# NB+C Engineering Services

## Penthouse Floor Structural Analysis

*Prepared for T-Mobile: Anchor*

### SITE INFORMATION

| | |
|---|---|
| **Address** | 301 Maple Ave West<br>Vienna, VA 22180<br>Lat: 38.89820100°<br>Long: -77.27086100° |
| **T-Mobile Site Number** | 7WAC050A |
| **T-Mobile Site Name** | White Oak Tower |
| **NB+C Project Number** | 100595 |
| **Date** | May 5, 2021 |

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## 1.0 INTRODUCTION

The existing structure is a 81′-6″ ± building located in Vienna, VA.

T-Mobile has proposed to reconfigure the site and install the new equipment as shown in the tables below. A structural analysis was performed to see if the new loads are safely supported by the proposed antenna mounts and to verify if the existing structure is in compliance with the applicable codes and standards. Information we have received and used for this analysis includes:

- RFDS provided by T-Mobile dated February 26, 2021
- Preliminary Construction Drawings prepared by **NB+C,** dated April 19, 2021
- Previous Construction Drawings by **NB+C**, dated June 10, 2020
- Previous Construction Drawings by Advantage Engineers, dated September 3, 2010
- Previous Structural Assessment by Adams-Mirza Engineering, dated October 31, 2007
- Construction Drawings prepared by Support Engineering, dated September 03, 2014
- Site Audit Photos dated February 10, 2021

## 2.0 EQUIPMENT LOADING

As per the information provided to us, the following tables show the proposed and existing equipment installation by T-Mobile.

**Table 1 – Proposed Equipment Information**

| Mounting Level (ft) | Center Line Elevation (ft) | Number | Manufacturer | Equipment Model | Carrier | Feed Line Size (in) | Note |
|---|---|---|---|---|---|---|---|
| Existing Penthouse | | 1 | - | 6160 (63”x25.6”x33.5”, 1500lbs) | T-Mobile | - | - |
| | | 1 | - | B160 (63”x26.0”x26.0”, 2000lbs) | | | |
| | | 1 | - | 6’x6’ Fiberglass Grating Skid | - | - | - |

**Table 2 – Existing Equipment Information**

| Mounting Level (ft) | Center Line Elevation (ft) | Number | Manufacturer | Equipment Model | Carrier | Feed Line Size (in) | Note |
|---|---|---|---|---|---|---|---|
| Existing Penthouse | | 1 | - | 6102 | T-Mobile | - | 1 |

Note: 1. Existing equipment to remain. 2. Existing equipment to be removed, was not considered in this analysis.

## 3.0 ASSUMPTIONS

This report is based on the theoretical capacity of the existing/proposed structural elements and is not an assessment of the overall suitability of the existing Structure or its components for any particular use other than specified here in this report:

- This report makes no warranties, expressed and/or implied, and disclaims any liability arising from material, fabrication and erection of the existing Structure

and any other existing or proposed components or appurtenances.

- All proposed and existing antennas, mounts, coaxial cables and appurtenances are assumed to be properly installed and configured according to manufacturer requirements.
- All existing structural elements are assumed to be in place and in good condition and were previously designed and constructed in accordance with applicable codes and standards.
- Contractor to verify existing site condition including the existing structure prior to fabrication and construction. In the event the existing structure conditions are different than the assumptions made in this report, this has to be brought to the structural engineer's attention before proceeding any further with bidding, fabrication and/or erection.

## 4.0 APPLICABLE CODES AND STANDARDS

The existing structure was analyzed/designed per the provisions of following applicable codes and standards:

- *2015 Virginia Uniform Statewide Building Code*
- *ANSI/TIA-222-G – Structural Standards for Antenna Supporting Structures and Antennas*
- *Minimum Design Loads for Buildings and Other Structures ASCE/SEI 7-10*
- *AISC Manual of Steel Construction, 14th Edition – ANSI/AISC 360-10*

## 5.0 ANALYSIS

Design Loads:

- Ultimate wind speed: 115 mph
- Occupancy Category: II
- Exposure: B

Load Combinations:

- D
- D + L
- D + 0.6W
- 0.6D + 0.6W

## 6.0 CONCLUSIONS & RECOMMENDATIONS

As discussed above in this report, the proposed cabinets are to be installed inside the existing penthouse on a new **6'-0" x 6'-0" Fiberglass grating "skid" resting directly on the penthouse floor**. Refer to construction drawings prepared by **NB+C ES** for the proposed location of the appurtenances, and the supporting mounts.

