830	3.371	1.830	3	-1.394	1.830	1
	7:DL + WL2	1.830	1.669	1.830	3	-0.885	1.830	1
	8:1.2DL + 1.6W	1.830	4.383	1.830	3	-1.773	1.830	1
	9:1.2DL + 1.6W	1.830	1.659	1.830	3	-0.959	1.830	1
6	6:DL + WL1	1.830	2.174	0.000	1	-2.095	0.000	2
	7:DL + WL2	1.830	4.061	0.000	2	-3.019	0.000	1
	8:1.2DL + 1.6W	1.830	2.518	0.000	1	-3.015	0.000	2
	9:1.2DL + 1.6W	1.830	5.486	0.000	2	-4.374	0.000	1
7	6:DL + WL1	1.080	0.368	1.080	2	-0.381	1.080	1
	7:DL + WL2	1.080	1.171	1.080	2	-0.567	1.080	3
	8:1.2DL + 1.6W	1.080	0.292	1.080	2	-0.518	1.080	1
	9:1.2DL + 1.6W	1.080	1.576	1.080	2	-0.778	1.080	3
8	6:DL + WL1	3.250	0.434	0.000	2	-0.315	0.000	1
	7:DL + WL2	3.250	1.081	0.000	2	-0.657	0.000	1
	8:1.2DL + 1.6W	3.250	0.402	0.000	2	-0.408	0.000	1
	9:1.2DL + 1.6W	3.250	1.436	0.000	2	-0.918	0.000	1
9	6:DL + WL1	1.830	0.059	1.830	1	-0.074	1.830	2
	7:DL + WL2	1.830	0.078	1.830	3	-0.042	1.830	2
	8:1.2DL + 1.6W	1.830	0.080	1.830	1	-0.086	1.830	2
	9:1.2DL + 1.6W	1.830	0.108	1.830	3	-0.035	1.830	2
10	6:DL + WL1	3.250	1.134	3.250	2	-0.602	3.250	3
	7:DL + WL2	3.250	0.381	3.250	2	-0.371	3.250	1
	8:1.2DL + 1.6W	3.250	1.521	3.250	2	-0.831	3.250	3
	9:1.2DL + 1.6W	3.250	0.317	3.250	2	-0.497	3.250	1
11	6:DL + WL1	1.080	1.106	0.000	2	-0.630	0.000	1
	7:DL + WL2	1.080	0.434	0.000	2	-0.318	0.000	1
	8:1.2DL + 1.6W	1.080	1.471	0.000	2	-0.880	0.000	1
	9:1.2DL + 1.6W	1.080	0.397	0.000	2	-0.418	0.000	1

Beam Combined Axial and Bending Stresses Summary Cont...

			Max Comp			Max Tens		
Beam	L/C	Length (ft)	Stress (ksi)	d (ft)	Corner	Stress (ksi)	d (ft)	Corner
12	6:DL + WL1	3.660	0.060	1.830	3			
	7:DL + WL2	3.660	0.057	1.830	3	-0.001	1.830	2
	8:1.2DL + 1.6W	3.660	0.080	1.830	3			
	9:1.2DL + 1.6W	3.660	0.076	1.830	3			
13	6:DL + WL1	1.080	1.996	1.080	2	-0.856	1.080	1
	7:DL + WL2	1.080	0.415	1.080	1	-0.436	1.080	2
	8:1.2DL + 1.6W	1.080	2.894	1.080	2	-1.270	1.080	1
	9:1.2DL + 1.6W	1.080	0.764	1.080	1	-0.998	1.080	2
14	6:DL + WL1	3.250	2.052	0.000	2	-0.800	0.000	1
	7:DL + WL2	3.250	0.381	0.000	1	-0.470	0.000	2
	8:1.2DL + 1.6W	3.250	2.979	0.000	2	-1.185	0.000	1
	9:1.2DL + 1.6W	3.250	0.706	0.000	1	-1.057	0.000	2
15	6:DL + WL1	3.660	0.051	1.830	3	-0.008	1.830	2
	7:DL + WL2	3.660	0.048	1.830	3	-0.011	1.830	2
	8:1.2DL + 1.6W	3.660	0.069	1.830	3	-0.002	1.830	2
	9:1.2DL + 1.6W	3.660	0.064	1.830	3	-0.006	1.830	2
16	6:DL + WL1	3.250	0.436	3.250	1	-0.414	3.250	2
	7:DL + WL2	3.250	1.995	3.250	2	-0.855	3.250	1
	8:1.2DL + 1.6W	3.250	0.793	3.250	1	-0.966	3.250	2
	9:1.2DL + 1.6W	3.250	2.888	3.250	2	-1.272	3.250	1
17	6:DL + WL1	1.080	0.351	0.000	1	-0.499	0.000	2
	7:DL + WL2	1.080	2.058	0.000	2	-0.792	0.000	1
	8:1.2DL + 1.6W	1.080	0.661	0.000	1	-1.098	0.000	2
	9:1.2DL + 1.6W	1.080	2.993	0.000	2	-1.167	0.000	1
18	6:DL + WL1	3.660	0.060	1.830	3			
	7:DL + WL2	3.660	0.058	1.830	3	-0.001	1.830	2
	8:1.2DL + 1.6W	3.660	0.080	1.830	3			
	9:1.2DL + 1.6W	3.660	0.076	1.830	3			
19	6:DL + WL1	8.500	0.005	0.000	1	-0.001	8.500	1
	7:DL + WL2	8.500				-0.015	8.500	1
	8:1.2DL + 1.6W	8.500	0.008	0.000	1			
	9:1.2DL + 1.6W	8.500				-0.023	8.500	1
20	6:DL + WL1	8.500				-0.018	8.500	1
	7:DL + WL2	8.500	0.009	0.000	1			
	8:1.2DL + 1.6W	8.500				-0.028	8.500	1
	9:1.2DL + 1.6W	8.500	0.013	0.000	1			
21	6:DL + WL1	8.500				-0.010	8.500	1
	7:DL + WL2	8.500	0.001	0.000	1	-0.005	8.500	1
	8:1.2DL + 1.6W	8.500				-0.015	8.500	1
	9:1.2DL + 1.6W	8.500	0.001	0.000	1	-0.006	8.500	1
22	6:DL + WL1	8.500				-0.008	8.500	1
	7:DL + WL2	8.500				-0.007	8.500	1
	8:1.2DL + 1.6W	8.500				-0.012	8.500	1
	9:1.2DL + 1.6W	8.500				-0.010	8.500	1

Beam Combined Axial and Bending Stresses Summary Cont...

			Max Comp			Max Tens		
Beam	L/C	Length (ft)	Stress (ksi)	d (ft)	Corner	Stress (ksi)	d (ft)	Corner
27	6:DL + WL1	9.539	0.058	0.000	1	-0.089	0.000	3
	7:DL + WL2	9.539	0.079	0.000	1	-0.078	0.000	3
	8:1.2DL + 1.6W	9.539	0.073	0.000	1	-0.109	9.539	3
	9:1.2DL + 1.6W	9.539	0.105	0.000	1	-0.090	0.000	3
28	6:DL + WL1	9.539	0.080	0.000	1	-0.075	0.000	3
	7:DL + WL2	9.539	0.056	0.000	1	-0.091	0.000	3
	8:1.2DL + 1.6W	9.539	0.108	0.000	1	-0.087	0.000	3
	9:1.2DL + 1.6W	9.539	0.070	0.000	1	-0.112	9.539	3
29	6:DL + WL1	1.830	0.100	0.000	1	-0.033	0.000	2
	7:DL + WL2	1.830	0.037	0.000	1	-0.083	0.000	2
	8:1.2DL + 1.6W	1.830	0.145	0.000	1	-0.021	0.000	2
	9:1.2DL + 1.6W	1.830	0.042	0.000	1	-0.101	0.000	2
30	6:DL + WL1	3.730				-0.040	0.000	1
	7:DL + WL2	3.730	0.043	0.000	1			
	8:1.2DL + 1.6W	3.730				-0.065	0.000	1
	9:1.2DL + 1.6W	3.730	0.069	0.000	1			
31	6:DL + WL1	3.730	0.044	0.000	1			
	7:DL + WL2	3.730				-0.041	0.000	1
	8:1.2DL + 1.6W	3.730	0.070	0.000	1			
	9:1.2DL + 1.6W	3.730				-0.065	0.000	1

