# STRUCTURAL ANALYSIS REPORT

For

## ME 5038 (LTE)

MORRILLS CORNER

880 Forrest Avenue
Portland, ME 04101

**Equipment Shelter on the Roof and Antennas Supported on Ballast Frames**

Prepared for:

at&t

500 Enterprise Drive, Suite 3A
Rock Hill, CT 06067

Dated:

March 1, 2012

STATE OF MAINE
DANIEL P. HAMM
No. 10344
LICENSED PROFESSIONAL ENGINEER

2/29/2012

Prepared by:
**HUDSON DESIGN GROUP, LLC.**
1600 Osgood Street Building 20 North, Suite 2-101
North Andover, MA 01845
Phone: (978) 557-5553
www.hudsondesigngroupllc.com

Hudson Design Group LLC

## SCOPE OF WORK:

Hudson Design Group LLC (HDG) has been authorized by AT&T to conduct a structural evaluation of the structure supporting the proposed AT&T equipment located in the areas depicted in the latest HDG's construction drawings.

This report represents this office's findings, conclusions and recommendations' pertaining to the support of AT&T's proposed LTE Equipment.

This office conducted an on-site visual survey of the above areas on February 29, 2011. Attendees included Sergio Anastacio (HDG-Assistant Project Manager).

## CONCLUSION SUMMARY:

Limited building plans prepared by Krumbhaar & Holt Associates Architects were available for our use. A limited visual survey of the structure was completed in or near the areas of the Proposed Work. Based on our evaluation, we have determined that, in general, structural designs to support the proposed AT&T Equipment within or near the Proposed Location can be completed and components installed with **NO STRUCTURAL UPGRADES REQUIRED** to the existing structure. Reference the attached HDG's drawings for all equipment locations.

A summary of the proposed support types and attachment locations are as follows:

**(3) LTE Antennas (KMW AM-X-CD-16-65-00T) (54"x12.6"x7.87" - Wt. 33lbs.) (One per Sector)....**Mounted on the existing steel pipes supported by the existing steel ballast frames.

**(1) RBS 6601 Indoor 23" Rack (Wt 100 lbs.)...**Mounted inside the existing equipment room at ground level.

**(3) Surge Arrestor DC2-48-60-0-9E (1 per sector)...**Mounted on unistruts secured to the existing steel ballast frames.

**(6) RRH (2 per sector) (Wt. = 50 lbs/each).....**Mounted on unistruts secured to the existing steel ballast frames.

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Referenced documents are attached.

**DESIGN CRITERIA:**

1. International Building Code 2009, ASCE 7-10 Minimum Design Loads for Buildings and Other Structures.

   Wind Analysis:

| | | |
|---|---|---|
| Reference Wind Speed: | 110 MPH | (FIG 26.5-1C; ASCE 7-10) |
| Category: | C | (26.7.3; ASCE 7 -10) |
| Gust Effect Factor (G): | 0.85 | (26.9.1; ASCE 7-10) |
| Force Coefficient (Cf): | Varies | (FIG 29.5-1 thru 29.5-3; ASCE 7-10) |
| F = qz * G * Cf * Af: | | (Equation 29.5-1; ASCE 7-10) |

   Snow Loading:

| | | |
|---|---|---|
| Ground Snow Load (Pg): | 60 psf | (FIG 7-1; ASCE 7-10) |
| Flat Roof Snow Load (Pf): | 37.8 psf | |

   **Pf** = 0.7 * Ce * Ct * I * Pg (Equation 7.3-1; ASCE 7-10)

   *Ce=0.9; Ct=1.0; I=1.0*

2. EIA/TIA -222- G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures

| | |
|---|---|
| County: | Cumberland |
| Wind Load: | 100 mph |

3. Approximate height above grade to antennas: 107'-0"

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## EXISTING ROOF CONSTRUCTION:

The roof appears to consist of a roofing membrane on rigid insulation over precast-prestressed concrete planks, supported by reinforced concrete bearing walls.

## EQUIPMENT SUPPORT RECOMMENDATIONS:

HDG recommends that the proposed equipment rack be mounted inside the existing AT&T equipment shelter on the roof.

## Antenna SUPPORT RECOMMENDATIONS:

The new LTE antennas are proposed to be supported by the existing steel pipes, secured to the existing ballasted roof top frames.

*HDG recommends adding more ballast to all the existing frames. See the latest HDG construction drawings for ballast requirements.*

## RRH's / Surge Arrestor SUPPORT RECOMMENDATIONS:

The new Surge Arrestors and RRH's are proposed to be mounted on new unistrut components secured to the existing ballast frames.

Notes:

1. Reference the latest HDG construction drawings for all the equipment locations.
2. All detail requirements will be designed and furnished in the construction drawings.
3. Mount all equipment per manufacturer's specifications.
4. HDG could not verify the support attachments to the roof structure at the time of our site visit. HDG is under the assumption that the equipment shelter was constructed properly and adequately attached to the building structure over bearing walls.
5. HDG is under the assumption that the ballast mounts were located over structurally adequate roof support (i.e. beam or column). HDG was not able to verify the roof structure and its components at the time of our visit.
6. All structural members and their connections are assumed to be in good condition and are free from defects with no deterioration to its member capacities.

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**EXISTING EQUIPMENT:**

**Photo 1:** Sample photo illustrating the existing equipment shelter.

**Photo 2:** Sample photo illustrating the existing equipment.

**EXISTING ANTENNAS:**

**Photo 3:** Sample photo illustrating the existing antennas.

**Photo 4:** Sample photo illustrating the existing antennas.

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# Proposed Drawings

## PROJECT INFORMATION

| | |
|---|---|
| SCOPE OF WORK: | UNMANNED TELECOMMUNICATIONS FACILITY MODIFICATIONS |
| SITE ADDRESS: | 880 FOREST AVENUE<br>PORTLAND, ME 04101 |
| LATITUDE: | 43.678305 N 43° 40' 41.90" N |
| LONGITUDE: | 70.289847 W 70° 17' 23.45" W |
| JURISDICTION: | NATIONAL, STATE & LOCAL CODES OR ORDINANCES |
| CURRENT USE: | TELECOMMUNICATIONS FACILITY |
| PROPOSED USE: | TELECOMMUNICATIONS FACILITY |

# SITE NUMBER: ME5038
# SITE NAME: MORRILLS CORNER

## DRAWING INDEX

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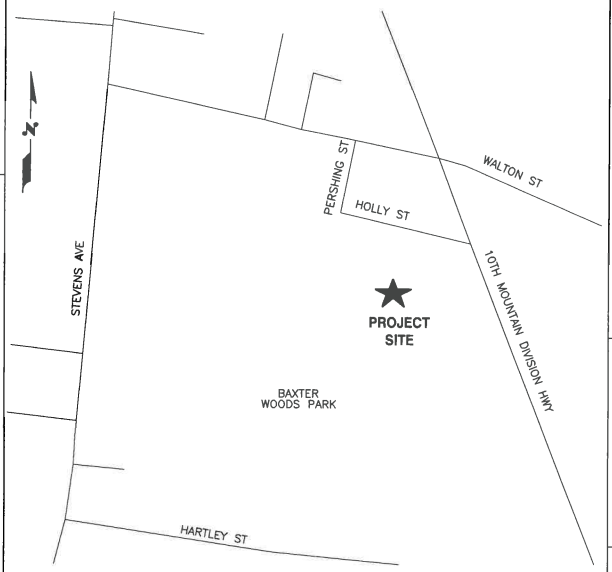
## VICINITY MAP