Based on the performed analysis of this structure for applied gravity and lateral loads, the existing structure was determined to have ***adequate*** capacity to support the proposed T-Mobile appurtenances.

The results in Appendix B of the report show that the additional forces imparted to the existing building

structure due to proposed appurtenance placement are within acceptable limits considering the overall configuration of the existing support structure, therefore the proposed installation may proceed as intended.

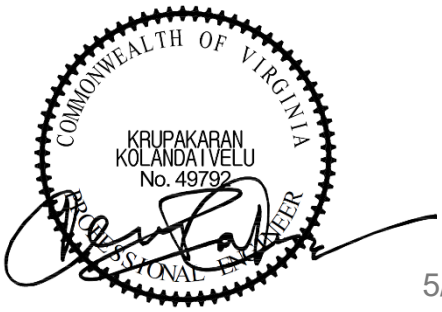
The conclusions reached by **NB+C ES** in this report are only applicable for the previously mentioned existing structural members supporting the T-Mobile equipment. Further, no structural qualification is made or implied by this report for existing structural members not supporting the T-Mobile equipment.

**NB+C ENGINEERING SERVICES, LLC**

Prepared by: Yaw O. Bonsu, E.I.T.

Respectfully Submitted by:

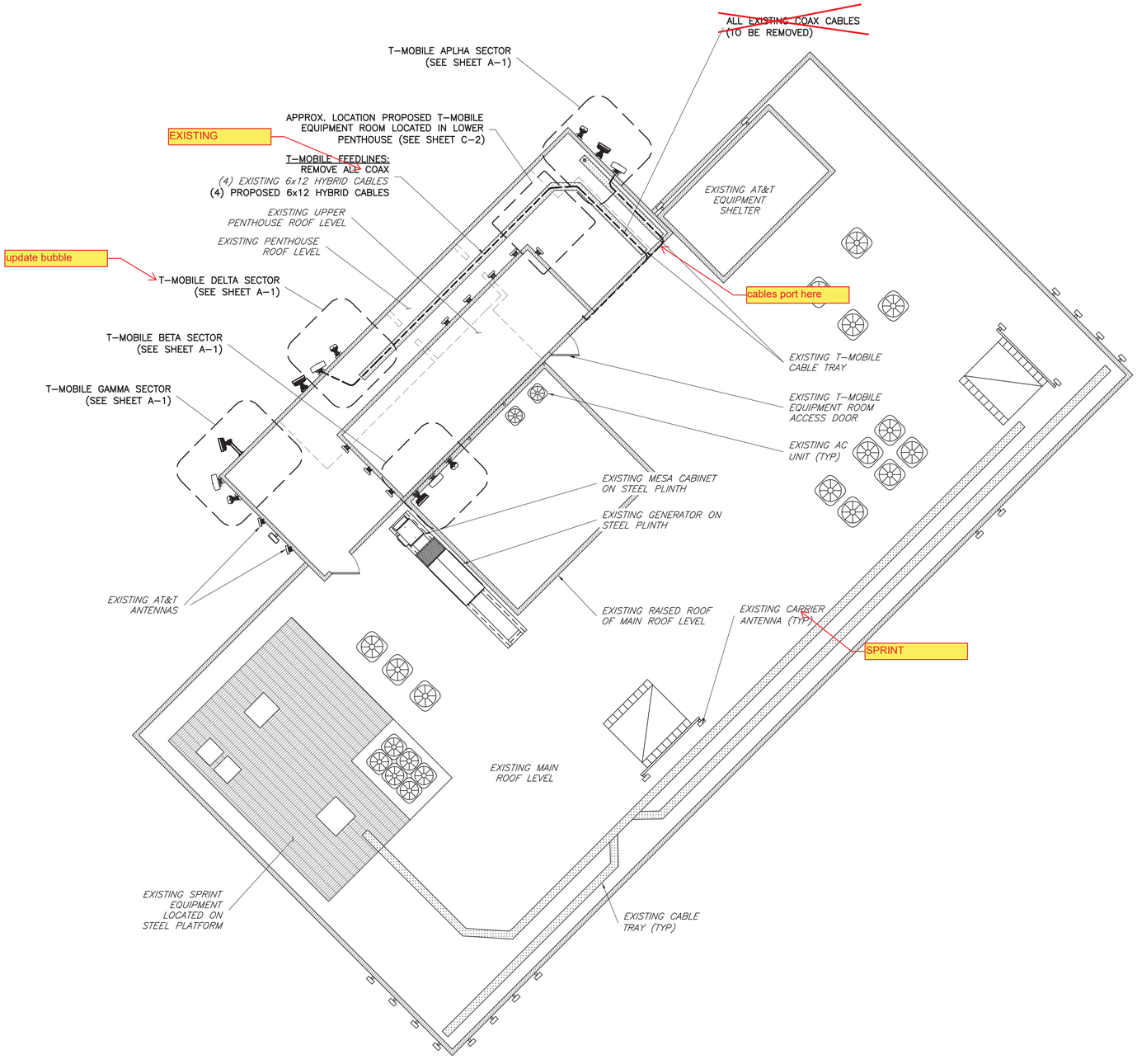
**Krupakaran Kolandaivelu, P.E.**
Director of Engineering
VA PE License # 49792




