STRUCTURAL ANALYSIS REPORT

For

ME 5040 (LTE)

MUNJOY HILL

211 Cumberland Avenue
Portland, ME 04101

Equipment Room in the Basement; Antennas Supported on the Building Façade and Roof Top Ballast Mounts

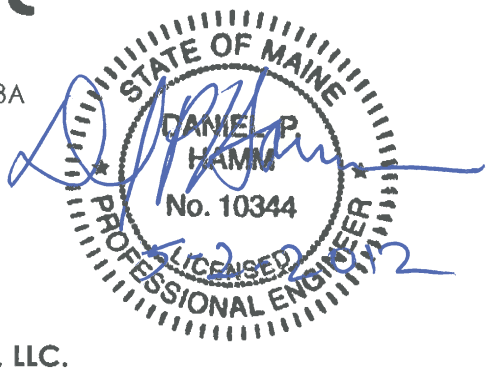
Prepared for:

at&t

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

Dated:

March 2, 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 March 1, 2011. Attendees included Sergio Anastacio (HDG-Assistant Project Manager).

CONCLUSION SUMMARY:

As-built plans were not available and could not be obtained 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 new steel pipes supported by the existing roof top ballast mounts.

(1) RBS 6601 Indoor 23" Rack (Wt 100 lbs.)... Mounted inside the existing equipment room in the basement.

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

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

Hudson Design Group LLC

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:

   160'-0"+/- (Alpha and Beta sectors)
   155'-0"+/- (Gamma sector)

Hudson Design Group LLC

EXISTING ROOF CONSTRUCTION:

No building plans were able to be obtained at the time of HDG's site visit; therefore, the roof construction is unknown.

Antenna SUPPORT RECOMMENDATIONS:

- The new LTE Alpha and Beta sector antennas are proposed to be supported by the existing steel pipes, secured to the non-penetrating ballasted roof top frames.
- The new LTE Gamma sector antenna is proposed to be supported by the existing steel pipe, secured to the building facade.

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 Alpha and Beta sector Surge Arrestors and RRH's are proposed to be mounted on new unistrut components, secured to the non-penetrating ballasted roof top frames.
- The new Gamma sector Surge Arrestor and RRH's are proposed to be mounted on new unistrut components, secured to the parapet using epoxy anchors.

EQUIPMENT SUPPORT RECOMMENDATIONS:

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

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 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.
5. 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.
6. HDG recommends adding tie-downs to the existing roof top sled mounts.

EXISTING ANTENNAS:

Photo 1: Sample photo illustrating the existing Alpha sector antennas.

Photo 2: Sample photo illustrating the existing Beta sector antennas.

Photo 3: Sample photo illustrating the existing Gamma sector antennas.

EXISTING EQUIPMENT:

Photo 4: Sample photo illustrating the existing equipment.

Hudson Design Group LLC

Proposed Drawings

PROJECT INFORMATION

SCOPE OF WORK:	UNMANNED TELECOMMUNICATIONS FACILITY MODIFICATIONS
SITE ADDRESS:	211 CUMBERLAND AVENUE PORTLAND, ME 04101
LATITUDE:	43.661380 N 43° 40' 41.90" N
LONGITUDE:	70.256111 W 70° 15' 22" W
JURISDICTION:	NATIONAL, STATE & LOCAL CODES OR ORDINANCES
CURRENT USE:	TELECOMMUNICATIONS FACILITY
PROPOSED USE:	TELECOMMUNICATIONS FACILITY

at&t

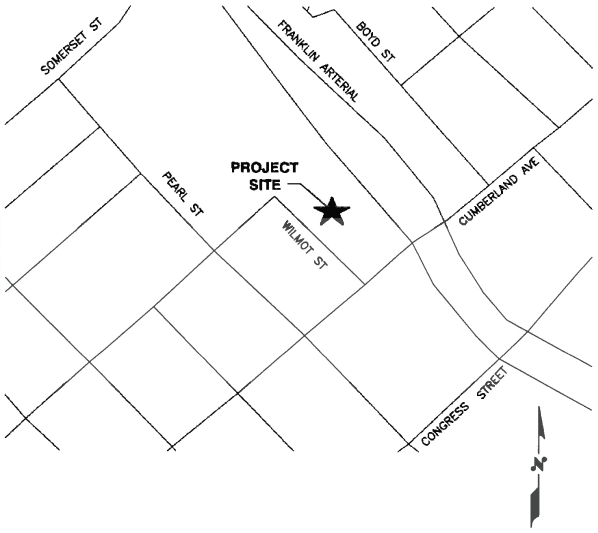
SITE NUMBER: ME5040
SITE NAME: MUNJOY HILL

DRAWING INDEX

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. 112.6 MI, MERGE ONTO I-295 N VIA EXIT 44 TOWARD SOUTH PORTLAND/DOWNTOWN PORTLAND (PORTIONS TOLL). 5.7 MI. TAKE THE FRANKLIN ST/US-1A EXIT, EXIT 7. 0.2 MI. TURN RIGHT ONTO US-1A S/FRANKLIN ARTERIAL. 0.4 MI. TURN RIGHT ONTO CUMBERLAND AVE. END AT 211 CUMBERLAND AVE. PORTLAND, ME 04101.