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)
1	PIPS40	PIPS40	0.718	1.000	0.718			2.960	6.820	6.820	13.640
2	PIPS40	PIPS40	0.505	1.000	0.505			2.960	6.820	6.820	13.640
3	L30304 LD	L30304 LDLI	0.317	1.000	0.317			2.880	2.488	21.825	0.060
4	L30304 LD	L30304 LDLI	0.325	1.000	0.325			2.880	2.488	21.825	0.060
5	L30304 LD	L30304 LDLI	0.137	1.000	0.137			2.880	2.488	21.825	0.060
6	L30304 LD	L30304 LDLI	0.218	1.000	0.218			2.880	2.488	21.825	0.060
7	L40406	N/A						2.860	1.736	6.982	0.134
8	L40406	N/A						2.860	1.736	6.982	0.134
9	L40406	N/A						2.860	1.736	6.982	0.134
10	L40406	N/A						2.860	1.736	6.982	0.134
11	L40406	N/A						2.860	1.736	6.982	0.134
12	L40406	N/A						2.860	1.736	6.982	0.134
13	L40406	N/A						2.860	1.736	6.982	0.134
14	L40406	N/A						2.860	1.736	6.982	0.134
15	L40406	N/A						2.860	1.736	6.982	0.134
16	L40406	N/A						2.860	1.736	6.982	0.134
17	L40406	N/A						2.860	1.736	6.982	0.134
18	L40406	N/A						2.860	1.736	6.982	0.134
19	L40406	N/A						2.860	1.736	6.982	0.134
20	L40406	N/A						2.860	1.736	6.982	0.134
21	L40406	N/A						2.860	1.736	6.982	0.134
22	L40406	N/A						2.860	1.736	6.982	0.134
27	L40406	N/A						2.860	1.736	6.982	0.134
28	L40406	N/A						2.860	1.736	6.982	0.134
29	L40406	N/A						2.860	1.736	6.982	0.134
30	L40406	N/A						2.860	1.736	6.982	0.134
31	L40406	N/A						2.860	1.736	6.982	0.134

Failed Members

No Failed Members -->> O.K.

There is no data of this type.

MAXIMUM PERMISSIBLE EXPOSURE STUDY

THEORETICAL REPORT

Site Number:	MA2312
Site Name:	CAMBRIDGE HAMPSHIRE STREET
Latitude:	42.37128611
Longitude:	-71.09710833
Address:	288 NORFOLK STREET, CAMBRIDGE, MA 02139

Conclusion: ***AT&T's proposed antenna installation is calculated to be within the FCC Standard for Uncontrolled/General Public and Controlled/Occupational Maximum Permissible Exposure (MPE).***

Prepared by: **SAI Communications**
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Second Floor
Salem, NH 03079
(603) 421-0470

Date of Report: May 03, 2017

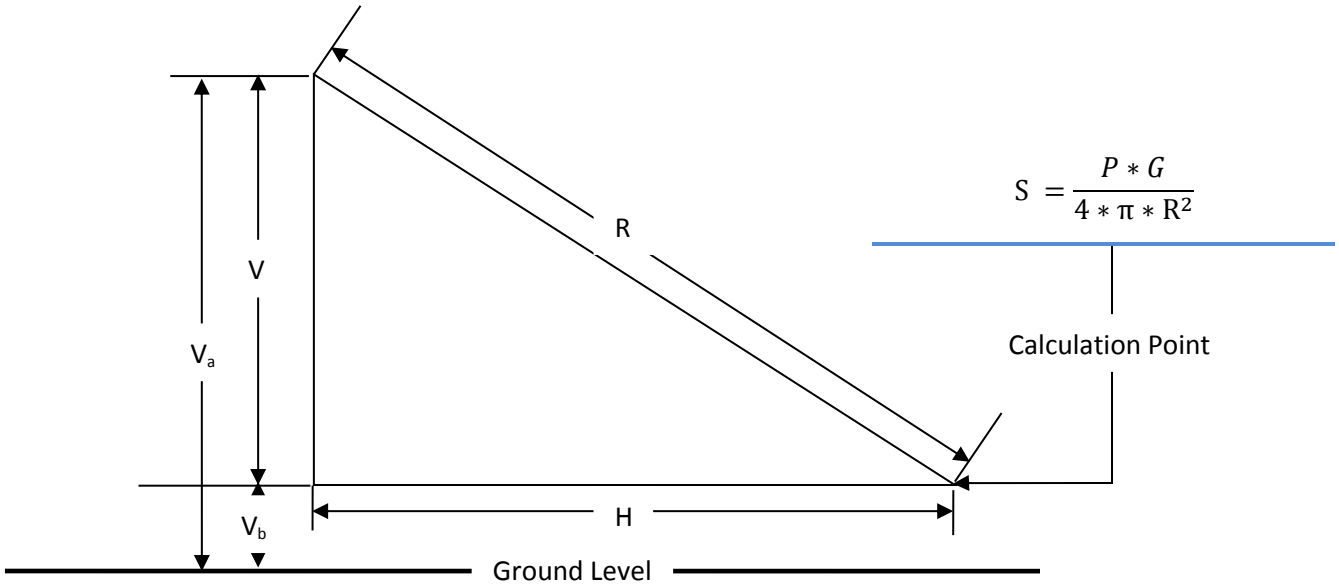
Table of Contents

Introduction

SAI Communications has conducted this theoretical analysis for AT&T, to ensure that the proposed radio facility complies with Federal Communications Commission (FCC) regulations. This report will show that, through the use of FCC suggested prediction methods, the radio facility in question will be in compliance with all appropriate Federal regulations in regards to Radio Frequency (RF) Exposure.

RF Exposure Prediction Method

Power Density is calculated in accordance with FCC OET Bulletin 65 formula (3):



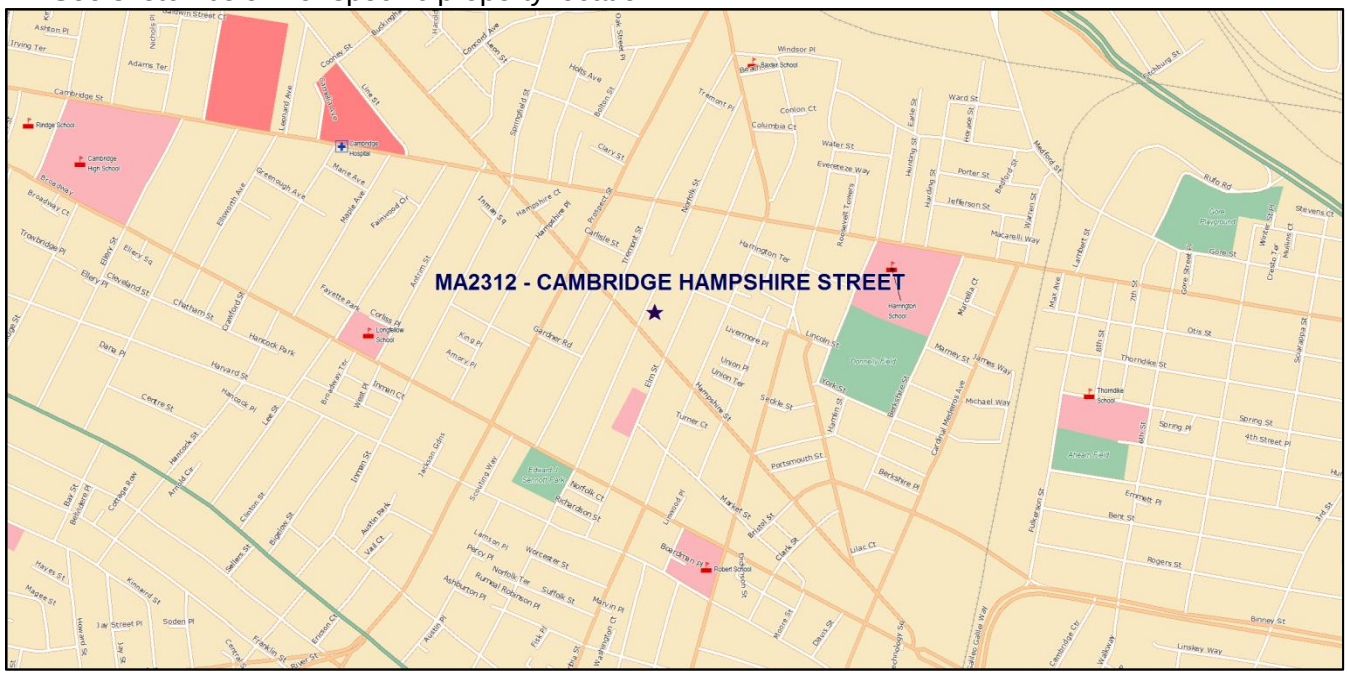
Where:
S = Power Density
P = Power input to the antenna
G = Gain of an antenna
R = Radial distance = $\sqrt{H^2 + V^2}$
H = Horizontal distance from antenna
V = Vertical distance from antenna = $Va - Vb$
V_a = Antenna height above ground
V_b = Calculation height above ground = 6ft

Case Summary

The proposed radio facility will have a radiation center of 61ft (to be the lowest) located at the following geographic coordinates:

Latitude: 42.37128611
Longitude: -71.09710833

See sketch below for specific property location.



