CUDDY +FEDER LLP

445 Hamilton Avenue, 14th Floor
White Plains, New York 10601
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Kristen Motel
kmotel@cuddyfedder.com

October 28, 2019

VIA EMAIL AND FEDERAL EXPRESS
Members of the Connecticut Siting Council
Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051

Re: Development and Management Plan ("D&M Plan")
Connecticut Siting Council Docket No. 485
Certificate of Environmental Compatibility and Public Need for the Construction, Maintenance and Operation ("Certificate") of a Telecommunications Facility at
1542 Boston Post Road, Westbrook, Connecticut

Dear Members of the Siting Council:

On behalf of Message Center Management, Inc. ("MCM"), and in furtherance of the captioned Certificate, please accept for review and Council approval this Development Management Plan ("D&M Plan") filing for the captioned Facility as approved in Docket No. 485.

Tower, Compound & Other Equipment

Enclosed are an original and fifteen (15) sets of 11" x 17" D&M Plan drawings prepared by All Points Technology Corporation (APT) revised through October 21, 2019 being filed in accordance with the Siting Council's ("Council") Decision and Order dated August 15, 2019 ("Decision and Order"). Two full sized sets of the D&M Plan drawings are also enclosed.

As per order number 1 of the Council's Decision and Order, the D&M Plan incorporates a 130' monopole tower with an overall facility height of 136' 8" to the top of the whip antenna for the Old Saybrook Police Department. The monopole design and the D&M Plan incorporate the antennas and specifications for Cellco Partnership d/b/a Verizon Wireless, AT&T, T-Mobil and the Old Saybrook Police Department. Included in the D&M plans, enclosed in Attachment 1, are the final site plans including specifications for the tower, tower foundation, antennas, modifications to the existing equipment compound, radio equipment, utilities and access road.

Of note, the D&M Plan also includes construction sequencing and site preparations, drainage, and erosion and sedimentation control measures consistent with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control as amended. Sheet L-1 of the D&M Plan drawings details a landscaping plan, including an evergreen tree planting plan. Sheet C-1 of the

CUDDY +FEDER LLP

D&M Plan drawings outlines construction sequencing, including proposed hours and days of the week for construction activities and a schedule for removal of the existing temporary tower.

As per condition 2 of the Council's Decision and Order the tower incorporates a yield point to ensure the setback radius remains within the boundaries of the subject property. This is described in detail in the October 17, 2019 letter from Habib Azouri, P.E. and structural analysis completed by ROHN Products LLC, included in Attachment 3.

Please also find enclosed a geotechnical report, prepared by Nobis Engineering, Inc. and dated March 18, 2017, included in Attachment 2. Details of the antennas and equipment to be installed on the tower by Verizon (Attachment 4), AT&T (Attachment 5) and T-Mobile (Attachment 6) are also provided. Please note that no additional backup emergency power generator is proposed at this time.

Required Notifications

In accordance with RCSA Section 16-50j-75, a copy of this filing is being provided to The Connecticut Water Company, as the property owner of record and the service list.

In accordance with the provisions of RCSA Section 16-50j-77, MCM hereby notifies the Council of its intention to begin site work immediately after Council approval of the D&M Plan. Construction of the tower and other site improvements will commence upon issuance of a local building permit. The supervisor for all construction related matters on this project is supervisor for all construction related matters on this project is Robert Stanford. Mr. Stanford is located at MCM's office in Hartford, Connecticut and can be reached by telephone at (860) 614-9929.

We respectfully request that this matter be included on the Council's next available agenda for review and approval.

Thank you for your consideration of the enclosed.