5/5/2021

# APPENDIX A:
# PLAN AND ELEVATION

TRUE NORTH




1 / C-1 ROOFTOP PLAN
SCALE: 1/8" = 1' (22X34)
SCALE: 1/16" = 1' (11X17)

GRAPHIC SCALE

16 8 0 1 2 4 8 16

1/8 INCH = 1 FOOT (22X34)
1/16 INCH = 1 FOOT (11X17)

APPLICANT

T-Mobile

T-MOBILE NORTHEAST LLC

12050 BALTIMORE AVENUE
BELTSVILLE, MD 20705
OFFICE: (240) 264-8600
FAX: (240) 264-8610

ENGINEER

NB+C TOTALLY COMMITTED.

NB+C ENGINEERING SERVICES, LLC.
6095 MARSHALEE DRIVE, SUITE 300
ELKRIDGE, MD 21075
(410) 712-7092

SITE INFORMATION

7WAC050A
WHITE OAK TOWER
301 MAPLE AVENUE WEST
VIENNA, VA 22180
TOWN OF VIENNA

DESIGN RECORD

REVISIONS

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| A | 04/19/21 | PRELIMINARY CDs | SCR |

PROFESSIONAL STAMP

ENGINEER

SHEET TITLE

ROOFTOP PLAN

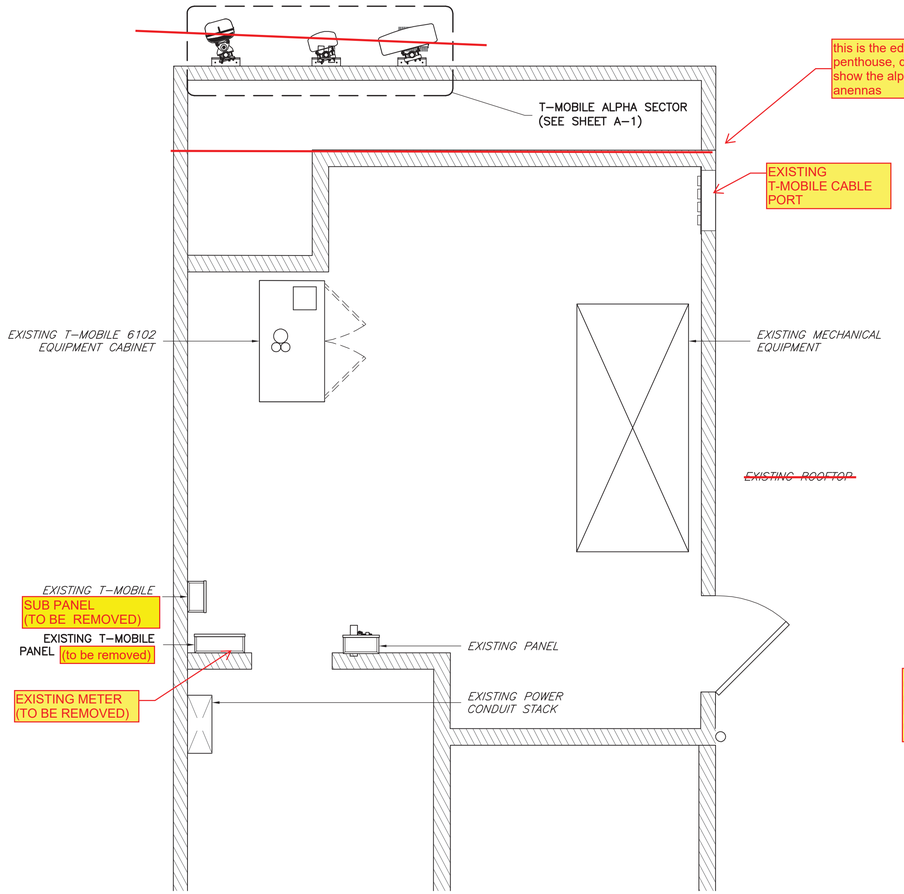
SHEET NUMBER

C-1

We need to accurately draw the equipment area to come up with the best way to place our cabinets,

Update per MAPPING IMG_1085 in Useful Docs Folder

TRUE NORTH



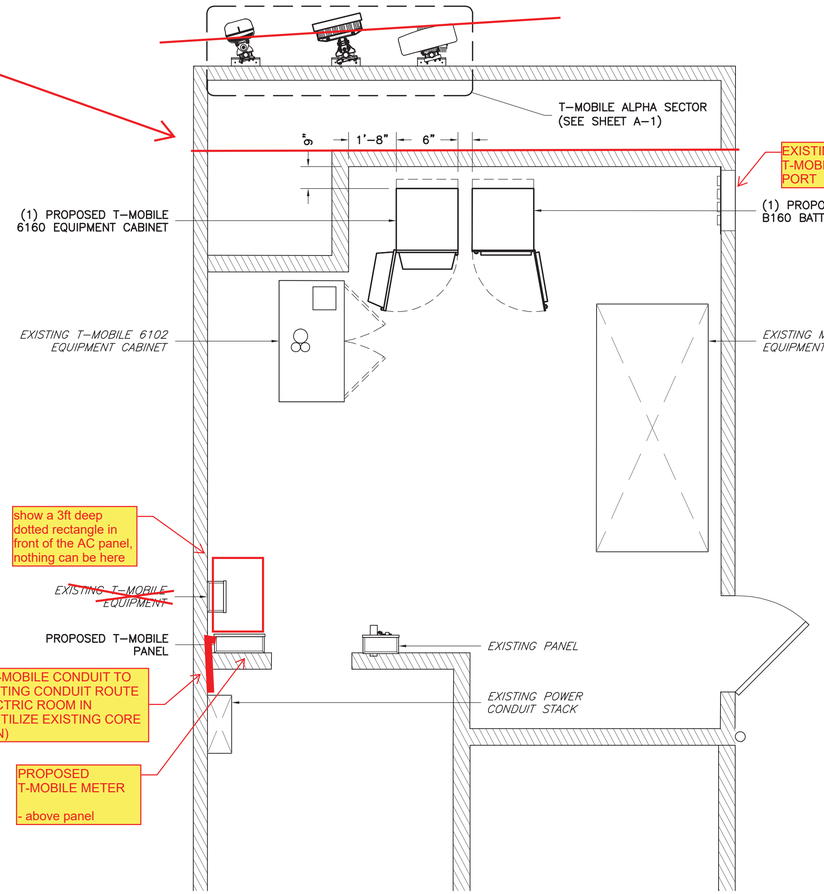

1 C-2 EXISTING EQUIPMENT PLAN

SCALE: 3/8" = 1' (22X34)
SCALE: 3/16" = 1' (11X17)