RF Design Specifications

AT&T Mobility is planning to install 6 panel antennas, 2 per sector for LTE Technology with azimuths of 30-150-270 for alpha-beta-gamma sectors. Table below shows the technical data used for the calculation.

	LTE700BC	LTE850	LTE1900	LTEWCS
Antenna Type:	CCI OPA-65R-LCUU-H6			
Antenna Gain (dBd)	11.85	12.45	14.85	15.35
Rad Center, AGL (ft)	61	61	61	61
ERP (dBm)	60.85	61.45	65.63	64.35
No of Radios	1	1	2	1

FCC Guidelines

Table 1. MPE Limits for General Population/ Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time for $\|E\|^2$, $\|H\|^2$, 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 – 1500	--	--	f/1500	30
1500– 100,000	--	--	1.0	30
f = frequency in MHz		* = Plane wave equivalent power density		

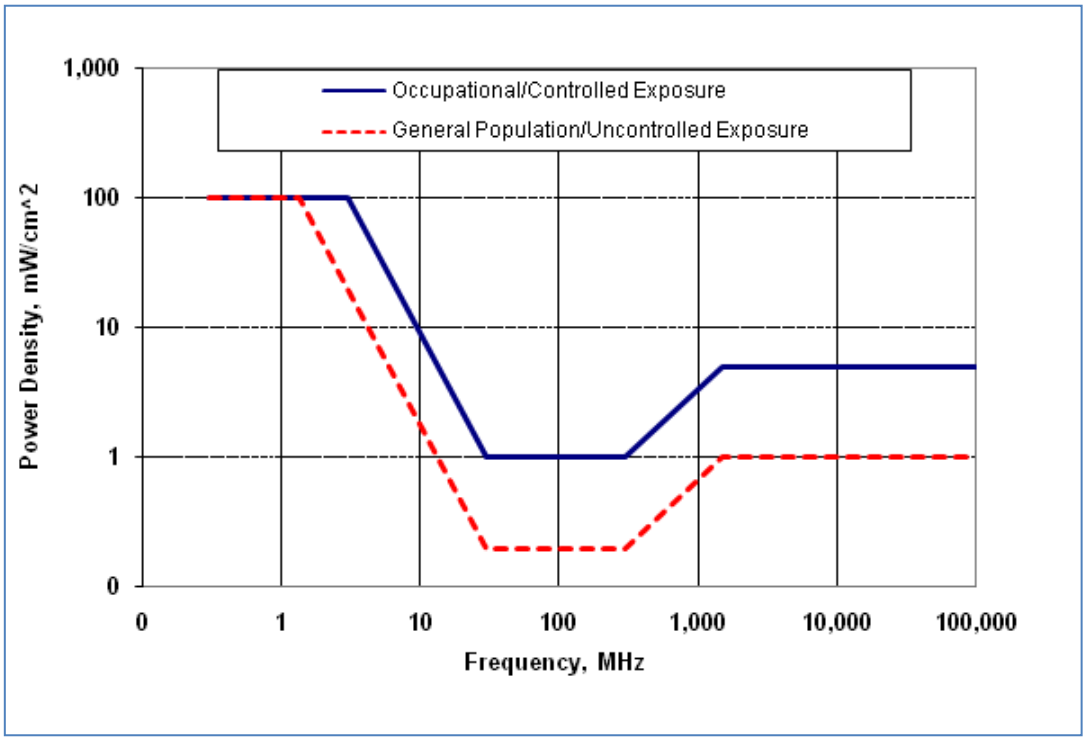
General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can't exercise control over their exposure.

Table 2. MPE Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time for $\|E\|^2$, $\|H\|^2$, 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 – 1500	--	--	f/300	6
1500– 100,000	--	--	5.0	6
f = frequency in MHz		* = Plane wave equivalent power density		

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where such occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

FCC RF Exposure Limits

FCC MPE LIMITS (mW/cm^2)		
EXPOSURE ENVIRONMENT	**AT&T FREQUENCY BANDS**	
	Cellular	**PCS**
General Public (Uncontrolled)	0.59	1.0
Occupational (Controlled)	2.93	5.0