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

CALL TOLL FREE 888-DIG-SAFE

UNDERGROUND SERVICE ALERT

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 3-101
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: ME5040
SITE NAME: MUNJOY HILL
211 CUMBERLAND AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

NO.	DATE	REVISIONS	BY	CHK	APP'D
2	03/06/12	ISSUED FOR CONSTRUCTION	HC	DC	DPH
1	02/23/12	ISSUED FOR PERMITTING	SB	DC	DPH
0	02/10/12	ISSUED FOR REVIEW	HC	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: HC

AT&T

TITLE SHEET (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5040.01	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 FOOTIING 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
TEL: (978) 557-5553
FAX: (978) 336-5556

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

SITE NUMBER: ME5040
SITE NAME: MUNJOY HILL
211 CUMBERLAND AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

NO.	DATE	REVISIONS	BY	CHK	APP'D
2	03/06/12	ISSUED FOR CONSTRUCTION	HC	DC	DPH
1	02/23/12	ISSUED FOR PERMITTING	SB	DC	DPH
0	02/10/12	ISSUED FOR REVIEW	HC	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: HC

AT&T

GENERAL NOTES
(LTE)

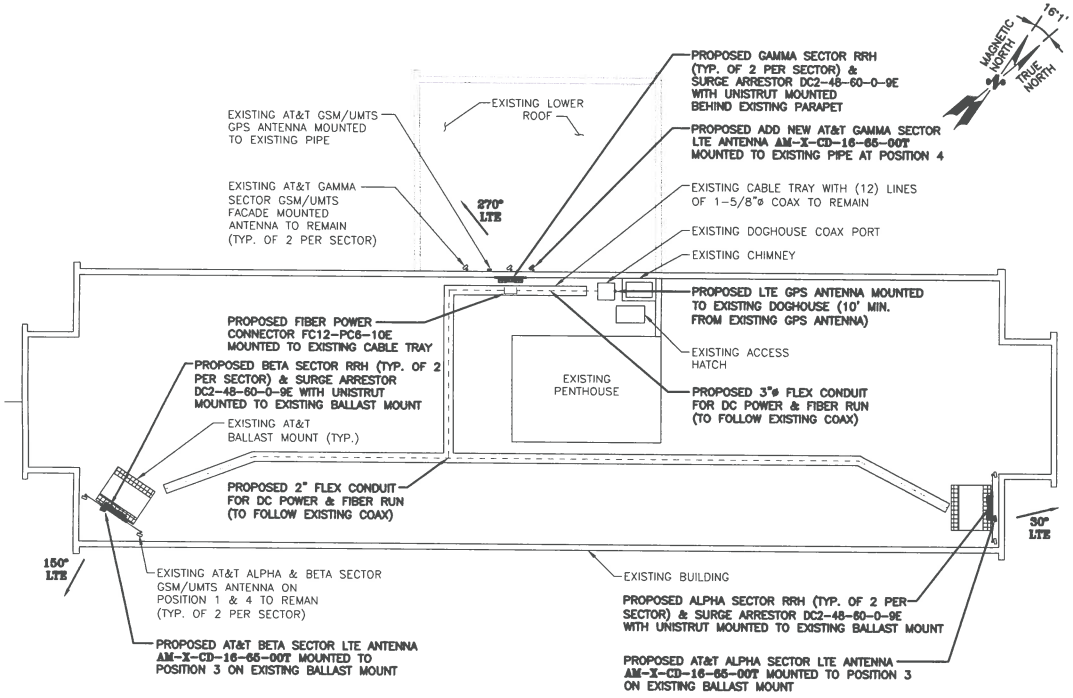
JOB NUMBER	DRAWING NUMBER	REV
5040.01	GN-1	2

NOTE:

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

NOTE:

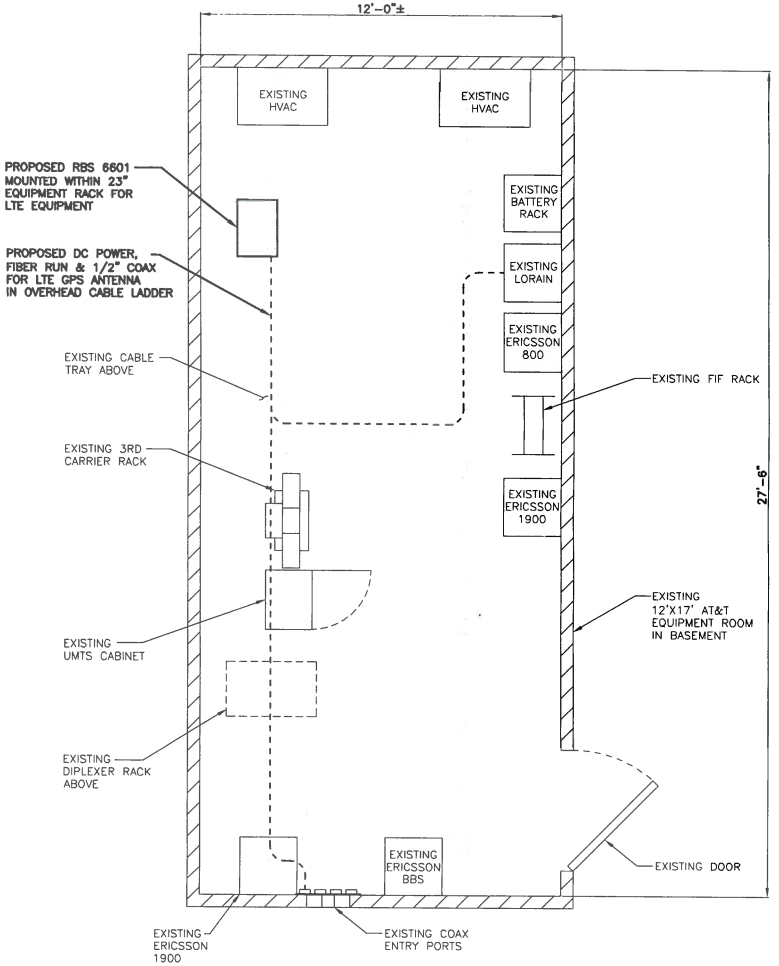
AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.