DIRECTIONS:

START WEST ON COCHITUATE RD TOWARD BURR ST. 0.3 MI. MAKE A U-TURN AT WHITTIER ST. 0.3 MI. TAKE RAMP RIGHT FOR I-90 E. 6.7 MI. TAKE EXIT 14 FOR I-95 N TOWARD N.H. – MAINE PARTIAL TOLL ROAD PASSING THROUGH NEW HAMPSHIRE ENTERING MAINE. 116.7 MI. TAKE EXIT 48/RIVERSIDE ST/LARRABEE RD 0.5 MI. TURN RIGHT ONTO RIVERSIDE ST. 0.4 MI. TURN RIGHT ONTO WARREN ST. 1.6 MI. TURN RIGHT ONTO FOREST AVE. (US-302) 0.9 MI. ARRIVE AT 880 FOREST AVENUE, PORTLAND ON THE RIGHT.




## GENERAL NOTES

1. THIS DOCUMENT IS THE CREATION, DESIGN, PROPERTY AND COPYRIGHTED WORK OF AT&T. ANY DUPLICATION OR USE WITHOUT EXPRESS WRITTEN CONSENT IS STRICTLY PROHIBITED. DUPLICATION AND USE BY GOVERNMENT AGENCIES FOR THE PURPOSES OF CONDUCTING THEIR LAWFULLY AUTHORIZED REGULATORY AND ADMINISTRATIVE FUNCTIONS IS SPECIFICALLY ALLOWED.
2. THE FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.
3. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE AT&T REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

CALL

BEFORE YOU DIG

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UNDERGROUND SERVICE ALERT


Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 2C NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5552
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095


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SCALE: AS SHOWN DESIGNED BY: RP DRAWN BY: RP

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TITLE SHEET (LTE)

| JOB NUMBER | DRAWING NUMBER | REV |
|---|---|---|
| 5038.01 | T-1 | 2 |

## GROUNDING NOTES

1. THE SUBCONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM AND LIGHTNING PROTECTION SYSTEM (AS DESIGNED AND INSTALLED) FOR STRICT COMPLIANCE WITH THE NEC (AS ADOPTED BY THE AHJ), THE SITE-SPECIFIC (UL, LPI, OR NFPA) LIGHTING PROTECTION CODE, AND GENERAL COMPLIANCE WITH TELCORDIA AND TIA GROUNDING STANDARDS. THE SUBCONTRACTOR SHALL REPORT ANY VIOLATIONS OR ADVERSE FINDINGS TO THE CONTRACTOR FOR RESOLUTION.

2. ALL GROUND ELECTRODE SYSTEMS (INCLUDING TELECOMMUNICATION, RADIO, LIGHTNING PROTECTION, AND AC POWER GES'S) SHALL BE BONDED TOGETHER, AT OR BELOW GRADE, BY TWO OR MORE COPPER BONDING CONDUCTORS IN ACCORDANCE WITH THE NEC.

3. THE SUBCONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR NEW GROUND ELECTRODE SYSTEMS. THE SUBCONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5 OHMS OR LESS.

4. METAL RACEWAY SHALL NOT BE USED AS THE NEC REQUIRED EQUIPMENT GROUND CONDUCTOR. STRANDED COPPER CONDUCTORS WITH GREEN INSULATION, SIZED IN ACCORDANCE WITH THE NEC, SHALL BE FURNISHED AND INSTALLED WITH THE POWER CIRCUITS TO BTS EQUIPMENT.

5. EACH BTS CABINET FRAME SHALL BE DIRECTLY CONNECTED TO THE MASTER GROUND BAR WITH GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRES, 6 AWG STRANDED COPPER OR LARGER FOR INDOOR BTS 2 AWG STRANDED COPPER FOR OUTDOOR BTS.

6. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE.

7. APPROVED ANTIOXIDANT COATINGS (I.E., CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.

8. ICE BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED OR BOLTED TO THE BRIDGE AND THE TOWER GROUND BAR.

9. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.

10. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.

11. METAL CONDUIT SHALL BE MADE ELECTRICALLY CONTINUOUS WITH LISTED BONDING FITTINGS OR BY BONDING ACROSS THE DISCONTINUITY WITH 6 AWS COPPER WIRE UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.

12. ALL NEW STRUCTURES WITH A FOUNDATION AND/OR FOOTING HAVING 20 FT. OR MORE 1/2" OR GREATER ELECTRICALLY CONDUCTIVE REINFORCING STEEL MUST HAVE IT BONDED TO THE GROUND RING USING AN EXOTHERMIC WELD CONNECTION USING #2 AWG SOLID TINNED COPPER GROUND WIRE, PER NEC 250.50

## GENERAL NOTES

1. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:
   CONTRACTOR – NEXLINK
   SUBCONTRACTOR – GENERAL CONTRACTOR (CONSTRUCTION)
   OWNER – AT&T MOBILITY

2. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING SUBCONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF CONTRACTOR.

3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. SUBCONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.

4. DRAWINGS PROVIDED HERE ARE NOT TO BE SCALED AND ARE INTENDED TO SHOW OUTLINE ONLY.

5. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.

6. "KITTING LIST" SUPPLIED WITH THE BID PACKAGE IDENTIFIES ITEMS THAT WILL BE SUPPLIED BY CONTRACTOR. ITEMS NOT INCLUDED IN THE BILL OF MATERIALS AND KITTING LIST SHALL BE SUPPLIED BY THE SUBCONTRACTOR.

7. THE SUBCONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.

8. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE SUBCONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE CONTRACTOR.

9. SUBCONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER AND T1 CABLES, GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING. SUBCONTRACTOR SHALL UTILIZE EXISTING TRAYS AND/OR SHALL ADD NEW TRAYS AS NECESSARY. SUBCONTRACTOR SHALL CONFIRM THE ACTUAL ROUTING WITH THE CONTRACTOR.

10. THE SUBCONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT SUBCONTRACTOR'S EXPENSE TO THE SATISFACTION OF OWNER.

11. SUBCONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS REMOVED SHALL BE RETURNED TO THE OWNER'S DESIGNATED LOCATION.

12. SUBCONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.

13. ALL CONCRETE REPAIR WORK SHALL BE DONE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE (ACI) 301.

14. ANY NEW CONCRETE NEEDED FOR THE CONSTRUCTION SHALL BE AIR-ENTRAINED AND SHALL HAVE 4000 PSI STRENGTH AT 28 DAYS. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH ACI 318 CODE REQUIREMENTS.