Very truly yours,

Kristen Motel

Enclosures

cc: Connecticut Water Company
Virginia King, MCM
Robert Stanford, MCM
Matthew Bandle, MCM
All-Points Technology Corporation
Christopher B. Fisher, Esq.
Anthony Befera, Verizon Wireless
Noel Bishop, First Selectman

CUDDY +FEDER LLP

CERTIFICATE OF SERVICE

I hereby certify that on this day, an original and 15 copies of the foregoing was sent electronically and by overnight delivery to the Connecticut Siting Council with copy to:

Facility Site Owner:

The Connecticut Water Company
93 West Main Street
Clinton, CT 06413

Town of Westbrook First Selectman:

Noel Bishop, First Selectman
866 Boston Post Road
Town of Westbrook
Westbrook, CT 06489

Anthony Befera
Cellco Partnership d/b/a Verizon
Wireless
20 Alexander Drive
Wallingford, CT 06492

Virginia King
MCM Holdings, LLC
40 Woodland Street
Hartford, CT 06105

Dated: October 28, 2019

Kristen Motel, Esq.

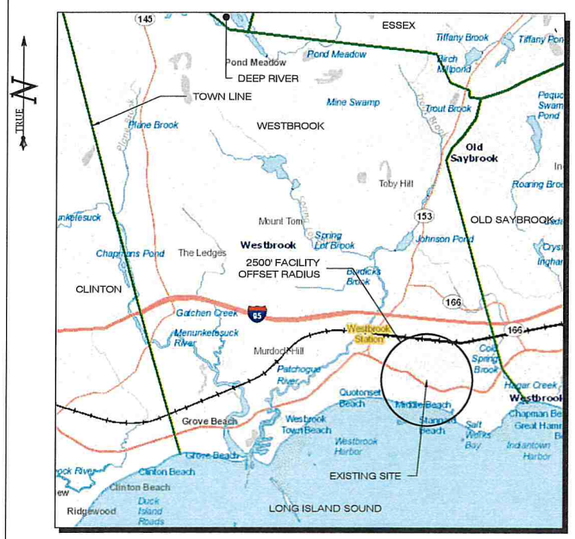
1

MCM HOLDINGS, LLC

40 WOODLAND STREET
HARTFORD, CT 06105
OFFICE: (888) 973-7483

WIRELESS SERVICES FACILITY

WESTBROOK H20 TANK
1542 BOSTON POST ROAD
WESTBROOK, CT 06498



MUNICIPAL NOTIFICATION LIMIT MAP
SCALE : 1" = 4000'-0"

VICINITY MAP
SCALE : 1" = 1000'-0"

SITE INFORMATION

SITE TYPE:	PROPOSED 130' AGL MONOPOLE
SCOPE OF WORK:	PROPOSED RF EQUIPMENT ON PROPOSED 130' AGL MONOPOLE TO CONNECT TO EXISTING GROUND EQUIPMENT WITHIN AN EXISTING FENCED COMPOUND.
SITE NAME:	WESTBROOK H20 TANK
SITE ADDRESS:	1542 BOSTON POST ROAD WESTBROOK, CT 06498
ZONING JURISDICTION:	CONNECTICUT SITING COUNCIL
COUNTY:	MIDDLESEX
ASSESSOR'S TAX ID#:	MAP: 182, LOT: 007
ZONING DISTRICT:	NEIGHBORHOOD COMMERCIAL DISTRICT (NCD)
LATITUDE:	41° 16' 54.9197" N
LONGITUDE:	72° 26' 14.9183" W
GROUND ELEVATION:	48'± AMSL
PROPERTY OWNER:	THE CONNECTICUT WATER COMPANY 93 WEST MAIN STREET CLINTON, CONNECTICUT 06413
LEGAL:	CUDDY & FEDER, LLP 445 HAMILTON AVENUE 14TH FLOOR WHITE PLAINS, NY 10601
APPLICANT:	MCM HOLDINGS, LLC 40 WOODLAND STREET HARTFORD, CT 06105
SITE ENGINEER:	ALL-POINTS TECHNOLOGY CORP., P.C. 3 SADDLEBROOK DRIVE KILLINGWORTH, CT 06419 (860) 663-1697 x206

LIST OF DRAWINGS

MCM HOLDINGS, LLC
P.O. BOX 320361
HARTFORD, CT 06132
OFFICE: (888) 973-7483

ALL-POINTS TECHNOLOGY CORPORATION
3 SADDLEBROOK DRIVE PHONE: (860)-663-1697
KILLINGWORTH, CT 06419 FAX: (860)-663-0935
WWW.ALLPOINTSTECH.COM