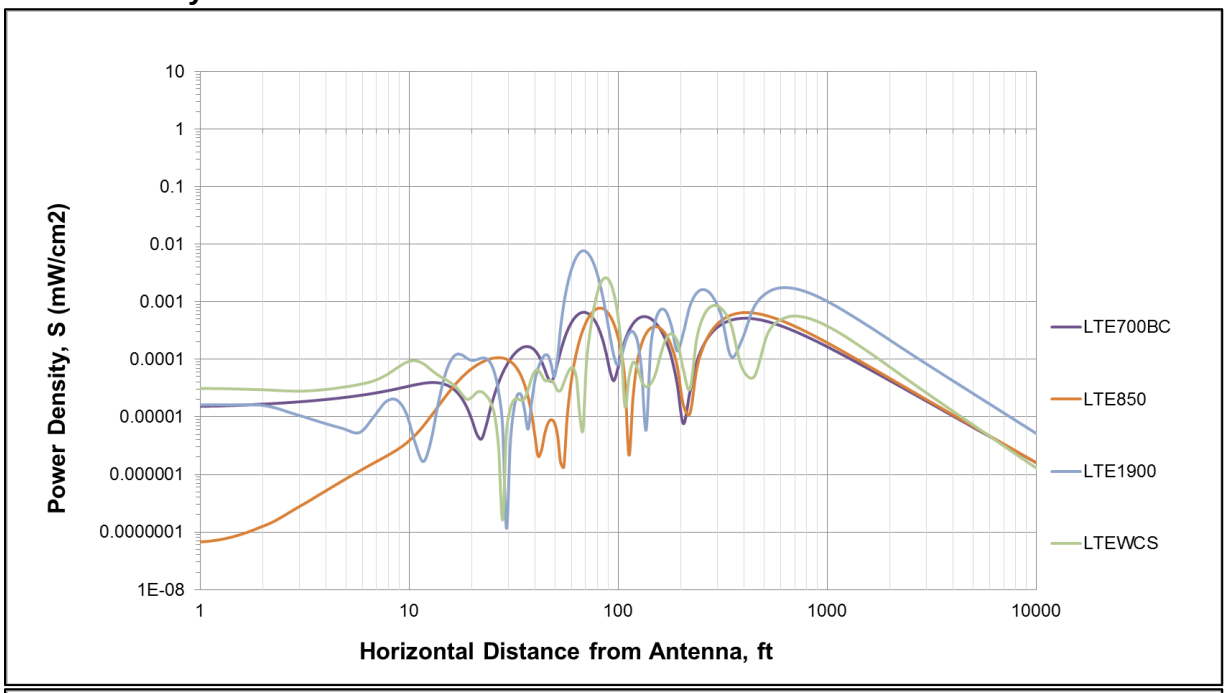


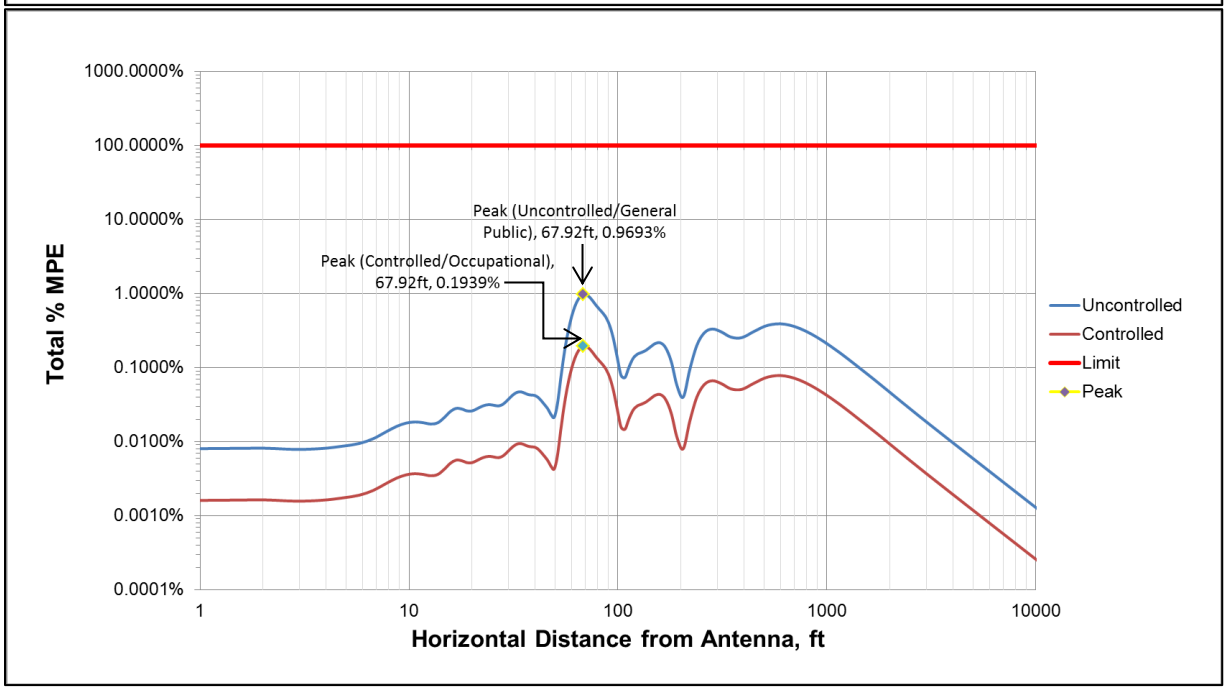
Maximum Permissible Exposures. Occupational/Controlled and General Population/Uncontrolled MPE's are functions of frequency.

Calculation Results (6ft AGL)

The following charts show the graphical representation of the calculated AT&T contribution on power density levels and % MPE at 6ft above ground, as horizontal distance from antenna increases. The calculations take into account the vertical pattern of the antennas and represent the immediate direction of each sector azimuth within the antenna horizontal beamwidth. The calculations also assume line of site to the antennas and the result will be lower if measured indoor due to in-building penetration loss.

Power Density and %MPE





Statement of Certification

I certify to the best of my knowledge that the statements contained in this report are true and accurate. The theoretical computations contained are based on FCC recommended methods, with industry standard assumptions & formulas, and complies with FCC mandated Maximum Permissible RF Exposure requirements.

A comprehensive field survey was not performed prior to the generation of this report. If questions arise regarding the calculations herein, SAI Communications recommends that a comprehensive field survey be performed to resolve any disputes.

Sanket Joshi
RF Engineer
SAI Communications

May 03, 2017
Date

APPENDIX A – REFERENCES

FCC Radio Frequency Safety
http://www.fcc.gov/encyclopedia/radio-frequency-safety

FCC OET Bulletin 56
https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf

FCC OET Bulletin 65
https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf

National Council on Radiation Protection and Measurements (NCRP)
http://www.ncrponline.org

American National Standards Institute (ANSI)
http://www.ansi.org

Environmental Protection Agency (EPA)
https://www3.epa.gov/radtown/wireless-technology.html

National Institutes of Health (NIH)
http://www.niehs.nih.gov/health/topics/agents/emf/

Occupational Safety and Health Agency (OSHA)
http://www.osha.gov/SLTC/radiofrequencyradiation/

International Commission on Non-Ionizing Radiation Protection (ICNIRP)
http://www.icnirp.org/

Noise Control Engineering, Inc.

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:	Joseph Hanna {Joseph.Hanna@noise-control.com}
	Michael Bahtiarian {mikeb@noise-control.com}
DATE:	June 3, 2013
SUBJECT:	Cell Site MA2312: 288 Norfolk Street, Cambridge, MA

INTRODUCTION

Noise Control Engineering, Inc. (NCE) has been retained by Dewberry Engineers, Inc. to perform a site evaluation for a proposed AT&T Mobility Site for a wireless facility located at the above address. The proposed wireless equipment is to be located on the rooftop of a five story commercial building at 288 Norfolk Street, Cambridge, MA, and the noise producing equipment consists of two Carrier Air Conditioning Units (R-22 AC 24ABR3), that will be located on the roof of the loading dock and storage area. All noise producing equipment equipment is located on the roof of the loading dock and storage area approximately 16 feet above ground level. It should be noted this site will not have an Emergency Diesel Generator.

NOISE LIMIT

The "Noise Control Ordinance" for the City of Cambridge, reference [1] states the maximum allowable noise levels for various zoning districts. AT&T has chosen that compliance must be met for all hours of the day, and has chosen to meet the residential limit for "other times". The maximum overall allowable noise level is taken to be 50 dB(A). In addition to the overall dB(A) limit, an octave band criteria is also given. An excerpt from the Cambridge Noise Limits Bylaw is reproduced below in Table 1.

TABLE 1: City of Cambridge Maximum Allowable Sound Pressure Levels, dB(A).

	Residential	
Frequency (Hz)	**Daytime (dB)**	**Other Times (dB)**
31.5	76	68
63	75	67
125	69	61
250	62	52
500	56	46
1000	50	40
2000	45	33
4000	40	28
8000	38	26
Total Equivalent SPL	**60 dB(A)**	**50 dB(A)**

NOISE EVALUATION; RESULTS

NCE used noise data from the manufacturer of the AC Units given in reference [2]. The two HVAC units will be the Carrier R-22 AC 24ABR3. The Sound Power Levels provided by Carrier given in Table 2.

TABLE 2: Source Sound Power Levels dB(A).

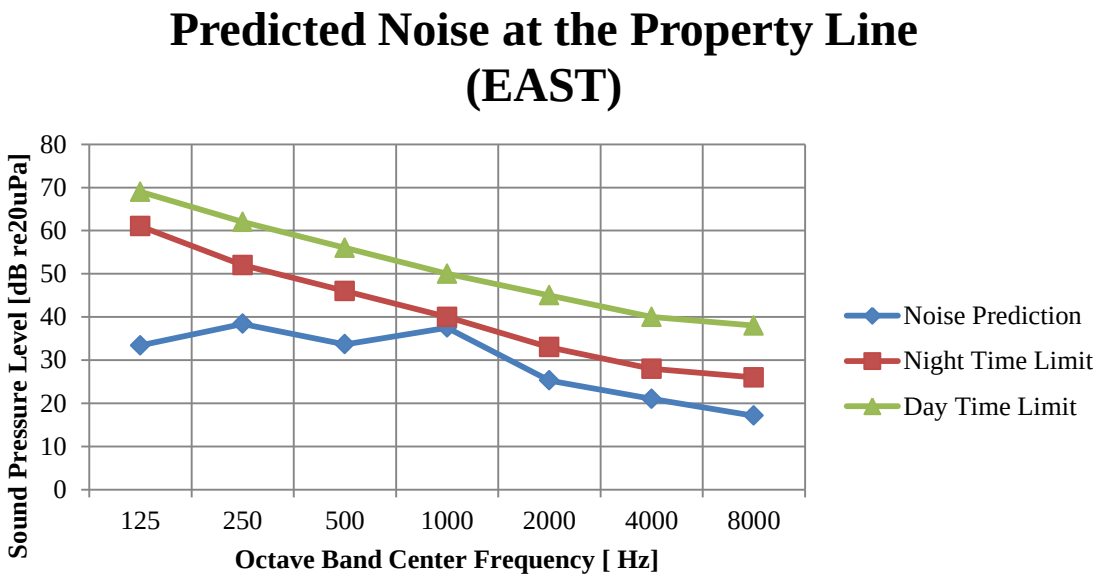
Direction	North	South	East	West
Sound Power Level, dB re 1 pico-Watt, A-weighted	78	78	78	78

To calculate the noise levels at the property line, NCE used the above sound power levels with further attenuation for spherical spreading (20xlogR). The units will be placed behind a partial barrier (or acoustical and visual screen wall) of approximately 5 feet tall surrounding the units on the North, East, and West Side. NCE calculated the attenuation from the partial barrier around the units, using methods from acoustics reference [3]. Table 3 summarizes the results for the AC units at each property line. NCE has assumed for these predictions that both AC units will be operating simultaneously. The octave band predictions for the Eastern property line are shown in Figure 1. The octave band noise predictions on the remaining sides are well within the criteria listed in Table 1. Figure 2 shows the locations of the North, South, East, and West property line locations for the calculated noise levels.