ROOF PLAN

SCALE: 3/32"= 1'

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



EQUIPMENT PLAN

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

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

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 304-5556

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

SITE NUMBER: ME5040
SITE NAME: MUNJOY HILL
211 CUMBERLAND AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

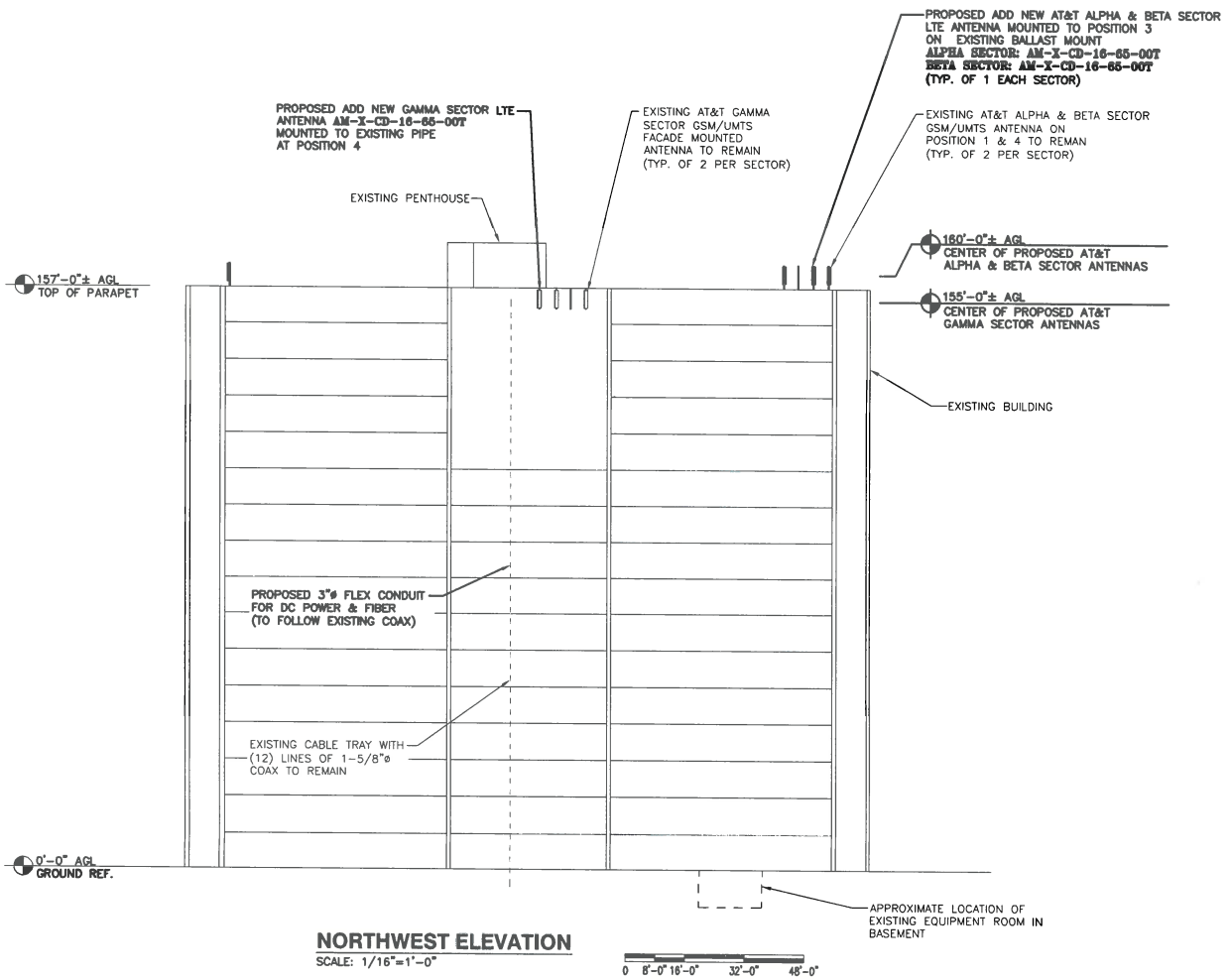
NO.	DATE	REVISIONS	BY	CHK	APP'D
2	03/06/12	ISSUED FOR CONSTRUCTION	HC	DC	DPH
1	02/23/12	ISSUED FOR PERMITTING	SB	DC	DPH
0	02/10/12	ISSUED FOR REVIEW	HC	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: HC

AT&T

EQUIPMENT & ROOFTOP PLAN (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5040.01	A-1	2