15. ALL STRUCTURAL STEEL WORK SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH AISC SPECIFICATIONS. ALL STRUCTURAL STEEL SHALL BE ASTM A36 (Fy = 36 ksi) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (Fy = 36 ksi). ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED. TOUCHUP ALL SCRATCHES AND OTHER MARKS IN THE FIELD AFTER STEEL IS ERECTED USING A COMPATIBLE ZINC RICH PAINT.

16. CONSTRUCTION SHALL COMPLY WITH UMTS SPECIFICATIONS AND "GENERAL CONSTRUCTION SERVICES FOR CONSTRUCTION OF AT&T MOBILITY SITES."

17. SUBCONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.

18. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION. ANY CONSTRUCTION WORK BY SUBCONTRACTOR SHALL NOT DISRUPT THE EXISTING NORMAL OPERATION. ANY WORK ON EXISTING EQUIPMENT MUST BE COORDINATED WITH CONTRACTOR. ALSO, WORK SHOULD BE SCHEDULED FOR AN APPROPRIATE MAINTENANCE WINDOW USUALLY IN LOW TRAFFIC PERIODS AFTER MIDNIGHT.

19. SINCE THE CELL SITE IS ACTIVE, ALL SAFETY PRECAUTIONS MUST BE TAKEN WHEN WORKING AROUND HIGH LEVELS OF ELECTROMAGNETIC RADIATION. EQUIPMENT SHOULD BE SHUTDOWN PRIOR TO PERFORMING ANY WORK THAT COULD EXPOSE THE WORKERS TO DANGER. PERSONAL RF EXPOSURE MONITORS ARE ADVISED TO BE WORN TO ALERT OF ANY DANGEROUS EXPOSURE LEVELS.

20. APPLICABLE BUILDING CODES:
SUBCONTRACTOR'S WORK SHALL COMPLY WITH ALL APPLICABLE NATIONAL, STATE, AND LOCAL CODES AS ADOPTED BY THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) FOR THE LOCATION. THE EDITION OF THE AHJ ADOPTED CODES AND STANDARDS IN EFFECT ON THE DATE OF CONTRACT AWARD SHALL GOVERN THE DESIGN.
   BUILDING CODE: IBC 2009
   ELECTRICAL CODE: REFER TO ELECTRICAL DRAWINGS
   LIGHTENING CODE: REFER TO ELECTRICAL DRAWINGS

SUBCONTRACTOR'S WORK SHALL COMPLY WITH THE LATEST EDITION OF THE FOLLOWING STANDARDS:

   AMERICAN CONCRETE INSTITUTE (ACI) 318; BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE;

   AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

   MANUAL OF STEEL CONSTRUCTION, ASD, NINTH EDITION;

   TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) 222-G, STRUCTURAL STANDARDS FOR STEEL

   ANTENNA TOWER AND ANTENNA SUPPORTING STRUCTURES; REFER TO ELECTRICAL DRAWINGS FOR SPECIFIC ELECTRICAL STANDARDS.

FOR ANY CONFLICTS BETWEEN SECTIONS OF LISTED CODES AND STANDARDS REGARDING MATERIAL, METHODS OF CONSTRUCTION, OR OTHER REQUIREMENTS, THE MOST RESTRICTIVE REQUIREMENT SHALL GOVERN. WHERE THERE IS CONFLICT BETWEEN A GENERAL REQUIREMENT AND A SPECIFIC REQUIREMENT, THE SPECIFIC REQUIREMENT SHALL GOVERN.

## ABBREVIATIONS

| | | | | | |
|---|---|---|---|---|---|
| AGL | ABOVE GRADE LEVEL | G.C. | GENERAL CONTRACTOR | RF | RADIO FREQUENCY |
| AWG | AMERICAN WIRE GAUGE | MGB | MASTER GROUND BUS | | |
| BCW | BARE COPPER WIRE | MIN | MINIMUM | TBD | TO BE DETERMINED |
| BTS | BASE TRANSCEIVER STATION | PROPOSED | NEW | TBR | TO BE REMOVED |
| EXISTING | EXISTING | N.T.S. | NOT TO SCALE | TBRR | TO BE REMOVED AND REPLACED |
| EG | EQUIPMENT GROUND | REF | REFERENCE | TYP | TYPICAL |
| EGR | EQUIPMENT GROUND RING | REQ | REQUIRED | | |


Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
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SCALE: AS SHOWN | DESIGNED BY: RP | DRAWN BY: RP

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GENERAL NOTES
(LTE)

| JOB NUMBER | DRAWING NUMBER | REV |
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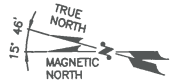
| 5038.01 | GN-1 | 2 |

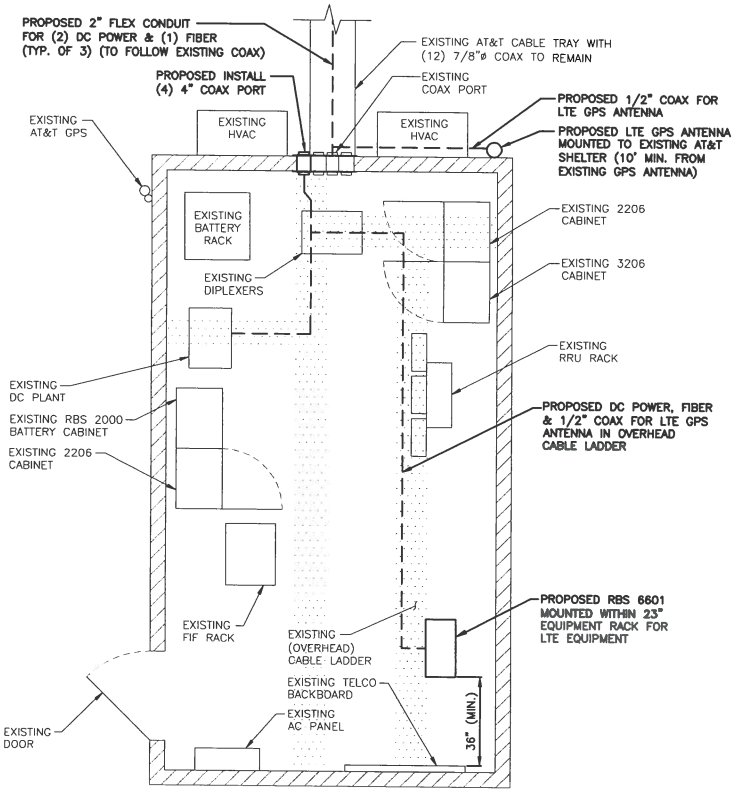



NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION. REFER TO STRUCTURAL ANALYSIS BY: HUDSON DESIGN GROUP LLC, DATED: MARCH 01, 2012.