DEVELOPMENT & MANAGAMENT PLANS

NO	DATE	REVISION
0	10/08/19	FOR REVIEW: RCB
1	10/21/19	CLIENT COMMENTS: RCB
2		
3		
4		
5		
6		

STATE OF CONNECTICUT
ROBERT CHARLES BURNS
No. 20071
LICENSED
PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 3 SADDLEBROOK DRIVE KILLINGWORTH, CT 06419

OWNER: THE CONNECTICUT WATER COMPANY
ADDRESS: 93 WEST MAIN STREET CLINTON, CONNECTICUT 06413

MCM SITE
WESTBROOK H20 TANK

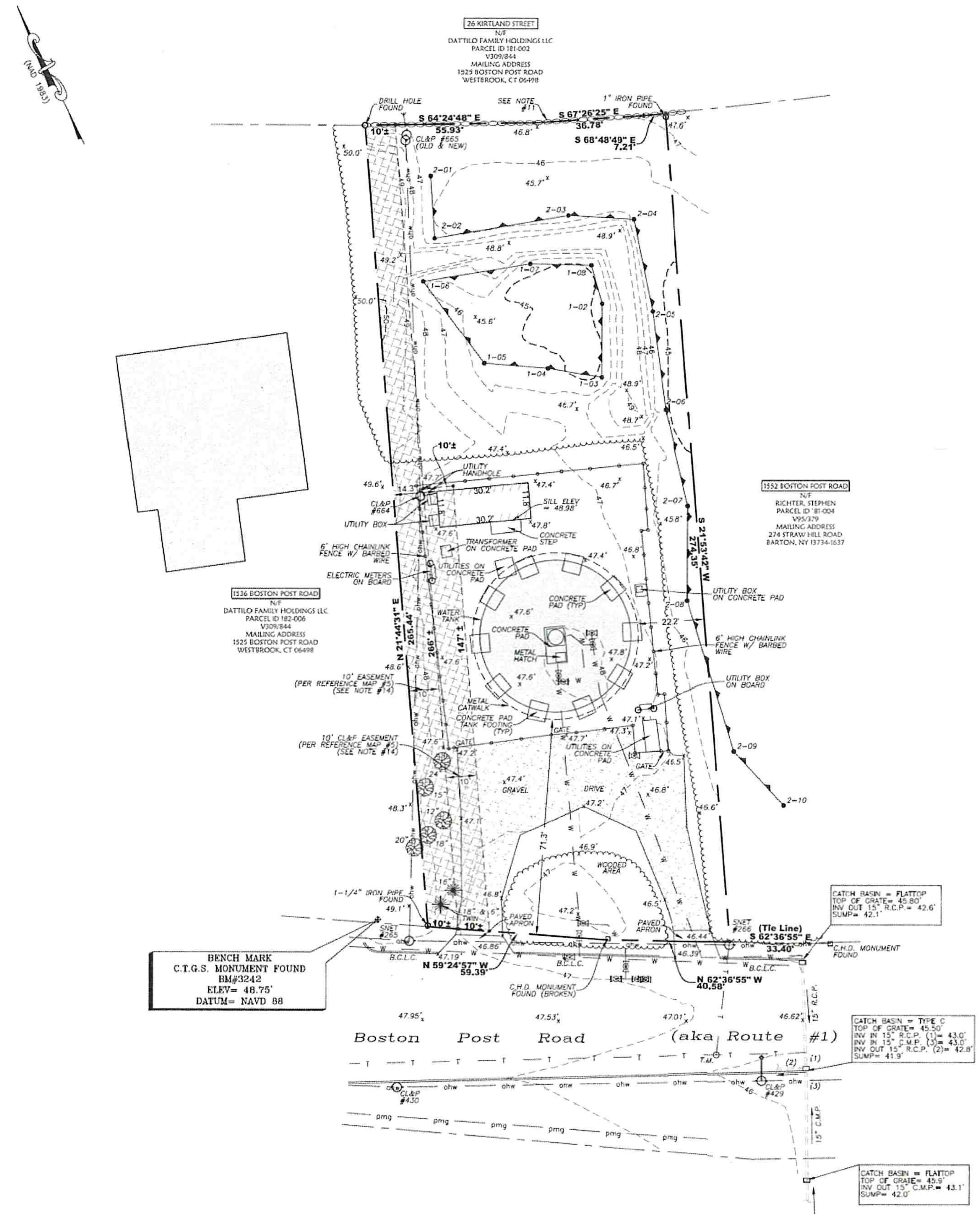
SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