NORTHWEST ELEVATION

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

NOTE:

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

NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5556

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

SITE NUMBER: ME5040
SITE NAME: MUNJOY HILL
211 CUMBERLAND AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

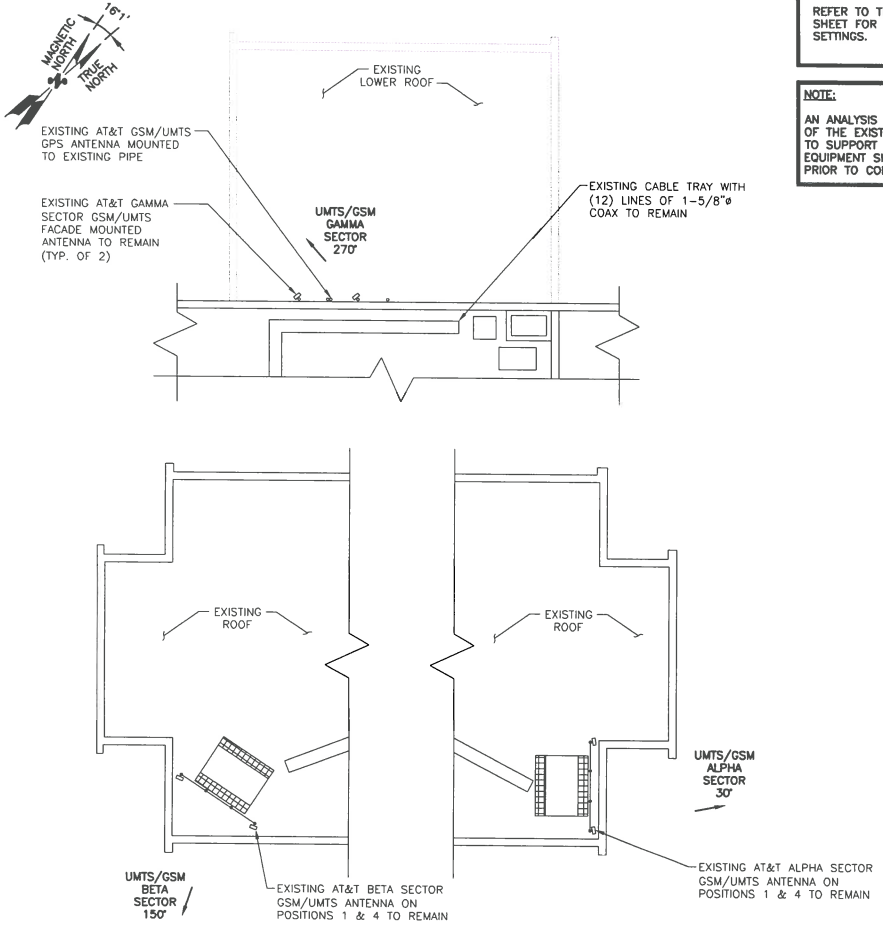
NO.	DATE	REVISIONS	BY	CHK	APP'D
2	03/06/12	ISSUED FOR CONSTRUCTION	HC	DC	DPH
1	02/23/12	ISSUED FOR PERMITTING	SB	DC	DPH
0	02/10/12	ISSUED FOR REVIEW	HC	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: HC

AT&T

ELEVATION (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5040.01	A-2	2



EXISTING GSM/UMTS ANTENNA LAYOUT

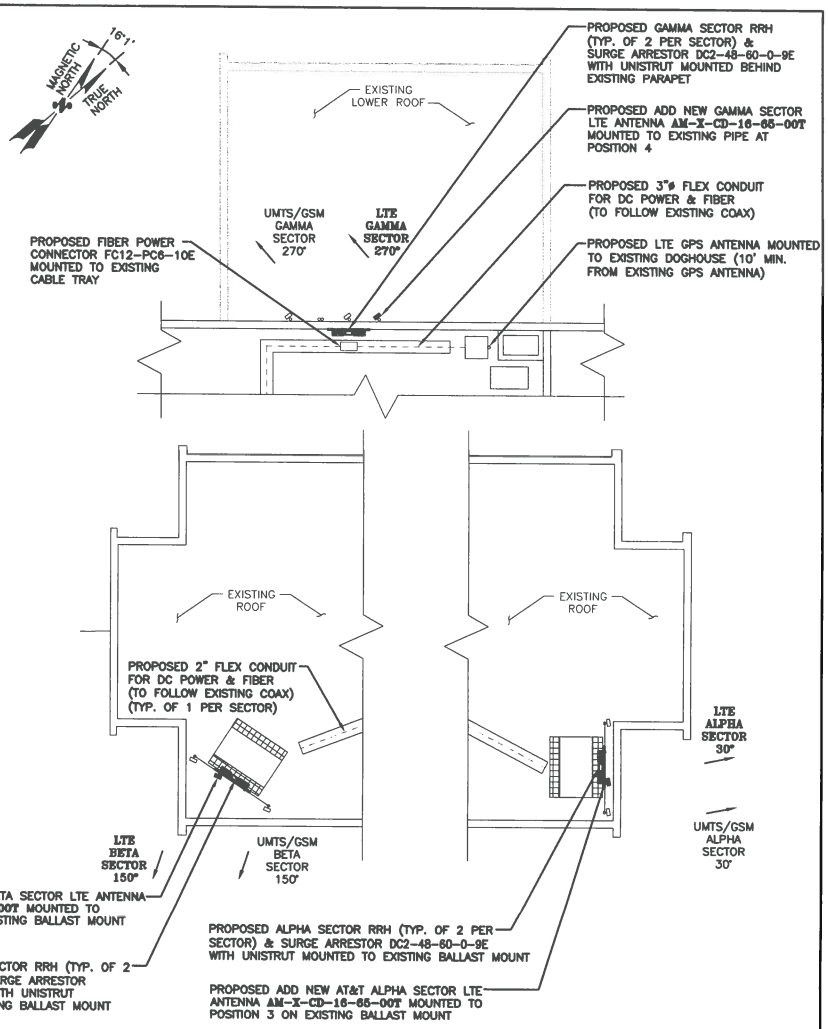
SCALE: N.T.S.