TABLE 3: AC Units Generated SPL at the Property Line, dB(A)

Property Line	North	South	East	West
Horizontal Distance to Property Line, feet	40	190	11	80
Vertical Distance to Property line, feet	16	16	16	16
Partial Barrier Attenuation	9	9	9	9
Calculated SPL @ Property Line, dB(A)	**28**	**24**	**40**	**22**
City of Cambridge Nighttime Residential Noise Limit, dB(A)	**50**			

FIGURE 1:



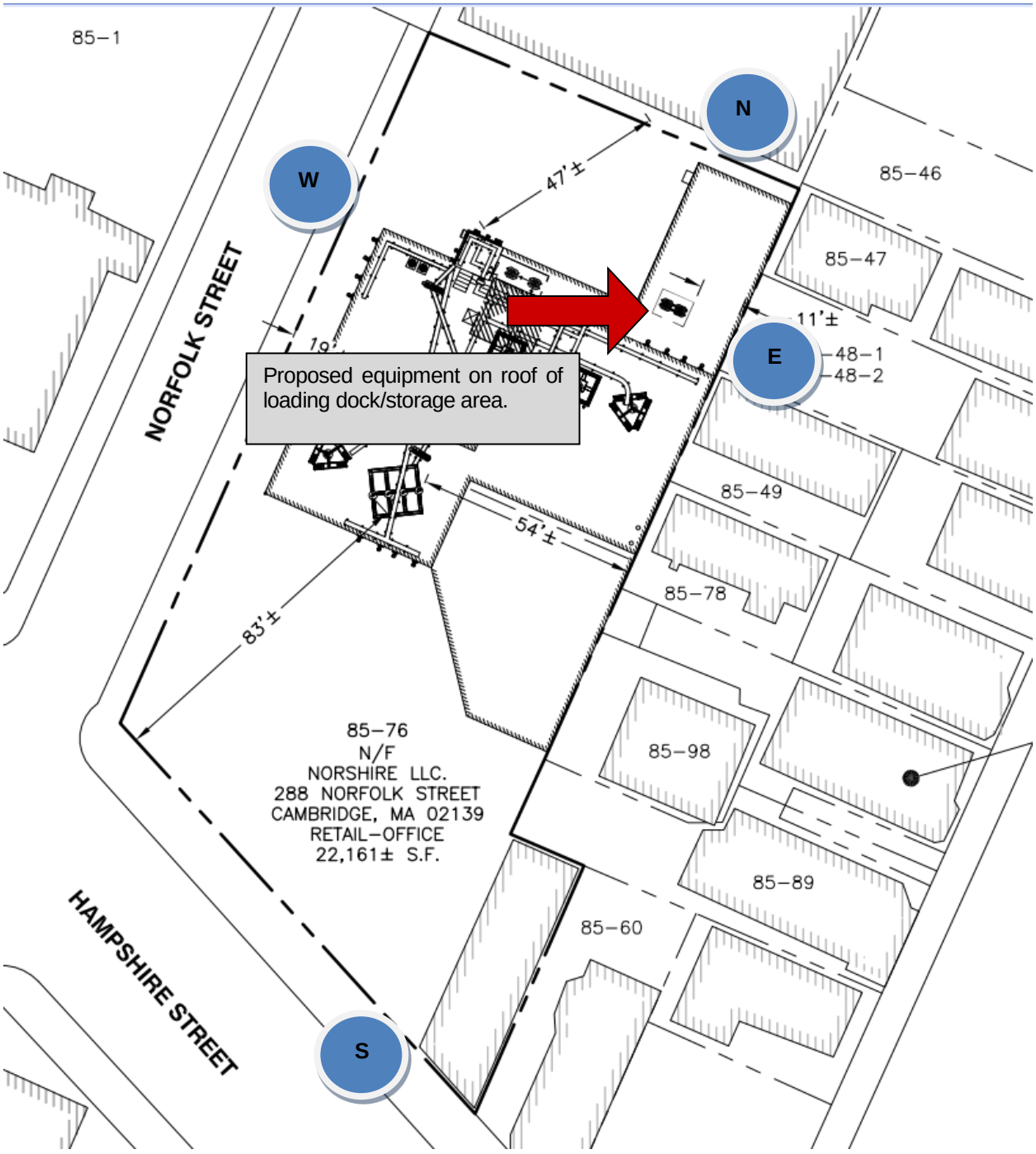
CONCULSION

The proposed AC units to be installed on the roof of the loading dock and storage area of the commercial building located at 288 Norfolk Street in Cambridge, MA taken together will comply with the overall dB(A) and octave band requirements of the Zoning Bylaws of the City of Cambridge.

REFERENCES

1. City of Cambridge Municipal Code, Title 8 Health and Safety, Chapter 8.16 Noise Control. Dated 1991.
2. Carrier Base Series 13 Air Product Data.
3. Bell, Lewis, and Douglas Bell. Industrial Noise Control Fundamentals and Applications, 1994.

FIGURE 2: Property Line Noise Evaluation Locations.



(5)

Bk: 51897 Pg: 321 Doc: DEED
Page: 1 of 5 11/17/2008 09:50 AM

QUITCLAIM DEED

E.L.I., Inc., a Massachusetts corporation and a successor by merger to Eli Heffron & Sons, Inc., with a principal place of business at 139-145 Hampshire Street, Cambridge, Massachusetts 02139 (collectively, the "Grantor"), hereby grants, conveys and transfers to Norshire LLC, a Massachusetts limited liability company, with a principal place of business at 288 Norfolk Street, Cambridge, Massachusetts 02139 (the "Grantee"), in consideration of ONE MILLION THREE HUNDRED AND TWENTY FIVE THOUSAND DOLLARS ($1,325,000.00), the receipt and sufficiency of which is hereby acknowledged,

With QUITCLAIM COVENANTS

The land in Cambridge, Middlesex County, Massachusetts, together with the buildings and other improvements thereon bounded and described as follows:

PARCEL NO. 1 is shown as Lot 18 on "Mason's Plan of Building Lots in Cambridgeport", dated October 21, 1852 and recorded with Middlesex County South District Registry of Deeds (the "Registry"), Book of Plans 16, Plan 18 (the "Plan"), and is bounded and described as follows:

Beginning at a point in the southeasterly line of Norfolk Street, one hundred thirty-eight and 83/100 (138.83) feet northeasterly from the intersection of said line with the northeasterly line of Hampshire Street, thence

NORTHEASTERLY — along said line of Norfolk Street, fifty (50) feet; thence

SOUTHEASTERLY — by a line at right angles to said Norfolk Street, ninety-nine (99) feet to its intersection with the southeasterly boundary line of land of the City of Cambridge, thence

ess: 133-145 Hampshire Street and 284-288 Norfolk Street, Cambridge, MA

Madoff & Khoury
124 Washington Street
Foxboro, MA 02035

MASSACHUSETTS EXCISE TAX
Southern Middlesex District ROD # 001
Date: 11/17/2008 09:50 AM
Ctrl# 117808 29160 Doc# 00184084
Fee: $6,042.00 Cons: $1,325,000.00

SOUTHWESTERLY — along said boundary line fifty (50) feet to its intersection with the division line between land of said City and land now or formerly of Richard H. and Sidney J. Monk, thence

NORTHWESTERLY — along said division line, ninety-nine (99) feet to its intersection with the southeasterly line of Norfolk Street at the point of beginning.

PARCEL NO. 2 is shown as Lot 19 on the Plan and is bounded and described as follows:

NORTHEASTERLY — by Norfolk Street, fifty (50) feet;

NORTHWESTERLY — by Lot 18 as shown on the Plan, ninety-nine (99) feet;

SOUTHEASTERLY — by land formerly of Snelling, fifty (50) feet; and

SOUTHWESTERLY — by Lot 21 as shown on the Plan and by Lot 20 as shown on the Plan, ninety-nine (99) feet.