NOTE:

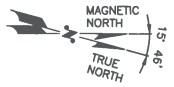
REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

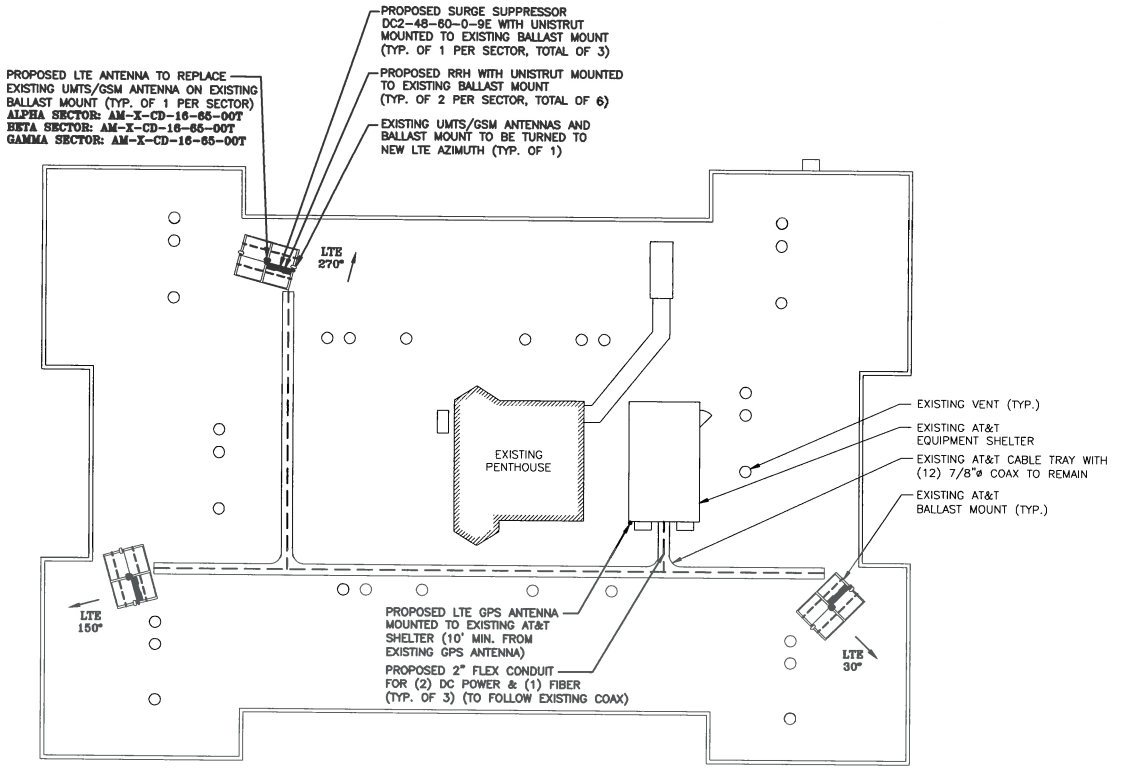



## EQUIPMENT PLAN

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

0 1'-0" 2'-0" 4'-0" 6'-0"




## ROOFTOP PLAN

SCALE: 3/32"=1'-0"

0 5'-4" 10'-8" 21'-4" 32'-0"

Hudson Design Group LLC
1400 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
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SCALE: AS SHOWN | DESIGNED BY: RP | DRAWN BY: RP

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EQUIPMENT & ROOFTOP PLAN (LTE)

| JOB NUMBER | DRAWING NUMBER | REV |
|---|---|---|
| 5038.01 | A-1 | 2 |

NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION. REFER TO STRUCTURAL ANALYSIS BY: HUDSON DESIGN GROUP LLC, DATED: MARCH 01, 2012.

NOTE:

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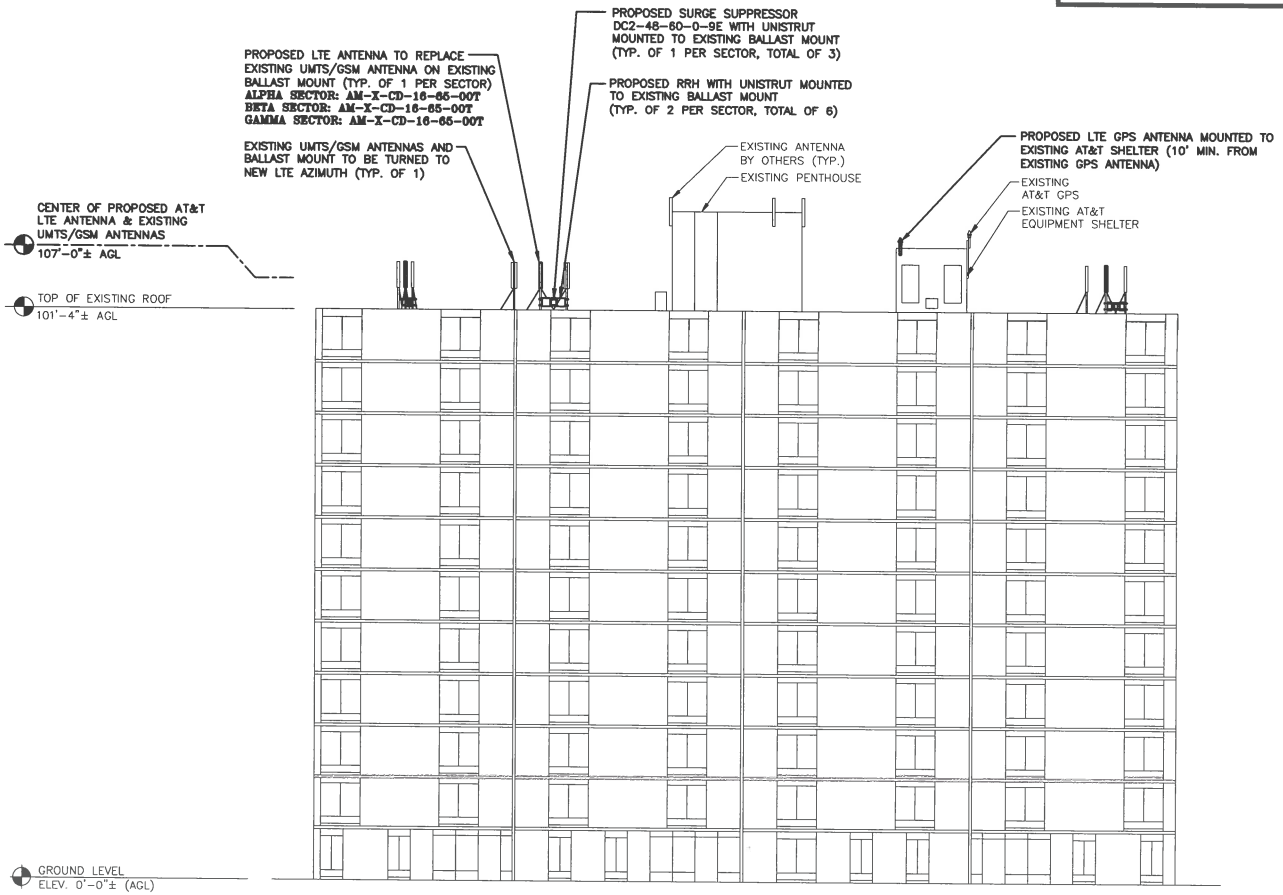


## EAST ELEVATION

SCALE: 3/32"=1'-0"

0 5'-4" 10'-8" 21'-4" 32'-0"