NOTE:

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

NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.



PROPOSED LTE ANTENNA LAYOUT

SCALE: N.T.S.

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 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: ME5040
SITE NAME: MUNJOY HILL
211 CUMBERLAND AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

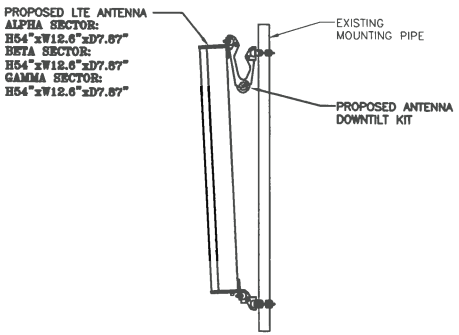
NO.	DATE	REVISIONS	BY	CHK	APP'D
2	03/08/12	ISSUED FOR CONSTRUCTION	HC	DC	DPH
1	02/23/12	ISSUED FOR PERMITTING	SB	DC	DPH
0	02/10/12	ISSUED FOR REVIEW	HC	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: HC

AT&T

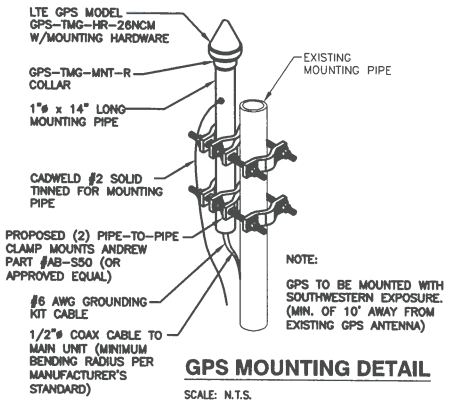
ANTENNA LAYOUT (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5040.01	A-3	2



PROPOSED LTE ANTENNA DETAIL

SCALE: N.T.S.



GPS MOUNTING DETAIL

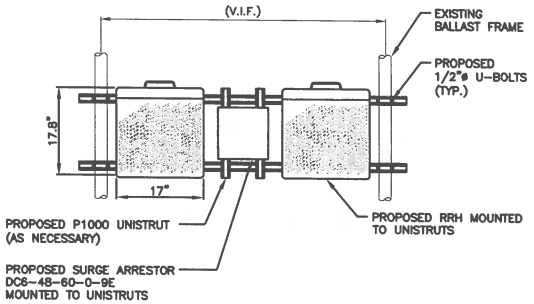
SCALE: N.T.S.

NOTE:

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

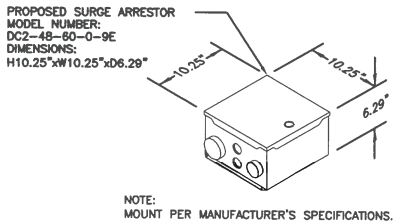
NOTE:

AN ANALYSIS FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT SHALL BE DETERMINED PRIOR TO CONSTRUCTION.



PROPOSED (ALPHA & BETA SECTORS) RRH & SURGE ARRESTOR MOUNTING DETAIL

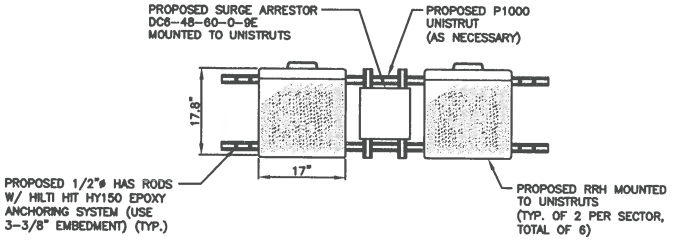
SCALE: N.T.S.



NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

DC SURGE SUPPRESSOR DETAIL

SCALE: N.T.S.

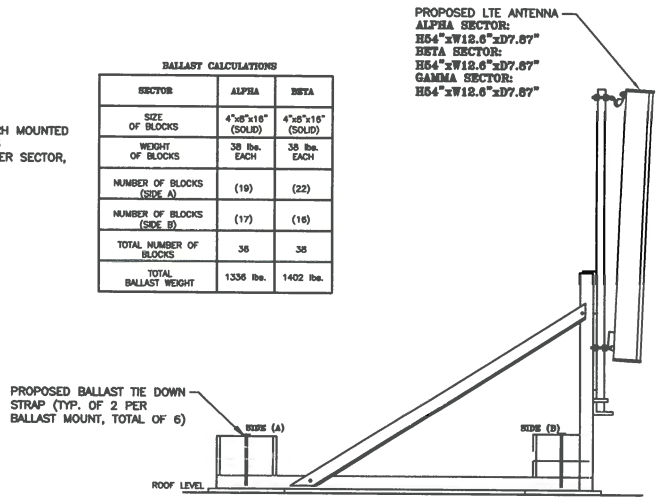


PROPOSED LTE (GAMMA SECTOR) RRH & SURGE ARRESTOR MOUNT DETAIL

SCALE: N.T.S.