DRAWN BY: CSH
DATE: 10/08/19 CHECKED BY: RCB

SHEET TITLE:
TITLE SHEET & INDEX

SHEET NUMBER:
T-1



Scale: 1"=20'

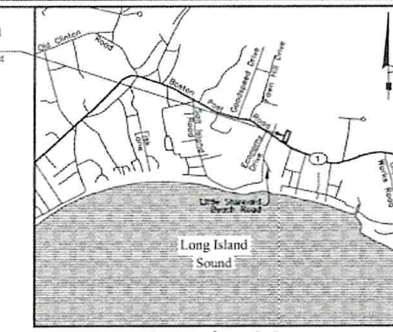
Legend

SYMBOL	DESCRIPTION
	PROPERTY CORNER
	IP / REBAR
	MON / MERESTONE
	BENCH MARK
	UTILITY POLE
	UTILITY POLE W/ LIGHT
	GUY WIRE
	GAS VALVE
	WATER VALVE
	FIRE HYDRANT
	CATCH BASIN
	MANHOLE
	SIGN
	LIGHT POLE
	YARD LIGHT
	WOOD POST
	DECIDUOUS TREE
	CONIFEROUS TREE
	SHRUB
	STUMP
	HEDGE
	STONEWALL
	TREELINE
	FENCE LINE
ohw	OVERHEAD WIRES
w	WATER LINE
T	TELEPHONE LINE
pmg	PAINT MARK GAS
	INDEX CONTOUR
	INTERMEDIATE CONTOUR
	PROPERTY LINE
	PROPERTY LINE OTHER
	ROAD PAINTMARKS
	WETLANDS
?-??	WETLANDS FLAG
x X.X'	SPOT ELEVATION
	PLANTED AREA
	GRAVEL AREA
	EXISTING BUILDING
	EASEMENT
N/F	NOW OR FORMERLY
ELEV / EL	ELEVATION
E.M.	ELECTRIC METER
T.M.	TELEPHONE MANHOLE
(TYP)	TYPICAL
C.M.P.	CORRUGATED METAL PIPE
R.C.P.	REINFORCED CONCRETE PIPE
C.P.P.	CORRUGATED PLASTIC PIPE
E.O.P.	EDGE OF PAVEMENT
B.C.L.C.	BITUMINOUS CONCRETE LIP CURB
W/	WITH
C.H.D.	CONNECTICUT HIGHWAY DEPARTMENT
C.T.G.S.	CONNECTICUT GEODETIC SURVEY

Subject Parcel Information

OWNER:	THE CONNECTICUT WATER COMPANY
PARCEL ADDRESS:	1542 BOSTON POST ROAD WESTBROOK, CONNECTICUT 06498
MAILING ADDRESS:	93 WEST MAIN STREET CLINTON, CONNECTICUT 06413
PARCEL ID:	MAP 182 LOT 007
DEED:	VOLUME 15 PAGE 287
LAND USE ZONE:	NEIGHBORHOOD COMMERCIAL DISTRICT
AREA:	26833.12 SQ. FT. ± OR .62 ACRES ±
FLOOD ZONE:	ZONE X PER FIRM MAP COMMUNITY PANEL #S 09007C0337J & 09007C0341J DATED FEBRUARY 6, 2013 (SEE NOTE #6)

1542 Boston Post Road
(aka Route #1)
Westbrook, Connecticut



Location Map

Scale: 1"=2000'