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ELEVATION
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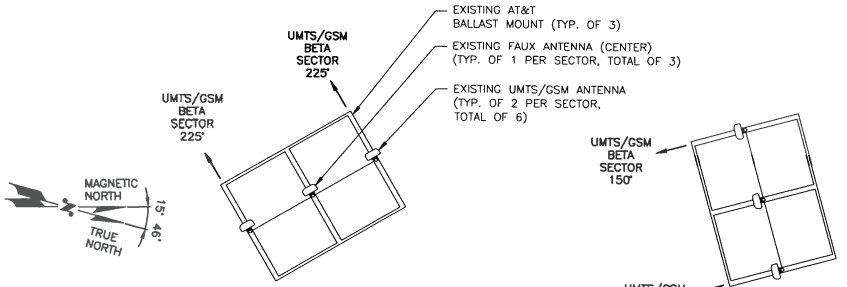
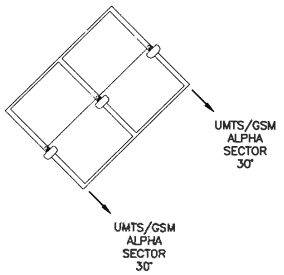
AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION. REFER TO STRUCTURAL ANALYSIS BY: HUDSON DESIGN GROUP LLC, DATED: MARCH 01, 2012.

NOTE:

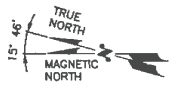
REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

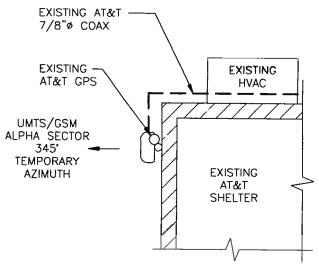



## EXISTING UMTS/GSM ANTENNA PLAN

SCALE: N.T.S.

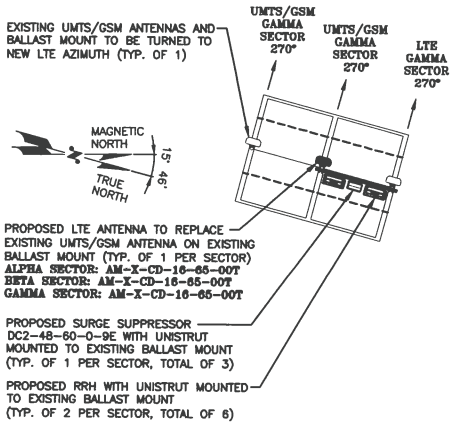


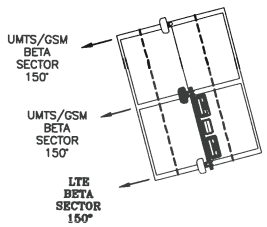



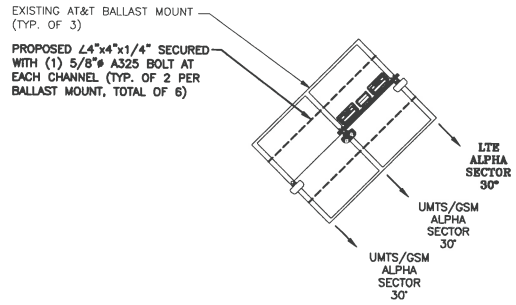

## TEMPORARY CONSTRUCTION AZIMUTH (ALPHA SECTOR)

SCALE: N.T.S.

NOTE:
DUE TO BUILDING CONSTRUCTION ALPHA SECTOR BALLAST MOUNT HAS BEEN DISMANTLED. EXISTING ALPHA SECTOR UMTS/GSM ANTENNA HAS BEEN TEMPORARILY RELOCATED TO EXISTING AT&T SHELTER




## PROPOSED LTE ANTENNA PLAN

SCALE: N.T.S.


Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 2C NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095


SITE NUMBER: ME5038
SITE NAME: MORRILLS CORNER
880 FOREST AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY


at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

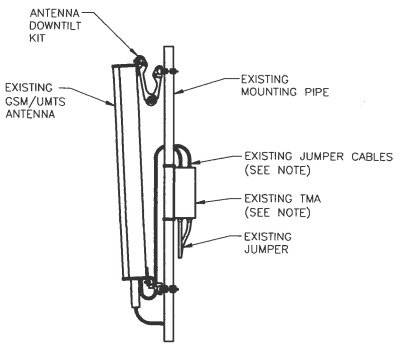

| NO. | DATE | REVISIONS | BY | CHK | APP'D |
|---|---|---|---|---|---|
| 2 | 03/01/12 | ISSUED FOR CONSTRUCTION | RP | DC | DPH |
| 1 | 02/23/12 | ISSUED FOR PERMITTING | RP | DC | DPH |
| 0 | 02/10/12 | ISSUED FOR REVIEW | RP | DC | DPH |

SCALE: AS SHOWN | DESIGNED BY: RP | DRAWN BY: RP

AT&T

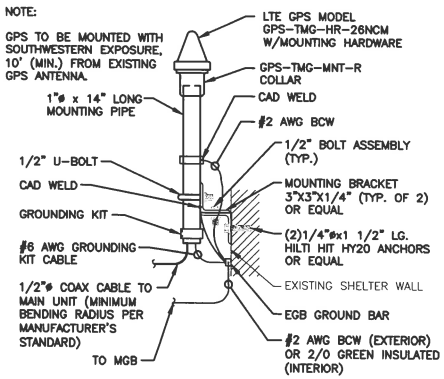
ANTENNA PLAN
(LTE)

| JOB NUMBER | DRAWING NUMBER | REV |
|---|---|---|
| 5038.01 | A-3 | 2 |




## PROPOSED UMTS/GSM ANTENNA DETAIL

SCALE: N.T.S.




## GPS MOUNTING DETAIL

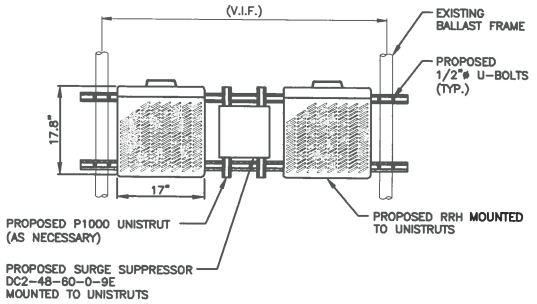
SCALE: N.T.S.

NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION. REFER TO STRUCTURAL ANALYSIS BY: HUDSON DESIGN GROUP LLC, DATED: MARCH 01, 2012.

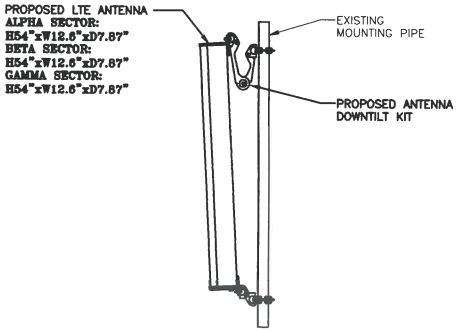
NOTE:

REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.