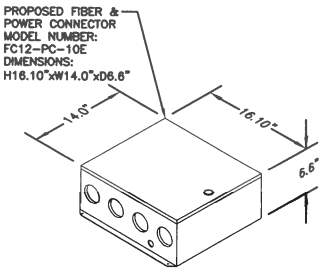
BALLAST CALCULATIONS

SECTOR	ALPHA	BETA
SIZE OF BLOCKS	4"x8"x16" (SOLID)	4"x8"x16" (SOLID)
WEIGHT OF BLOCKS	38 lbs. EACH	38 lbs. EACH
NUMBER OF BLOCKS (SIDE A)	(19)	(22)
NUMBER OF BLOCKS (SIDE B)	(17)	(16)
TOTAL NUMBER OF BLOCKS	36	36
TOTAL BALLAST WEIGHT	1336 lbs.	1402 lbs.



PROPOSED LTE ANTENNA DETAIL (BETA SECTOR)

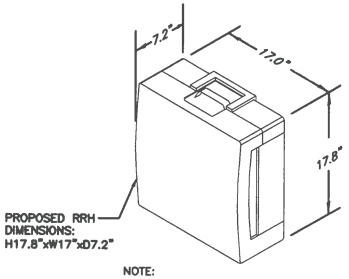
SCALE: N.T.S.



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.

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 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: ME5040
SITE NAME: MUNJOY HILL
211 CUMBERLAND AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

NO.	DATE	REVISIONS	BY	CHK	APP'D
2	03/06/12	ISSUED FOR CONSTRUCTION	HC	DC	DPH
1	02/23/12	ISSUED FOR PERMITTING	SB	DC	DPH
0	02/10/12	ISSUED FOR REVIEW	HC	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: HC

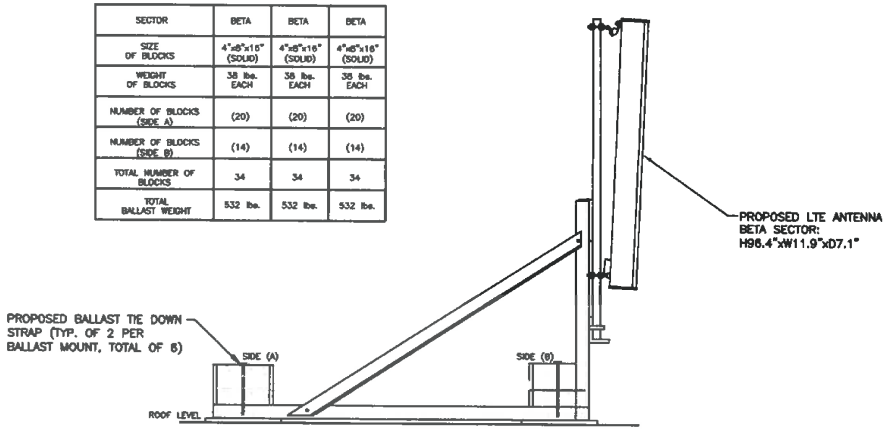
AT&T

DETAILS (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5040.01	A-4	2

BALLAST CALCULATIONS

SECTOR	BETA	BETA	BETA
SIZE OF BLOCKS	4"x8"x16" (SOLID)	4"x8"x16" (SOLID)	4"x8"x16" (SOLID)
WEIGHT OF BLOCKS	38 lbs. EACH	38 lbs. EACH	38 lbs. EACH
NUMBER OF BLOCKS (SIDE A)	(20)	(20)	(20)
NUMBER OF BLOCKS (SIDE B)	(14)	(14)	(14)
TOTAL NUMBER OF BLOCKS	34	34	34
TOTAL BALLAST WEIGHT	532 lbs.	532 lbs.	532 lbs.



PROPOSED LTE ANTENNA DETAIL (BETA SECTOR)

SCALE: N.T.S.

Hudson Design Group LLC
1600 OSGOOD STREET
BUILDING 20 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: ME5040
SITE NAME: MUNJOY HILL
211 CUMBERLAND AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

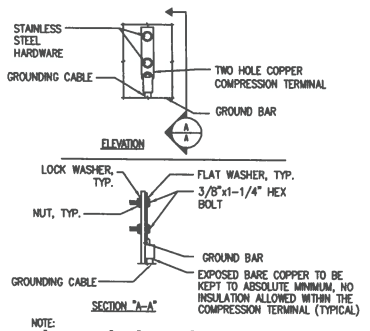
NO.	DATE	REVISIONS	BY	CHK	APP'D
2	03/06/12	ISSUED FOR CONSTRUCTION	HC	DC	DPH
1	02/23/12	ISSUED FOR PERMITTING	SB	DC	DPH
0	02/10/12	ISSUED FOR REVIEW	HC	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: HC