Notes

1) THIS SURVEY PLAN HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTION 20-300B-1 THROUGH 20-300B-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIATION OF THE LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996.
A. TYPE OF SURVEY: TOPOGRAPHIC SURVEY
B. WITH RESPECT TO THE PERIMETER OF THE PROPERTY THE BOUNDARY DETERMINATION IS BASED UPON A RESURVEY OF REFERENCE MAP #4.
C. THIS SURVEY CONFORMS TO THE STANDARDS AND THE ACCURACY OF CLASS: A-2 HORIZONTAL & T-2 TOPOGRAPHIC ACCURACY.
D. BEARINGS AS DEPICTED ARE BASED UPON THE CONNECTICUT GRID SYSTEM NORTH AMERICAN DATUM OF 1983
E. ELEVATIONS BASED UPON NORTH AMERICAN VERTICAL DATUM 1988
F. CONTOUR INTERVAL = 1'
G. THE INTENT OF THIS MAP IS TO DEPICT THE EXISTING CONDITIONS OF THE PROPERTY

2) BOUNDARY LINES OF ADJOINING PROPERTIES ARE SHOWN FOR GENERAL INFORMATIONAL PURPOSES ONLY AND ARE NOT TO BE CONSTRUED AS BEING ACCURATELY LOCATED OR DEPICTED.

3) THE WORD "CERTIFY" AS USED IS UNDERSTOOD TO BE AN EXPRESSION OF PROFESSIONAL OPINION BY THE SURVEYOR. IT IS A DECLARATORY STATEMENT, WHICH IS BASED ON HIS BEST KNOWLEDGE, INFORMATION AND BELIEF. AS SUCH IT CONSTITUTES NEITHER GUARANTEE NOR WARRANTY, EXPRESSED OR IMPLIED, OF ANY INFORMATION CONTAINED HEREON. NO CERTIFICATION IS EXPRESSED OR IMPLIED ON ANY ORIGINAL OR ANY DUPLICATE OF THIS MAP UNLESS IT BEARS AN ORIGINAL STAMP OR SEAL AND ORIGINAL SIGNATURE OF THE INDIVIDUAL WHOSE REGISTRATION NUMBER APPEARS HEREON.

4) THIS MAP IS THE PROPERTY OF GESICK & ASSOCIATES P.C. AND HAS BEEN SPECIFICALLY PREPARED FOR THE OWNER OF THIS PROJECT OR PROPERTY. IT IS NOT TO BE DUPLICATED OR USED IN PART OR WHOLE FOR ANY OTHER PURPOSE, PROJECT, LOCATION, OR OWNER WITHOUT THE EXPRESS WRITTEN CONSENT OF GESICK & ASSOCIATES P.C.

5) BASE MAPPING PREPARED BY GESICK & ASSOCIATES P.C. FROM A 01/09/2017 THRU 01/13/2017 FIELD SURVEYS.

6) WETLANDS BOUNDARY LIMITS DELINEATED BY ALL POINTS TECHNOLOGY CORPORATION AND FIELD LOCATED BY GESICK & ASSOCIATES, P.C. 01/09/2017.

7) THE FLOOD ZONE BOUNDARIES SHOWN WERE DERIVED UTILIZING FLOOD INSURANCE RATE MAPS. THE FLOOD ZONE BOUNDARIES WERE DIGITIZED AND ARE TO BE CONSIDERED AS APPROXIMATE ONLY AND FOR INFORMATIONAL PURPOSES ONLY. DATUM = NAVD 1988

8) UNDERGROUND UTILITY, STRUCTURE AND FACILITY LOCATIONS DEPICTED AND NOTED HEREON HAVE BEEN COMPILED, IN PART, FROM RECORD MAPPING AND LIMITED FIELD MEASUREMENTS. THESE LOCATIONS MUST BE CONSIDERED AS APPROXIMATE IN NATURE. ADDITIONALLY, OTHER SUCH FEATURES MAY EXIST ON THE SITE, THE EXISTENCE OF WHICH ARE UNKNOWN TO GESICK & ASSOCIATES, P.C. THE SIZE LOCATION AND EXISTENCE OF ALL SUCH FEATURES MUST BE FIELD DETERMINED AND VERIFIED BY THE APPROPRIATE AUTHORITIES PRIOR TO CONSTRUCTION. CALL BEFORE YOU DIG 1-800-922-4455.