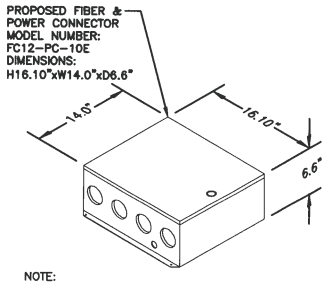

## PROPOSED RRH AND SURGE ARRESTOR MOUNTING DETAIL

SCALE: N.T.S.




## PROPOSED LTE ANTENNA DETAIL

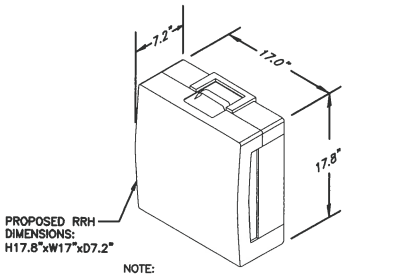
SCALE: N.T.S.




NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

## FIBER & POWER CONNECTOR DETAIL

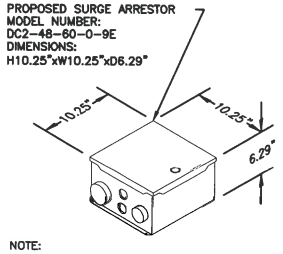
SCALE: N.T.S.




NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

## RRH DETAIL

SCALE: N.T.S.




NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

## DC SURGE SUPPRESSOR DETAIL

SCALE: N.T.S.


Hudson Design Group LLC
1400 OSGOOD STREET
BUILDING 22 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095


**SITE NUMBER: ME5038**
**SITE NAME: MORRILLS CORNER**
880 FOREST AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

| NO. | DATE | REVISIONS | BY | CHK | APP'D |
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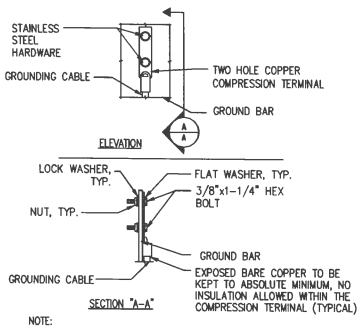
SCALE: AS SHOWN | DESIGNED BY: RP | DRAWN BY: RP

AT&T

DETAILS (LTE)

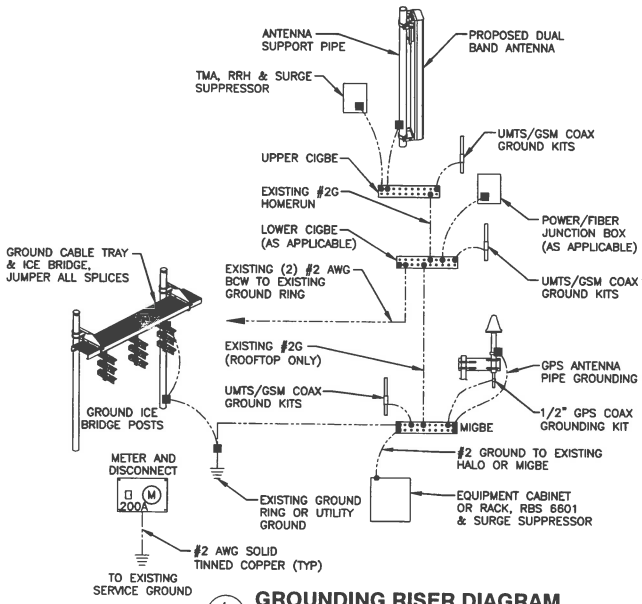
| JOB NUMBER | DRAWING NUMBER | REV |
|---|---|---|
| 5038.01 | A-4 | 2 |




NOTE:
1. "DOUBLING UP" OR "STACKING " OF CONNECTION IS NOT PERMITTED.
2. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATIONS.
3. CADWELD DOWNLEADS FROM UPPER EGB, LOWER EGB, AND MGB.

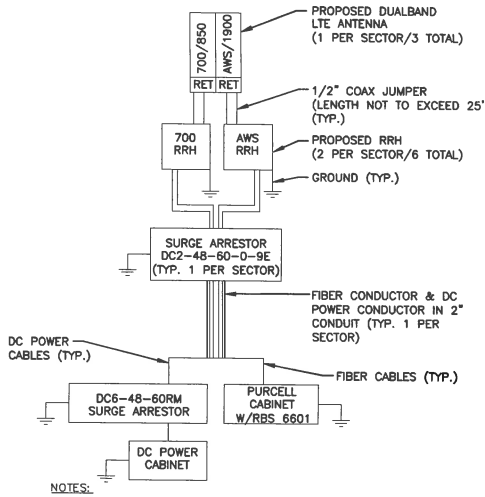
## TYPICAL GROUND BAR CONNECTION DETAIL

2 — N.T.S.




## GROUNDING RISER DIAGRAM

1 — N.T.S.



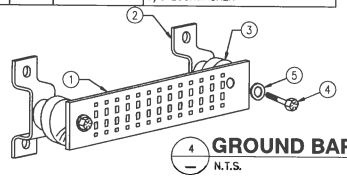

NOTES:

1. CONTRACTOR TO CONFIRM ALL PARTS.
2. INSTALL ALL EQUIPMENT TO MANUFACTURER'S RECOMMENDATIONS.

## PLUMBING DIAGRAM

3 — N.T.S.

| WIRELESS SOLUTIONS INC. | | | |
|---|---|---|---|
| NO. | REQ. | PART NO. | DESCRIPTION |
| 1 | 1 | HLGB-0420-IS | SOLID GND. BAR (20"x4"x1/4") |
| 2 | 2 | ——— | WALL MTG. BRKT. |
| 3 | 2 | ——— | INSULATORS |
| 4 | 4 | ——— | 5/8"--11x1" H.H.C.S. |
| 5 | 4 | ——— | 5/8 LOCKWASHER |




## GROUND BAR - DETAIL

4 — N.T.S.

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

SECTION "P" – SURGE PRODUCERS

CABLE ENTRY PORTS (HATCH PLATES) (#2)
GENERATOR FRAMEWORK (IF AVAILABLE) (#2)
TELCO GROUND BAR
COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND (#2)
+24V POWER SUPPLY RETURN BAR (#2)
-48V POWER SUPPLY RETURN BAR (#2)
RECTIFIER FRAMES.