AT&T

PLUMBING DIAGRAM & GROUNDING DETAILS (LTE)

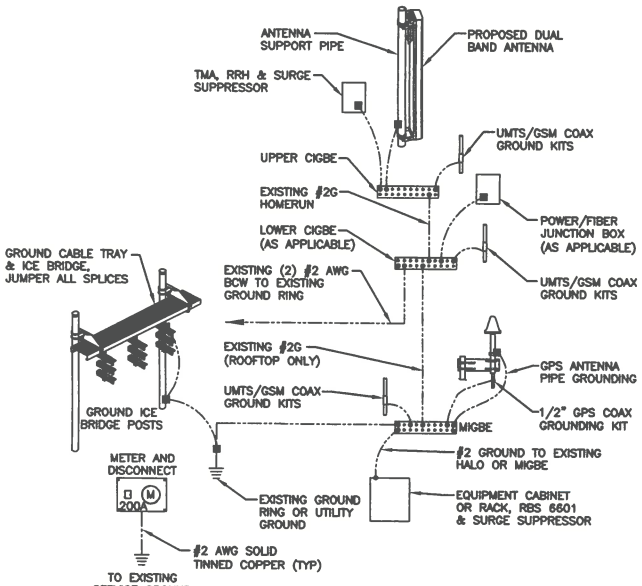
JOB NUMBER	DRAWING NUMBER	REV
5040.01	G-1	2



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.

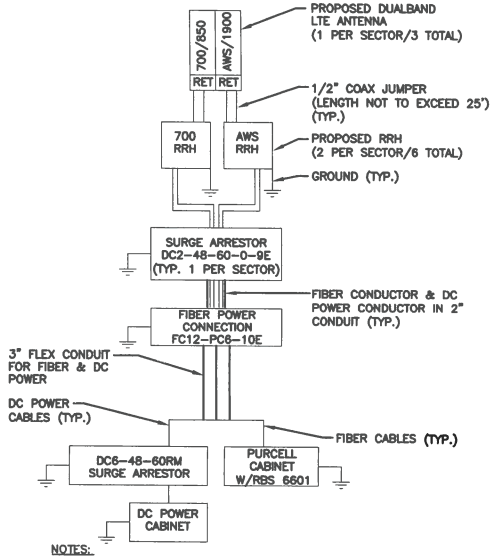
TYPICAL GROUND BAR CONNECTION DETAIL

2 — N.T.S.



GROUNDING RISER DIAGRAM

1 — N.T.S.



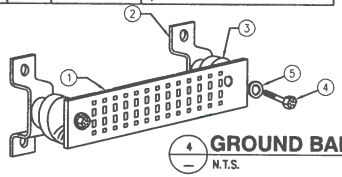
NOTES:

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 20 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: ME5040
SITE NAME: MUNJOY HILL
211 CUMBERLAND AVENUE
PORTLAND, ME 04101
CUMBERLAND COUNTY

at&t
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

NO.	DATE	REVISIONS	BY	CHK	APP'D
2	03/06/12	ISSUED FOR CONSTRUCTION	HC	DC	DPH
1	02/23/12	ISSUED FOR PERMITTING	SB	DC	DPH
0	02/10/12	ISSUED FOR REVIEW	HC	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: HC

AT&T

PLUMBING DIAGRAM & GROUNDING DETAILS (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5040.01	G-1	2

Hudson Design Group LLC

Calculations

Date: 03-02-12
Project Name: Munjoy Hill
Project Number: ME5040
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=	160	(ft) → ANTENNAS (ALPHA + BETA SECTORS)
z_g=	900	(ft)
α=	9.5	

K_z= 1.397

Kzmin ≤ Kz ≤ 2.01

Table 2-4

Exposure	Z_g	α	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!

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=	160	
H=	0	(Ht. of the crest above surrounding terrain)
K_{zt}=	1.00	

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

Category= **1**

Date: 03-02-12
Project Name: Munjoy Hill
Project Number: ME5040
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= 160 Gh= 0.56

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: 03-02-12
Project Name: Munjoy Hill
Project Number: ME5040
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_i= 1
I= 1
K_{iz}= 1.17
K_{zt}= 1

t_{iz}= 2.34

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

K_{iz}= 1.17

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= 55 (in) Largest Dim of Member

A_{iz} = 421.90

2.6.9 Design Wind Load:

F= qz*Gh*(EPA's)

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

K_z= 1.397
K_{zt}= 1
K_d= 0.95
V_{max}= 100

q_z= 33.98

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: 03-02-12
Project Name: Munjoy Hill
Project Number: ME5040
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= **23.64** **Cf=** 1.2

Appurtenances	Height	Width	Depth	Flat Area	Force Per Appurtenance
Item No.1	54	12.6	7.78	4.73	**260.11** (lbs) → (P) ANTENNA
Item No.2	55	11	5	4.20	**231.28** (lbs) → (E) ANTENNA
Item No.3	55	11	5	4.20	**231.28** (lbs) → (E) ANTENNA
Item No.4	0	0	0	0.00	**0.00** (lbs)
Item No.5	0	0	0	0.00	**0.00** (lbs)

TOTAL FORCE (ΣF_A) = **722.68** (lbs)

Date: 03-02-12
Project Name: Munjoy Hill
Project Number: ME5040
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=	158	(ft) → RRH's SURGE ARRESTOR
z_g=	900	(ft)
α=	9.5	