GRAPHIC SCALE

4 0 1 2 4 8

3/8 INCH = 1 FOOT (22X34)
3/16 INCH = 1 FOOT (11X17)




2 C-2 PROPOSED EQUIPMENT PLAN

SCALE: 3/8" = 1' (22X34)
SCALE: 3/16" = 1' (11X17)

GRAPHIC SCALE

4 0 1 2 4 8

3/8 INCH = 1 FOOT (22X34)
3/16 INCH = 1 FOOT (11X17)

NOTE:
ALL EXISTING COAX CABLES AND TMAS ARE TO BE REMOVED

APPLICANT

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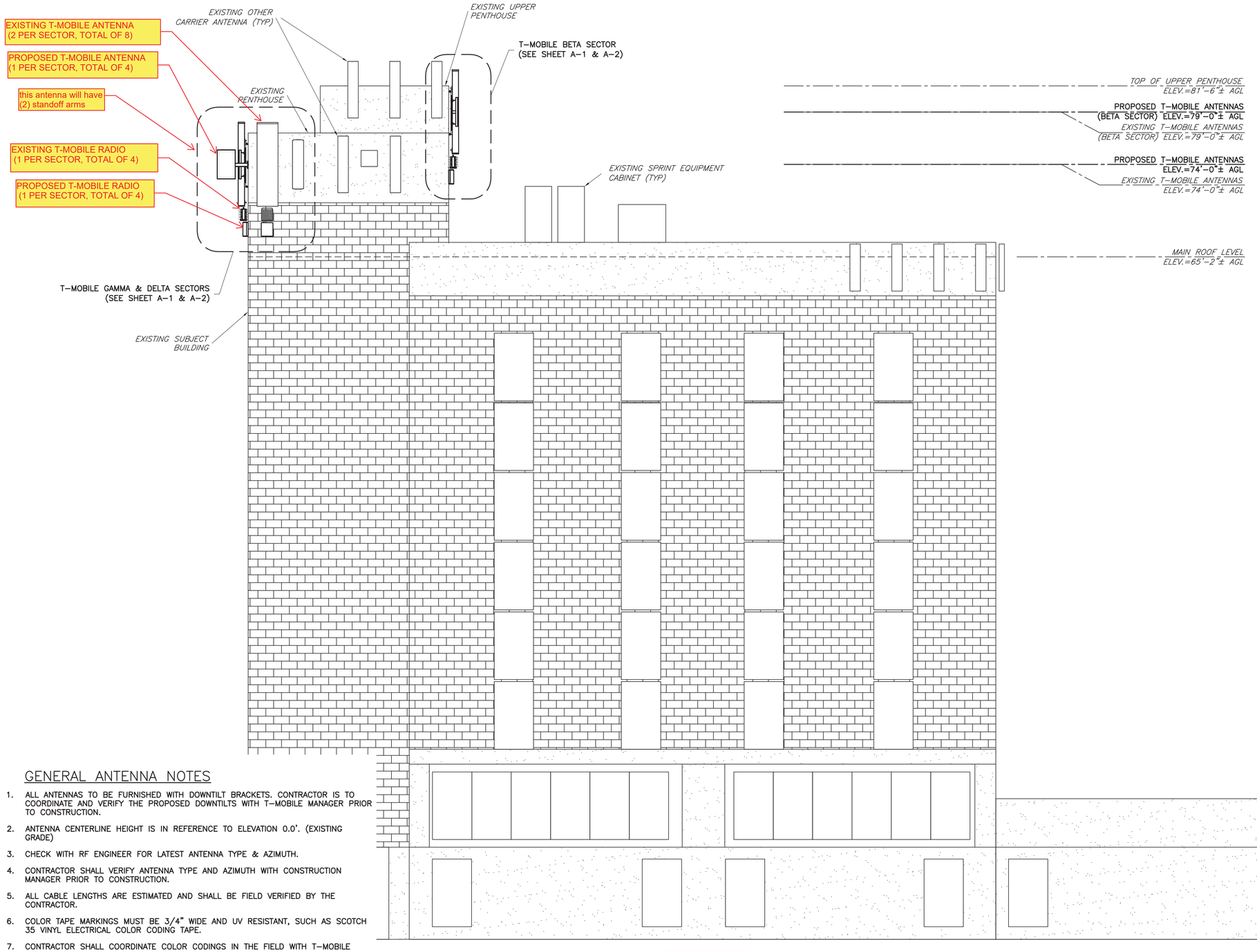
SHEET NUMBER