9) TREES SHOWN ON THIS MAP WERE FIELD LOCATED BUT ARE NOT SHOWN TO SCALE

10) UNLESS OTHERWISE NOTED, BUILDING OFFSETS ARE TO BUILDING SIDING ABOVE THE FOUNDATION

11) THE STONEWALLS AND/OR FENCES SHOWN AS BOUNDARIES MAY HAVE IRREGULARITIES OF COURSE BETWEEN PRINCIPAL POINTS OF COURSE INDICATED.

12) TIE LINE IS NOT PROPERTY LINE.

13) HEIGHT OF WATER TANK = 121.8'

14) PARCEL IS SUBJECT TO EASEMENTS TO THE CONNECTICUT LIGHT AND POWER COMPANY AS SHOWN IN VOLUME 232 PAGE 245 OF THE TOWN OF WESTBROOK LAND RECORDS

Reference Maps

1. "MAP OF PROPERTY OF M.EUGENE CULVER & KATE H. SPARROW WESTBROOK CONNECTICUT"
PREPARED BY L. NORMAN GERMAIN
DATED SEPTEMBER, 1927 SCALE 1"=30' TOWN CLERK MAP #66
2. "CONNECTICUT STATE HIGHWAY DEPARTMENT RIGHT OF WAY MAP TOWN OF WESTBROOK BOSTON POST ROAD FROM STANNARD BEACH ROAD WESTERLY ABOUT 1900 FEET ROUTE NO 1"
PREPARED BY THE CONNECTICUT STATE HIGHWAY DEPARTMENT
DATED OCTOBER 21, 1927 SCALE 1"=40' DRAWING 70 SHEET 1 OF 1
3. "CONNECTICUT STATE HIGHWAY DEPARTMENT RIGHT OF WAY MAP TOWN OF WESTBROOK BOSTON POST ROAD FROM WESTBROOK CENTER EASTERLY TO STANNARD HILL ROUTE US 1"
PREPARED BY THE CONNECTICUT STATE HIGHWAY DEPARTMENT
DATED MAY 28, 1929 SCALE 1"=40' DRAWING 831 SHEET 2 OF 2
4. "MAP OF PROPERTY OWNED BY THE CONNECTICUT WATER COMPANY WESTBROOK CONNECTICUT"
PREPARED BY ROBERT C HART
DATED OCTOBER 7, 1996 SCALE 1"=20'
5. "COMPILATION PLAN MAP SHOWING EASEMENT AREA TO BE GRANTED TO THE CONNECTICUT LIGHT AND POWER COMPANY ACROSS THE PROPERTY OF THE CONNECTICUT WATER COMPANY 1542 BOSTON POST ROAD WESTBROOK CONNECTICUT"
PREPARED BY L-C ASSOCIATES INC.
DATED OCTOBER 1, 2002 SCALE 1"=20' TOWN CLERK MAP #2325

Copies of this survey map not bearing the Land Surveyor's Embossed Seal shall not be considered to be valid copies, certificates indicated or implied hereon shall run only to the party for whom the Survey is prepared, and on behalf to the additional parties listed hereon. Certificates are not transferable to additional parties, or subsequent owners not listed hereon.

To the best of my knowledge and belief this map is substantially correct as noted hereon.