SECTION "A" – SURGE ABSORBERS

INTERIOR GROUND RING (#2)
EXTERNAL EARTH GROUND FIELD (BURIED GROUND RING) (#2)
METALLIC COLD WATER PIPE (IF AVAILABLE) (#2)
BUILDING STEEL (IF AVAILABLE) (#2)

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 22 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
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NEXLINK GLOBAL SERVICES
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| 0 | 02/10/12 | ISSUED FOR REVIEW | RP | DC | DPH |

SCALE: AS SHOWN | DESIGNED BY: RP | DRAWN BY: RP

AT&T

PLUMBING DIAGRAM & GROUNDING DETAILS (LTE)

| JOB NUMBER | DRAWING NUMBER | REV. |
|---|---|---|
| 5038.01 | G--1 | 2 |

Hudson Design Group LLC

# Calculations

**Date:** 03-01-12
**Project Name**: MORRILLS CORNER
**Project Number:** ME5038
**Designed By:** AA **Checked By**: MSC

Hudson Design Group LLC

## 2.6.5.2 Velocity Pressure Coeff:

$K_z = 2.01\ (z/z_g)^{2/\alpha}$

| | | |
|---|---|---|
| $z$= | 107 | (ft) |
| $z_g$= | 900 | (ft) |
| $\alpha$= | 9.5 | |

**$K_z$= 1.284**

Kzmin ≤ Kz ≤ 2.01

**Table 2-4**

| Exposure | $Z_g$ | $\alpha$ | $K_{zmin}$ | $K_e$ |
|---|---|---|---|---|
| B | 1200 ft | 7 | 0.70 | 0.90 |
| C | 900 ft | 9.5 | 0.85 | 1 |
| D | 700 ft | 11.5 | 1.03 | 1.10 |

## 2.6.6.4 Topographic Factor:

**Table 2-5**

| Topo. Category | $K_t$ | f |
|---|---|---|
| 2 | 0.43 | 1.25 |
| 3 | 0.53 | 2 |
| 4 | 0.72 | 1.5 |

$K_{zt} = [1+(K_e K_t/K_h)]^2$ $K_h = e^{(f*z/H)}$

**$K_{zt}$= #DIV/0!**

*(If Category 1 then $K_{zt}$ =1.0)*

| | |
|---|---|
| Category= | 1 |

| | | |
|---|---|---|
| $K_h$= | #DIV/0! | |
| $K_e$= | 0 | (from Table 2-4) |
| $K_t$= | 0 | (from Table 2-5) |
| f= | 0 | (from Table 2-5) |
| z= | 107 | |
| H= | 0 | (Ht. of the crest above surrounding terrain) |
| $K_{zt}$= | 1.00 | |

Date: 03-01-12
Project Name: MORRILLS CORNER
Project Number: ME5038
**Designed By:** AA **Checked By**: MSC

Hudson Design Group LLC

## 2.6.7 Gust Effect Factors

*2.6.7.1 Self Supporting Lattice Structures*

Gh = 1.0 Latticed Structures > 600 ft

Gh = 0.85 Latticed Structures 450 ft or less

Gh = 0.85 + 0.15 [h/150 - 3.0] h= ht. of structure

h= 107 Gh= 0.507

*2.6.7.2 Guyed Masts* Gh= 0.85

*2.6.7.3 Pole Structures* Gh= 1.1

*2.6.7.4 Structures Supported on Other Structures*
*(Cantilivered tubular or latticed spines, pole, structures on buildings (ht. : width ratio > 5)*

Gh= 1.35 **Gh= 1.35**

Date: 03-01-12
Project Name: MORRILLS CORNER
Project Number: ME5038
**Designed By:** AA **Checked By**: MSC

Hudson Design Group LLC

## 2.6.8 Design Ice Thickness:

$t_{iz} = 2.0*t_i*I*K_{iz}*(K_{zt})^{0.35}$

$t_{iz}$= 2.25

$t_i$= 1
I= 1
$K_{iz}$= 1.12
$K_{zt}$= 1

$K_{iz} = [z/33]^{0.10} \leq 1.4$

$K_{iz}$= 1.12

Calculating the weight of ice, the cross-sectional area of ice shall be determined by:

$A_{iz} = \pi*t_{iz}*(D_c + t_{iz})$

Dc= 54 (in) Largest Dim of Member

$A_{iz}$ = 397.55

## 2.6.9 Design Wind Load:

**F= qz*Gh*(EPA's)**

$q_z = 0.00256*K_z*K_{zt}*K_d*V_{max}^2$

$q_z$= 31.22

$K_z$= 1.284
$K_{zt}$= 1
$K_d$= 0.95
$V_{max}$= 100

**Table 2-2**

| Structure Type | Wind Direction Probability Factor, Kd |
|---|---|
| Latticed structures with triangular, square or rectangular cross sections | **0.85** |
| Tubular pole structures, latticed structures with other cross sections, appurtenances. | **0.95** |

Date: 03-01-12
Project Name: MORRILLS CORNER
Project Number: ME5038
**Designed By:** AA **Checked By:** MSC

Hudson Design Group LLC

**Determine Cf:**

If lattice Structure See Manual

If Tubular Pole Structure, Use Corrected Value from Table 2.7 Below

| C mph.ft | Round | 18 Sided | 16 Sided | 12 Sided | 8 Sided |
|---|---|---|---|---|---|
| **< 32** (Subcritical) | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| **32 to 64** (Transitional) | $38.4/C^{1.0}$ | $25.8/C^{0.885}$ | $12.6/C^{0.678}$ | $2.99/C^{0.263}$ | 1.2 |
| **> 64** (Supercritical) | 0.6 | 0.65 | 0.75 | 1 | 1.2 |

$C = (I*K_{zt}*K_z)^{0.5}*V*D$

**Dp** = Outside Diameter or Out to Out: 0.2 feet

**C=** **22.66** **Cf=** 1.2

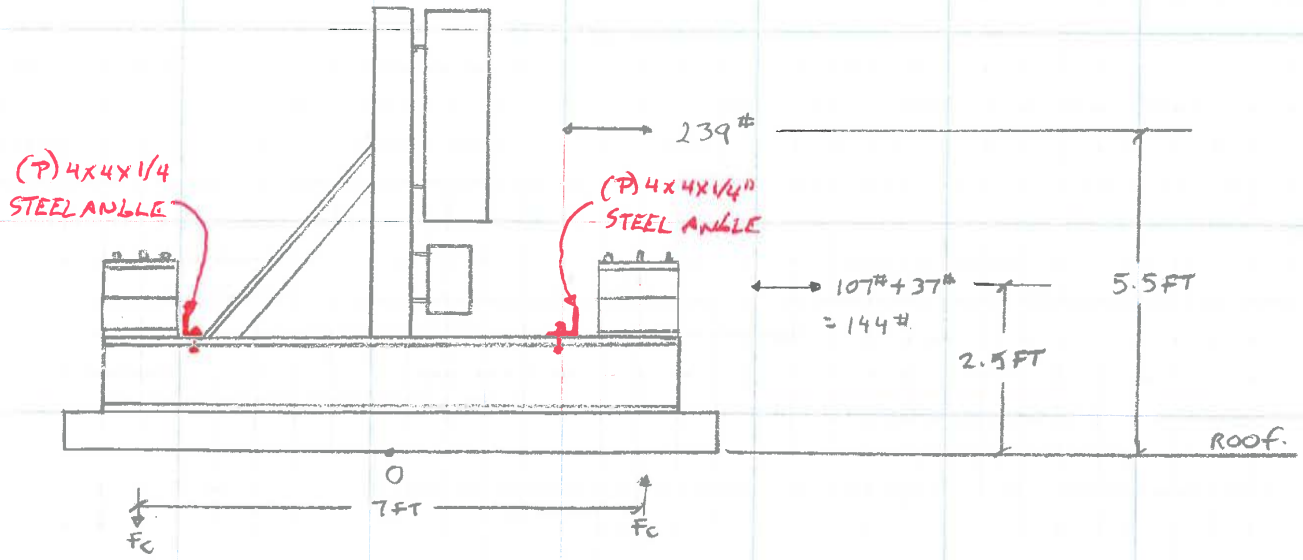
| Appurtenances | Height | Width | Depth | Flat Area | Force Per Appurtenance |
|---|---|---|---|---|---|
| **Item No.1** | 54 | 12.6 | 7.87 | 4.73 | **238.98** (lbs) |
| **Item No.2** | 17.8 | 17 | 7.2 | 2.10 | **106.29** (lbs) |
| **Item No.3** | 10.25 | 10.25 | 6.29 | 0.73 | **36.90** (lbs) |
| **Item No.4** | 0 | 0 | 0 | 0.00 | **0.00** (lbs) |
| **Item No.5** | 0 | 0 | 0 | 0.00 | **0.00** (lbs) |