C-2




## GENERAL ANTENNA NOTES

1. ALL ANTENNAS TO BE FURNISHED WITH DOWNTILT BRACKETS. CONTRACTOR IS TO COORDINATE AND VERIFY THE PROPOSED DOWNTILTS WITH T-MOBILE MANAGER PRIOR TO CONSTRUCTION.
2. ANTENNA CENTERLINE HEIGHT IS IN REFERENCE TO ELEVATION 0.0'. (EXISTING GRADE)
3. CHECK WITH RF ENGINEER FOR LATEST ANTENNA TYPE & AZIMUTH.
4. CONTRACTOR SHALL VERIFY ANTENNA TYPE AND AZIMUTH WITH CONSTRUCTION MANAGER PRIOR TO CONSTRUCTION.
5. ALL CABLE LENGTHS ARE ESTIMATED AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR.
6. COLOR TAPE MARKINGS MUST BE 3/4" WIDE AND UV RESISTANT, SUCH AS SCOTCH 35 VINYL ELECTRICAL COLOR CODING TAPE.
7. CONTRACTOR SHALL COORDINATE COLOR CODINGS IN THE FIELD WITH T-MOBILE REPRESENTATIVE.
8. PRIOR TO THE INSTALLATION OF THE PROPOSED EQUIPMENT OR MODIFICATION OF THE EXISTING STRUCTURE, A STRUCTURAL & MOUNT ANALYSIS SHALL BE PERFORMED BY THE OWNER'S AGENT TO CERTIFY THAT THE EXISTING/PROPOSED COMMUNICATION STRUCTURE AND COMPONENTS ARE STRUCTURALLY ADEQUATE TO SUPPORT ALL EXISTING AND PROPOSED ANTENNAS, COAXIAL CABLES AND OTHER APPURTENANCES. THE OWNER'S AGENT SHALL FURNISH A CERTIFICATION LETTER SEALED BY A REGISTERED PROFESSIONAL ENGINEER STATING THAT THIS STRUCTURAL ANALYSIS WAS PREPARED IN ACCORDANCE WITH ALL APPLICABLE CODES AND STANDARDS.

WEST

1 / C-3 ELEVATION
SCALE: 1" = 10' (22X34)
SCALE: 1" = 20' (11X17)

GRAPHIC SCALE
10 0 5 10 20 40
1 INCH = 10 FEET (22X34)
1 INCH = 20 FEET (11X17)

add C-4
North Elevation
Like L700 4x2

APPLICANT

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PROFESSIONAL STAMP

ENGINEER

SHEET TITLE

WEST
ELEVATION

SHEET NUMBER

C-3

# APPENDIX B:
# CALCULATIONS

## PURPOSE / ASSUMPTIONS

The purpose of these calculation is to structurally qualify the poenthouse floor for supporting the T-Mobile equipment.

## Proposed Cabinet Installation on Grating Skid Check:

Proposed 6160 + Proposed B160 .

Wplat

$W1 := 1500lbf$ 6160.

$W2 := 2000lbf$ B160

$Ws := 500lbf$ Fiberglass Grating (Estimated)

$$P2 := \frac{W1}{(26in \cdot 33.5in)} = 247.99 \cdot psf$$

$$P3 := \frac{W2}{(26in \cdot 33.5in)} = 330.65 \cdot psf$$

*Penthouse Floor Live Load => 125 psf. Cabinets cannot rest directly on penthouse floor. Cabinets to be installed on a proposed 6' x 6' Fiberglass Grating "skid" to distribue proposed cabinet weights more evenly.*

$$Fiber := \frac{W1 + W2 + Ws}{(72in \cdot 72in)} = 111.11 \cdot psf$$

$Fiber < 125psf$ Proposed "skid" installation is acceptable.