PARCEL NO. 3 is shown as Lot 20 on the Plan and is bounded and described as follows:

NORTHWESTERLY — by said Norfolk Street, eighty-eight (88) feet, ten (10) inches;

SOUTHWESTERLY — by Hampshire Street, fifty-three (53) feet, eleven (11) inches;

SOUTHEASTERLY — by Lot 21 as shown on the Plan, one hundred ten (110) feet, eight (8) inches;

NORTHEASTERLY — by Lot 19 as shown on the Plan, forty-nine (49) feet, six (6) inches.

Said lots together containing 14,840 square feet of land and be any or all of said measurements or contents more or less.

PARCEL NO. 4 is shown as Lot 21 on the Plan, and is bounded and described as follows:

NORTHEASTERLY — by land now or formerly of Close, being shown as Lot No. 19 on the Plan, forty-nine (49) feet, six (6) inches;

SOUTHEASTERLY — by land formerly of Snelling, now of owners unknown, one hundred thirty-two (132) feet, six (6) inches;

SOUTHWESTERLY — by Hampshire Street, fifty-three (53) feet, eleven (11) inches; and

NORTHWESTERLY — by land shown as Lot No. 20 on the Plan, one hundred ten (110) feet, eight (8) inches, be any or all of said measurements more or less, and containing 6,019 square feet, more or less.

PARCEL NO. 5 comprises a portion of Lot No. 6 as shown on a "Plan of House Lots in Cambridgeport, owned by E.H. Snelling". Jos. Whitney, Surveyor, dated June, 1851, recorded with the Registry at the end of Record Book 730, and is shown as Lot "B" on a plan entitled "Subdivision Lot #6 for Bessie Feinberg from office of Silverman, Engineering Co." recorded with the Registry at the end of Book 3460, and is bounded and described as follows:

SOUTHERLY — by Hampshire Street, twenty-one and 84/100 (21.84) feet;

WESTERLY — by Lot 21 as shown on plan above referred as recorded in Plan Book 16, Plan 18, sixty and 70/100 (60.70) feet;

NORTHERLY — by land shown on Lot No. 5 on the Plan dated June 1851 recorded at the end of Book 730, twenty (20) feet;

EASTERLY — by land of owners unknown, sixty-nine and 48/100 (69.48) feet, be any or all of said measurements more or less and containing 1302 square feet, more or less.

PARCEL NO. 6 comprises a certain parcel of land bounded and described as follows:

Beginning at the junction of Hampshire Street with the Northwesterly line of Elm Street and running

NORTHEASTERLY — on said Elm Street, seventy-four and 16/100 (74.16) feet; thence running

NORTHWESTERLY — by land nor or formerly of Dennis Shea, forty-nine (49) feet; thence running

SOUTHWESTERLY — by land now or formerly of Hiram Someroy or of persons unknown fifty-two and 11/100 (52.11) feet to Hampshire Street; thence running

SOUTHEASTERLY — by said Hampshire Street, fifty-three and 52/100 (53.52) feet to the point of beginning.

Containing 3,106.75 square feet of land more or less.

For title to Parcels 1, 2 and 3, see that deed from Rosberts Co., Inc. to the Grantor dated September 5, 1974 and recorded at the Registry at Book 12695, Page 172 and that deed from Harry Rosenfield et al, dated October 6, 1947 and recorded with the Registry in Book 7215, Page 99.

For title to Parcels 4, 5 and 6 above, see that deed from Rosberts Co., Inc. to the Grantor dated September 5, 1974 and recorded at the Registry at Book 12695, Page 172 and that deed from Colonial Beverage Company dated June 26, 1953 and recorded with the Registry in Book 8096, Page 80.

PARCEL 7: A certain parcel of land with the buildings thereon situated in said Cambridge, and being Lot A on a plan called "Subdivision Lot #6 for Bessie Feinberg from the office of Silverman Engineering Co." recorded with Middlesex South District Deeds at the end of record book 3460, and bounded and described as follows:

SOUTHERLY	by Hampshire Street thirty-two and 76/100 (32.76) feet;
WESTERLY	by Lot B on the Plan sixty-nine and 48/100 (69.48) feet;
NORTHERLY	by Lot 5 on a plan "Plan of House Lots in Cambridgeport owned by E.H. Snelling, Jos. Whitney, surveyors dated June, 1851 and recorded with the Registry at the end of record book 730, thirty (30) feet;
EASTERLY	by Lot 7 on said second mentioned plan eighty-two and 65/100 (82.65) feet;

Containing about 2,282 square feet more or less according to the Plan. For title of Grantor, from Paru Realty Corp. recorded at the Registry at Book 13517, Page 76.

[SIGNATURE PAGE FOLLOWS]

Witness our hand and seal this _____ day of November, 2008.

E.L.I, INC., Seller
as Successor by Merger to
Eli Heffron & Sons, Inc.

By: _____
Bennett Heffron, its duly-authorized President

E.L.I, INC., Seller
as Successor by Merger to
Eli Heffron & Sons, Inc.

By: _____
Jo-Edith Heffron, its duly-authorized Treasurer

COMMONWEALTH OF MASSACHUSETTS

Middlesex, ss. November 4, 2008

Before me personally appeared the above-named Bennett Heffron and Jo-Edith Heffron, proved to me through satisfactory evidence of identification, which were MA DL _____, to be the persons who signed the preceding document in my presence, and who acknowledged to me that they signed it voluntarily for its stated purpose as the duly-authorized President and Treasurer of E.L.I., Inc.

_____
Notary Public: MY COMMISSION EXPIRES
My Commission Expires: DECEMBER 29, 2011

MARTHA COAKLEY
ATTORNEY GENERAL

THE COMMONWEALTH OF MASSACHUSETTS
OFFICE OF THE ATTORNEY GENERAL
CENTRAL MASSACHUSETTS DIVISION
10 MECHANIC STREET, SUITE 301
WORCESTER, MA 01608

(508) 792-7600
(508) 795-1991 fax
www.mass.gov/ago

June 10, 2014

Janet A. Vellante, Town Clerk
Town of Harvard
13 Ayer Road
Harvard, MA 01451-1458

RE: Harvard Annual Town Meeting of April 1, 2014 - Case # 7101
Warrant Articles # 40, 41, 42, 43, 44, 45 and 46 (Zoning)
Warrant Articles # 19 and 38 (General)

Dear Ms. Vellante:

Articles 19, 38, 40, 41, 42, 43, 44, and 45 - We approve these Articles, and the maps pertaining to Articles 42 and 44, from the Harvard Annual Town Meeting of April 1, 2014. We will return the approved maps to you by regular mail. Our comments on Article 41 are detailed below.

Article 46 - We retain Article 46 for further review and will issue our decision on it before our deadline of July 29, 2014.

Article 41 - Article 41 amends the Town's zoning by-laws Section 125-27, "Wireless Communications Towers Overlay District," by adding a new subsection D (3) to accommodate the Town's public safety department communication equipment. The new subsection D (3) provides as follows:

> For new towers, or modifications to existing towers that require grant of a special permit by the Planning Board, the tower owner shall allow the installation of municipal public safety communications equipment provided such equipment does not interfere with the service of other carriers on the tower. The Town shall bear the cost of the equipment and its installation.

The new subsection D (3) requires a wireless communications tower owner to provide space on the tower for municipal public safety equipment. Subsection D (3) expressly provides that the Town shall pay the cost of the equipment and its installation. However, subsection D (3) is silent on whether the space will be provided at no charge. Subsection D (3) cannot be interpreted and applied to mean that the Town must only pay the costs associated with the installation of its antennas and equipment and nothing else. Such interpretation and application would be a "taking" in violation of the Fifth Amendment as applied to the states via the

Fourteenth and Article 10 of the Massachusetts Declaration of Rights. *See* Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 426 (1982); Nollan v. California Coastal Comm'n., 483 U.S. 825, 831 (1987); and Dolan v. City of Tigard, 512 U.S. 374, 383 (1994). We strongly suggest that the Town discuss the proper application of subsection D (3) with Town Counsel.

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 that 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 voted by Town Meeting, unless a later effective date is prescribed in the by-law.