**TOTAL FORCE ($\Sigma F_A$) =** **382.17** (lbs)

DATE: 03-01-12
Project Name: MORRILLS CORNER
Project No.: ME 5038
Design By: AA Chk'd By: MSC Page ____ of ____

Hudson Design Group LLC

- CHECK BALLAST REQUIREMENT:




- WEIGHT OF PARTIAL FRAME: (FOR PROPOSED ANTENNA)

| | | |
|---|---|---|
| - L 3"x3"x1/4" | 4.90 PLF x 4 x 8 FT | = 156.8# |
| - PLATE 5"x16"x3/8" | → (6.416FT x 1.33FT x 0.031 FT)(490 FT³) x 4 | = 34# |
| - 4x8x16 SOLID BLOCK | 38#/EA | = 152# |
| - 6"x6" P.T POST | 7.35 PLF x 9 FT | = 66# |
| - MSC. | | = 20# |
| | | = 428.8# |

$M_O = (239\#\times 5.5FT) + (144\#\times 2.5FT) = 1{,}674.5\#\text{-FT}$

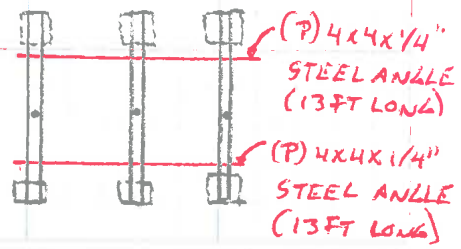
$F_C = \frac{1674.5\#\text{-FT}}{7\ FT} = 239.21\# > 428.8\#/2 \therefore$ N.G! EXTRA BALLAST REQUIRED

- BALLAST REQUIRED / SIDE

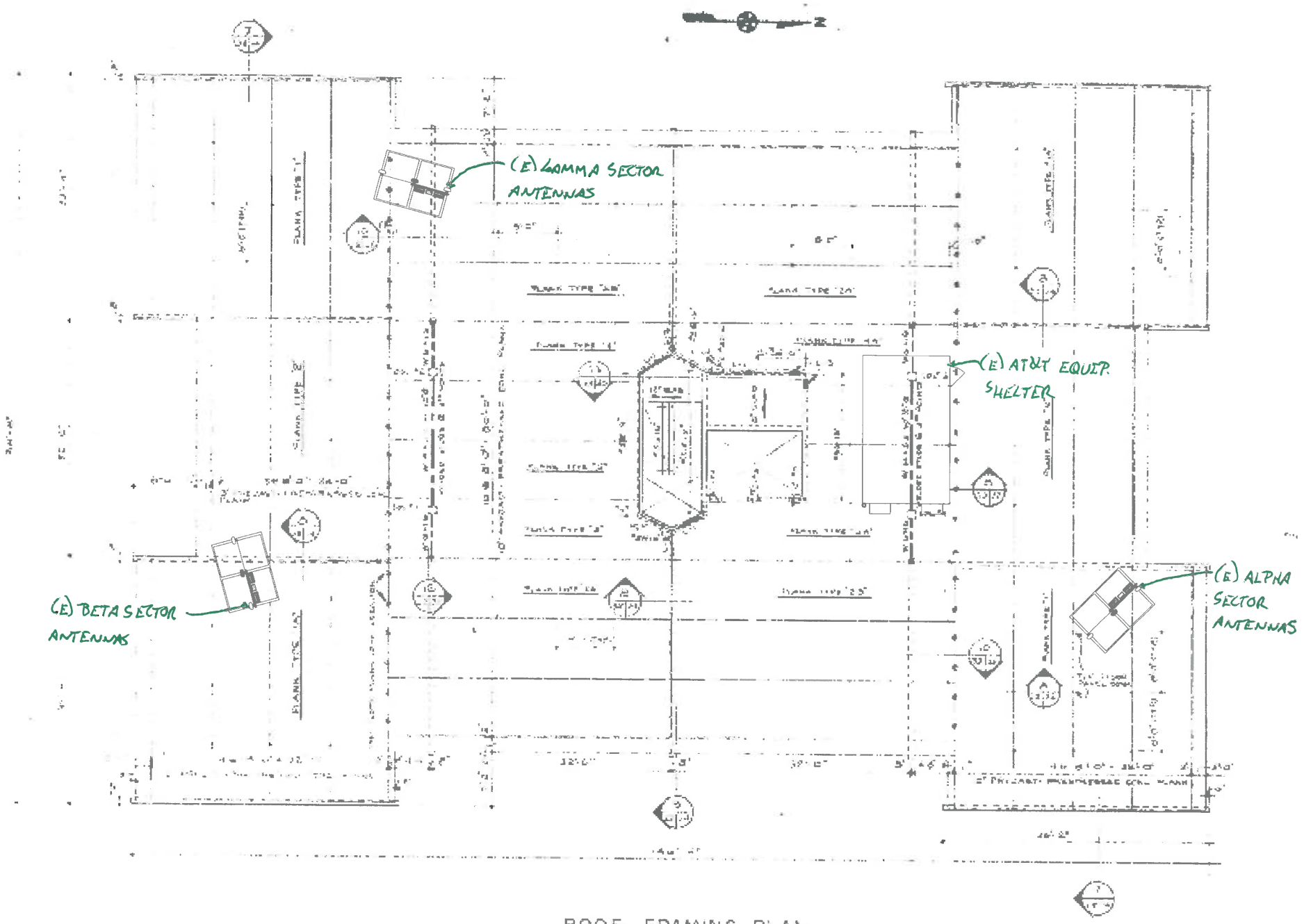
$239.21\# - 428.8\#/2 = 24.81\# \times 3 = 74.43\# < 85.8\# \therefore$ OK!

- CONCLUSION: ADD (2) 4x4x1/4" ANGLES BOLTED TO EXISTING FRAME, (1) PER SIDE AS SHOWN →

WT PER ANGLE = 6.60#/FT x 13FT = 85.8#




157132




ROOF FRAMING PLAN

L-11

L-12