K_z= 1.394

Kzmin ≤ Kz ≤ 2.01

Table 2-4

Exposure	Z_g	α	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=	158	
H=	0	(Ht. of the crest above surrounding terrain)
K_{zt}=	1.00	

Date: 03-02-12
Project Name: Munjoy Hill
Project Number: ME5040
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= 158 Gh= 0.558

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: 03-02-12
Project Name: Munjoy Hill
Project Number: ME5040
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}= **2.34**

t_i= 1
I= 1
K_{iz}= 1.17
K_{zt}= 1

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

K_{iz}= **1.17**

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= 17.8 (in) Largest Dim of Member

A_{iz} = **147.99**

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= **33.89**

K_z= 1.394
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: 03-02-12
Project Name: Munjoy Hill
Project Number: ME5040
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= **23.61** **Cf=** 1.2

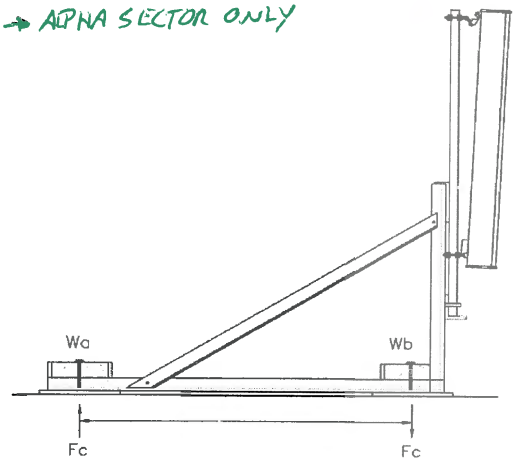
Appurtenances	Height	Width	Depth	Flat Area	Force Per Appurtenance
Item No.1	17.8	17	7.2	2.10	**115.37** (lbs) → (P) RRH
Item No.2	17.8	17	7.2	2.10	**115.37** (lbs) → (P) RRH
Item No.3	10.25	10.25	6.29	0.73	**40.06** (lbs) → (P) SURGE ARRESTOR
Item No.4	0	0	0	0.00	**0.00** (lbs)
Item No.5	0	0	0	0.00	**0.00** (lbs)

TOTAL FORCE (ΣF_A) = **270.81** (lbs)

Site Name: MUNJOY HILL
Site No. ME5040
Done by: AA **Checked by:** MSC
Date: 3/1/2012

Hudson Design Group LLC

Calculate Total Ballast Required for Ballast Mount → ALPHA SECTOR ONLY



Length = 7 ft

WIND FORCES

F antenna = 723 lbs.

Antenna Height = 7 ft

Overturning at Ballast

Moment = 6073.2 lbs.-ft S.F. 1.2

Hold Down Force = 867.60 lbs. Per Side

Wa Ballast

Equipment

Frame =	150 lbs.

Total Ballast Required Wa= **717.60** lbs.

Blocks Required Wa = **19** Assumed 38lbs Block (4"x8"x16" Solid)

Wb Ballast

Equipment

Frame	150 lbs.
Antennas	100 lbs.
Total =	250 lbs.

Total Ballast Required Wb = **617.60** lbs.

Blocks Required Wb= **17** Assumed 38lbs Block (4"x8"x16" Solid)

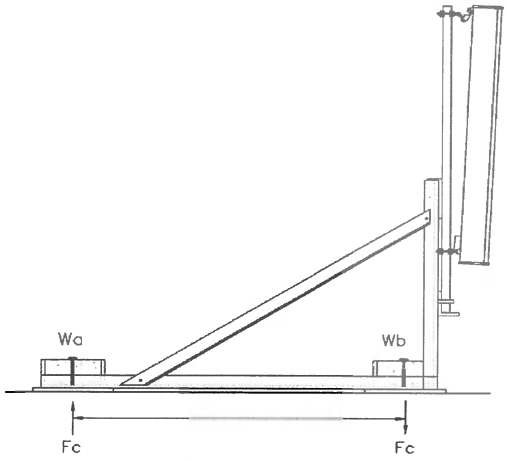
Site Name: MUJOY HILL
Site No. ME5040
Done by: AA **Checked by:** MSC
Date: 3/1/2012

Hudson Design Group LLC

Calculate Total Ballast Required for Ballast Mount → BETA SECTOR ONLY

WIND FORCES

F antenna =	723	lbs.
F rrh =	231	lbs.
F surge =	40	lbs.
Antenna Height =	7	ft
RRH & Surge Height =	2	ft



Length = 7 ft

Overturning at Ballast

Moment =	6723.6 lbs.-ft		S.F.
			1.2
Hold Down Force =	960.51 lbs.	Per Side	

Wa Ballast

Equipment

Frame =	150	lbs.

Total Ballast Required Wa= **810.51** lbs.

Blocks Required Wa = **22** Assumed 38lbs Block (4"x8"x16" Solid)

Wb Ballast

Equipment

Frame	150	lbs.
Antennas	100	lbs.
RRH's	100	lbs.
Surge Arrestor	20	lbs.
Total =	370	lbs.

Total Ballast Required Wb = **590.51** lbs.

Blocks Required Wb= **16** Assumed 38lbs Block (4"x8"x16" Solid)