Very truly yours,
MARTHA COAKLEY
ATTORNEY GENERAL

Margaret J. Hurley

by: Margaret J. Hurley, Assistant Attorney General
Chief, Central Massachusetts Division
Director, Municipal Law Unit
Ten Mechanic Street, Suite 301
Worcester, MA 01608
(508) 792-7600 x 4402

cc: Town Counsel Mark J. Lanza

MAURA HEALEY
ATTORNEY GENERAL

THE COMMONWEALTH OF MASSACHUSETTS
OFFICE OF THE ATTORNEY GENERAL
CENTRAL MASSACHUSETTS DIVISION
10 MECHANIC STREET, SUITE 301
WORCESTER, MA 01608

(508) 792-7600
(508) 795-1991 fax
www.mass.gov/ago

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

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Assistant Attorney General
Municipal Law Unit
10 Mechanic Street, Suite 301
Worcester, MA 01608
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cc: Town Counsel Thomas Mullen

MAURA HEALEY
ATTORNEY GENERAL

THE COMMONWEALTH OF MASSACHUSETTS
OFFICE OF THE ATTORNEY GENERAL
CENTRAL MASSACHUSETTS DIVISION
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(508) 795-1991 fax
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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

By: Nicole B. Caprioli
Assistant Attorney General
Municipal Law Unit
10 Mechanic Street, Suite 301
Worcester, MA 01608
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nicole.caprioli@state.ma.us

cc: Town Counsel Gregg J. Corbo

CAMBRIDGE HISTORICAL COMMISSION

831 Massachusetts Avenue, 2nd Floor, Cambridge, Massachusetts 02139
Telephone: 617 349 4683 TTY: 617 349 6112
E-mail: histcomm@cambridgema.gov URL: http://www.cambridgema.gov/Historic

Jurisdiction Advice

To the Owner of Property at **288 Norfolk Street**

The above-referenced property is subject to the jurisdiction of the Cambridge Historical Commission (CHC) by reason of the status referenced below:

__ Old Cambridge Historic District
__ Fort Washington Historic District
(M.G.L. Ch. 40C, City Code §2.78.050)
__ Avon Hill Neighborhood Conservation District
__ Half Crown – Marsh Neighborhood Conservation District
__ Harvard Square Conservation District
__ Mid Cambridge Neighborhood Conservation District
__ Designated Landmark
__ Property is being studied for designation: _____
(City Code, Ch. 2.78., Article III, and various City Council Orders)
__ Preservation Restriction or Easement (as recorded)
_**X**_ Structure is fifty years or more old and therefore subject to CHC review of any application for a demolition permit, if one is required by ISD. (City Code, Ch. 2.78, Article II). See the back of this page for definition of demolition.
No demolition proposed in zoning application.
__ No jurisdiction: not a designated historic property and the structure is less than fifty years old.
__ No local jurisdiction, but the property is listed on the National Register of Historic Places; CHC staff is available for consultation, upon request.
Staff comments: _____

The Board of Zoning Appeal advises applicants to complete Historical Commission or Neighborhood Conservation District Commission reviews before appearing before the Board.

If a line indicating possible jurisdiction is checked, the owner needs to consult with the staff of the Historical Commission to determine whether a hearing will be required.

CHC staff initials SLB Date February 2, 2018

Received by Uploaded to Energov Date February 2, 2018
Relationship to project BZA 15524-2018

cc: Applicant
Inspectional Services Commissioner

Demolition Delay Ordinance and Application Information

The Demolition Delay Ordinance (Chapter 2.78, Article II of the Cambridge Municipal Code) was adopted by the City Council in 1979 to afford public review of demolition permit applications for potentially significant buildings. When the Historical Commission determines that a building is significant and should be preserved, demolition will be delayed for up to six months so that solutions can be sought to preserve the building indefinitely. The Ordinance covers all buildings over 50 years old, city-wide. The Historical Commission archives provide dates of construction for all properties in the City.

Demolition is defined in the ordinance as "the act of pulling down, destroying, removing or razing a building or commencing the work of total or substantial destruction with the intent of completing the same." The Inspectional Services Commissioner has provided further guidelines to outline what actions require a demolition permit. **In addition to complete demolition of a building, the following actions may require a demolition permit,**

- **removal of a roof,**
- **removal of one side of a building,**
- **gutting of a building's interior to the point where exterior features (windows, etc.) are impacted, and**
- **removal of more than 25% of a structure.**

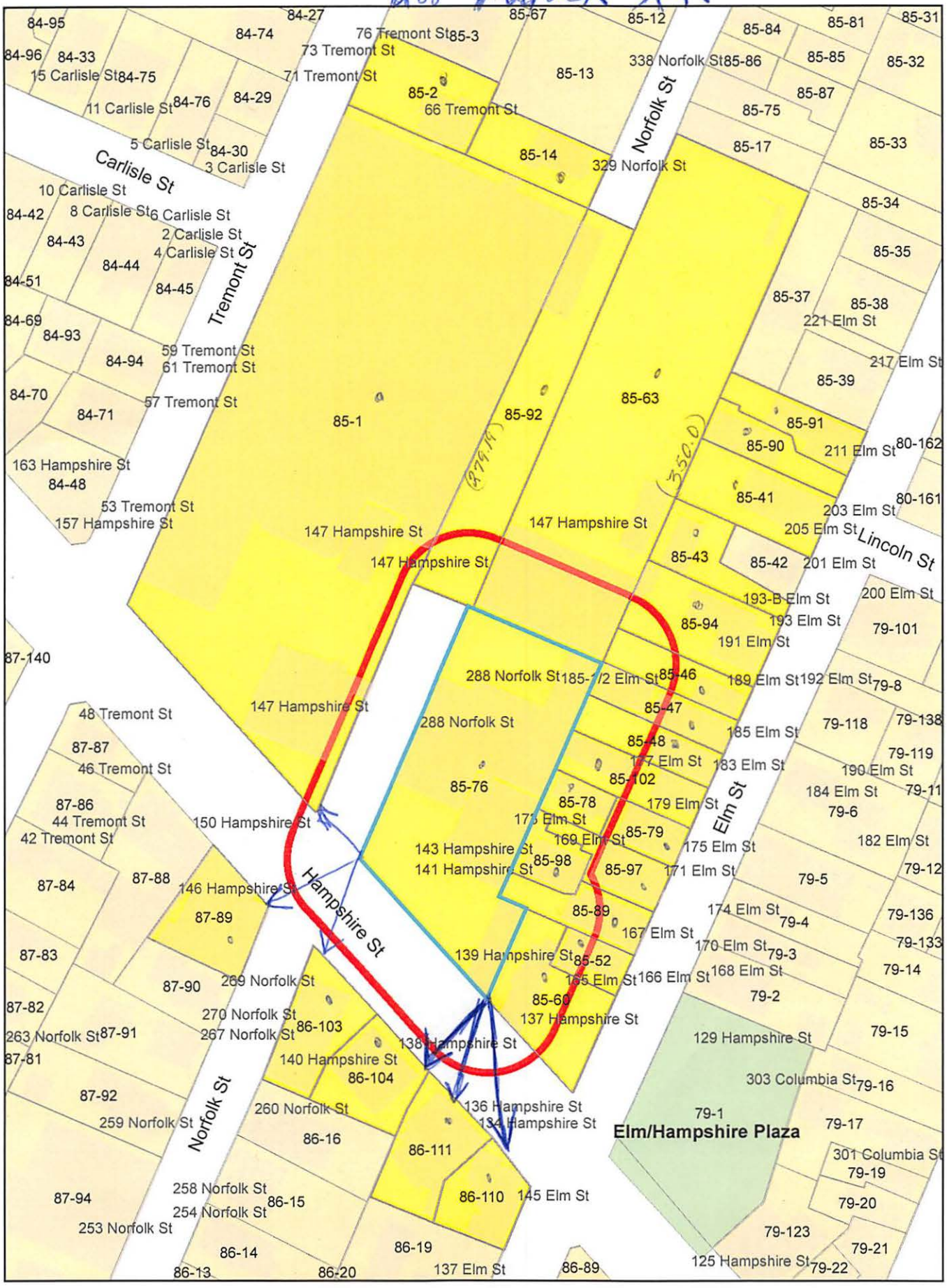
Please contact the building inspector or a staff member of the Historical Commission if you have questions about whether a demolition permit is required for a particular project.

Demolition permit applications can be obtained from the Inspectional Services Department. The completed application should be submitted to the Historical Commission, where the staff will review the application. If the Executive Director of the Historical Commission makes an initial determination that the building is significant, a public hearing will be scheduled with Historical Commission. If the staff makes an initial determination that the building is not significant, the application is released for further review by the Building Commissioner.

More information about the demolition permit application procedures is available on the Historical Commission's web site or by calling or dropping by the Historical Commission office.

July 2003

Cambridge Historical Commission
831 Massachusetts Ave., 2nd Fl.
Cambridge, MA 02139
Ph: 617/349-4683 or TTY: 617/349-6112
http://www.cambridgema.gov/Historic


288 Norfolk St.
84-95
84-96
84-33
15 Carlisle St
84-75
11 Carlisle St
84-76
84-74
84-27
84-29
5 Carlisle St
84-30
3 Carlisle St
Carlisle St
10 Carlisle St
84-42
8 Carlisle St
6 Carlisle St
2 Carlisle St
4 Carlisle St
84-43
84-44
84-51
84-45
Tremont St
84-69
84-93
84-94
59 Tremont St
61 Tremont St
84-70
84-71
57 Tremont St
163 Hampshire St
84-48
53 Tremont St
157 Hampshire St
87-140
48 Tremont St
87-87
46 Tremont St
87-86
44 Tremont St
42 Tremont St
87-84
87-88
87-89
87-83
87-90
87-82
263 Norfolk St
87-91
87-81
87-92
259 Norfolk St
87-94
253 Norfolk St
258 Norfolk St
254 Norfolk St
86-15
86-14
86-13
86-20
86-19
137 Elm St
86-89
86-110
145 Elm St
86-111
86-16
260 Norfolk St
86-104
140 Hampshire St
86-103
267 Norfolk St
270 Norfolk St
269 Norfolk St
139 Hampshire St
138 Hampshire St
136 Hampshire St
134 Hampshire St
137 Hampshire St
85-60
85-52
165 Elm St
166 Elm St
168 Elm St
170 Elm St
167 Elm St
174 Elm St
171 Elm St
85-97
85-98
141 Hampshire St
143 Hampshire St
169 Elm St
175 Elm St
85-79
179 Elm St
177 Elm St
85-78
85-102
183 Elm St
187 Elm St
85-48
185 Elm St
85-47
189 Elm St
192 Elm St
185-1/2 Elm St
85-46
288 Norfolk St
85-76
147 Hampshire St
150 Hampshire St
146 Hampshire St
Hampshire St
Norfolk St
Elm St
Lincoln St
147 Hampshire St
147 Hampshire St
147 Hampshire St
85-1
85-92
85-63
(879.4')
(350.0')
85-94
193-B Elm St
193 Elm St
191 Elm St
85-43
85-42
201 Elm St
205 Elm St
203 Elm St
85-41
85-90
85-91
211 Elm St
85-39
217 Elm St
85-37
85-38
221 Elm St
85-35
85-34
85-33
85-17
85-75
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85-85
85-86
338 Norfolk St
85-13
85-12
85-67
85-3
76 Tremont St
73 Tremont St
71 Tremont St
85-2
66 Tremont St
85-14
329 Norfolk St
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85-81
85-31
85-32
79-101
200 Elm St
79-8
79-118
79-138
79-119
190 Elm St
184 Elm St
79-11
79-6
182 Elm St
79-12
79-5
79-136
79-4
79-133
79-3
79-14
79-2
79-15
129 Hampshire St
303 Columbia St
79-16
79-1
Elm/Hampshire Plaza
79-17
301 Columbia St
79-19
79-20
79-123
79-21
125 Hampshire St
79-22
80-162
80-161

288 Norfolk St

192

85-1-63-92
CAMBRIDGE CITY OF PUBLIC WORKS DEPT
147 HAMPSHIRE ST
CAMBRIDGE, MA 02139

85-2
BORGES, MICHAEL M. & JACINTA BORGES
66 TREMONT STREET
CAMBRIDGE, MA 02139

Petitioner
SAI COMMUNICATIONS, INC.
C/O DAN BILEZIKIAN
125 TREMONT STREET
REHOBOTH, MA 02769

85-43
PEREZ, FELIX & CARMEN PEREZ
197 ELM ST.
CAMBRIDGE, MA 02139

85-46
CHERNEY, CHARLES & CANDACE BOTT
189 ELM ST
CAMBRIDGE, MA 02139

85-47
CAZEAU, ANDRE & MATANIE CAZEAU,
TRS. THE CAZEAU REALTY TRUST
P.O. BOX 400844
CAMBRIDGE, MA 02140

85-52
BAE HOLDINGS LLC
C/O ELMSHIRE LLC
59 TEMPLE PLACE, SUITE 204
BOSTON, MA 02111

85-1-63-92
CITY OF CAMBRIDGE
C/O LOUIS DEPASQUALE
CITY MANAGER

85-1-63-92
CITY OF CAMBRIDGE
C/O NANCY GLOWA
CITY SOLICITOR

85-60-76
NORSHIRE LLC,
288 NORFOLK ST
CAMBRIDGE, MA 02139

85-78
SYTCHOV, MIKHAIL
173R ELM ST
CAMBRIDGE, MA 02139

85-90
MALAMUD, NORBERT S. & LINDA NGUYEN
209 ELM ST
CAMBRIDGE, MA 02139

85-91
LACOURT FOUNDATION, LLC
30 COLLEGE AVE
SOMERVILLE, MA 02144

85-14
TINKJIAN, KEVORK & ANNA M. ROSENBLATT
50 PROSPECT ST
CAMBRIDGE, MA 02139

85-94
PIRES, FRANCISCA
193 ELM ST
CAMBRIDGE, MA 02139

85-98
THAMES, JAMES NATHAN &
ELIZABETH WILLARD THAMES
169R ELM ST.
CAMBRIDGE, MA 02139

86-103-104
ROWLEY, JAMES J. & JOANNE K. ROWLEY,
TRS THE ROWLEY FAMILY REALTY TRUST
29 RUSKIN ST.
WEST ROXBURY, MA 02132

85-102
DASILVA, NAZIDIR RODRIGUES
179 ELM STREET
CAMBRIDGE, MA 02139

86-110
HENRY, SHAWN R. & LAETITIA M. HENRY
145 ELM ST
CAMBRIDGE, MA 02139

86-111
JEFFRIES, BENJAMIN E.,
TR OF HAMPSHIRE STREET REALTY TRUST
P.O. BOX 534
N. SEABREEZE AVE
STONINGTON, ME 04681

87-89
MASS AVE BAPTIST CHURCH INC
146 HAMPSHIRE
CAMBRIDGE, MA 02139

85-41
DE, ALOK M. & MAYA DEE
TR. THE DE FAMILY TRUST
203-205 ELM ST., #1
CAMBRIDGE, MA 02139

85-41
HOSS, JENNIFER L. & ANDREW GUZIOR HOSS
203-205 ELM ST. UNIT# 3
CAMBRIDGE, MA 02139

85-41
SELIGER, VERENA INGEBORG
203-205 ELM ST., #2
CAMBRIDGE, MA 02139

85-79
SEWELL, ELI A. & JILL W. SEWELL
175 ELM ST., #175/1
CAMBRIDGE, MA 02139

85-79
YIP, ARTHUR HONG CHUN
175 ELM ST., #175/3
CAMBRIDGE, MA 02139

85-79
WONG, ON YI
394 NORFOLK ST.
CAMBRIDGE, MA 02139

85-97
PEDRELLI, PAOLA
171 ELM ST., UNIT #1
CAMBRIDGE, MA 02139

85-97
KHANGURA, NAVTEJ
171 ELM ST., #3
CAMBRIDGE, MA 02139

85-97
WHITE, ANNE ELISABETH
C/O MARTYN, RAJEEVE & MELISSA DUGGAN
171 ELM ST., #2
CAMBRIDGE, MA 02139

288 Norfolk St.

292

85-48
SUZUKI, YUJI , KEIKO SUZUKI & SARA SUZKI
183 ELM ST., #1
CAMBRIDGE, MA 02139

85-48
LEE, BRITTANY L.
183 ELM ST., #2
CAMBRIDGE, MA 02140

85-89
PETERSON, HILLARY FITZPATRICK &
BENJAMIN J. PETERSON
167 ELM ST., #1
CAMBRIDGE, MA 02139

85-89
SCOTT,LEONARD GREGORY &PAMELA KAY OTSTOT
TRUSTEES OF THE LG& PK SCOTT 2013 TRUST
2434 JACKSON ST.
SAN FRANCISCO, CA 94118

85-89
YANG, YU-SANG
167 ELM ST., #2
CAMBRIDGE, MA 02139

85-102
BERRY, JESSICA C.
177 ELM ST.
CAMBRIDGE, MA 02141