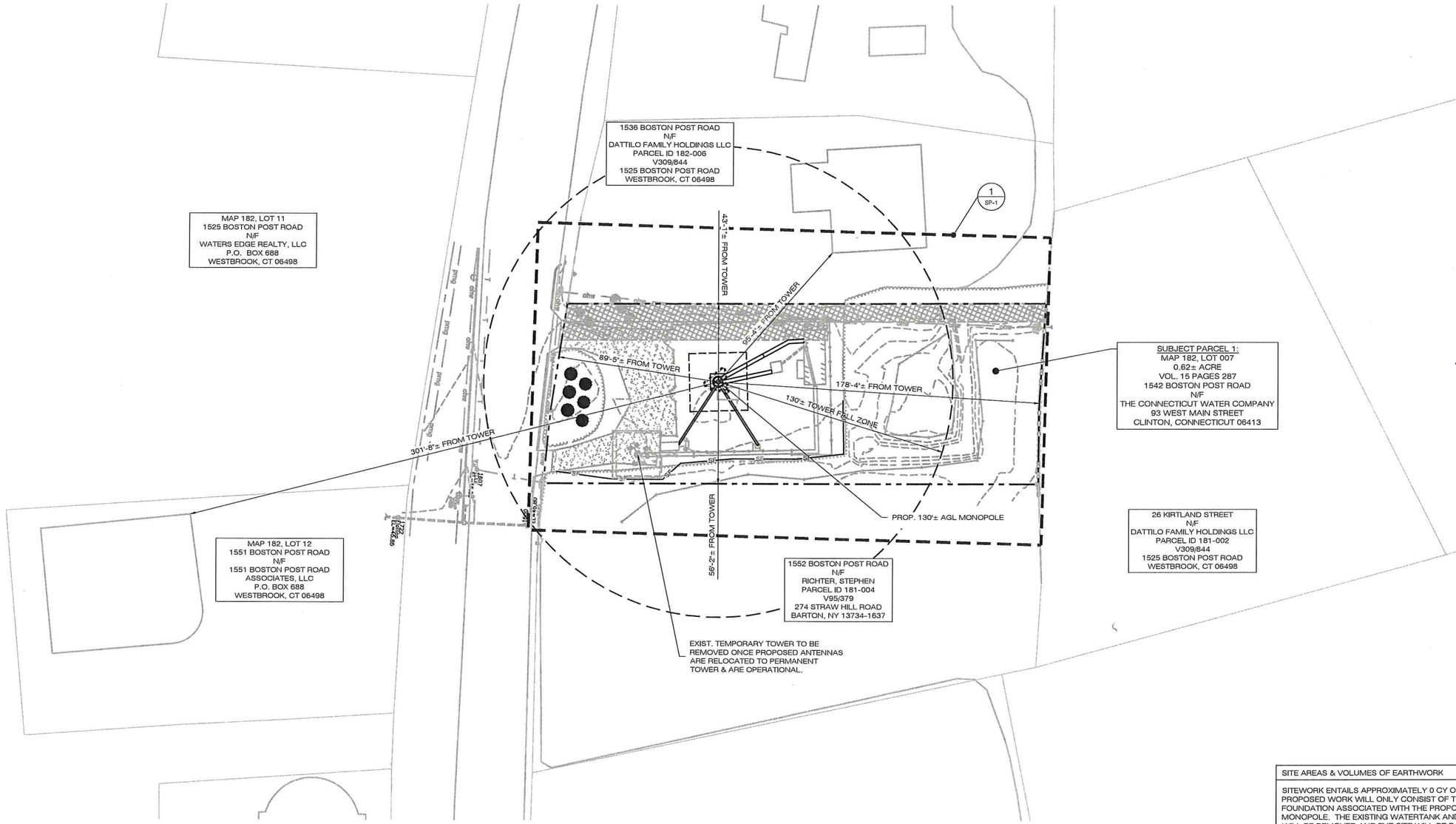
Donald L. Gesick Jr. L.S
Reg. No. 18417

GESICK & ASSOCIATES, P.C.
SURVEYORS ! MAPPERS ! PLANNERS
19 CEDAR ISLAND AVE.
CLINTON, CONNECTICUT 06413
OFFICE: 860-669-7799 FAX: 860-669-5833
www.gesicksurveyors.com

Topographic Survey
of
1542 Boston Post Road
(aka Route #1)
Westbrook, Connecticut
Prepared for
ConnecticutWater

Revisions

Date: January 18, 2017
Drawing: 17-002a
CWC Drawing: SL-1512
Drawn: P.H.
Sheet
1 OF 1



N

1 R-1 **ABUTTERS MAP**
SCALE : 1" = 30'-0"

30 0 15 30 60
(IN FEET) 1 inch = 30 ft.

BASE MAPPING FOR SHEETS R-1, SP-1 & A-1 FROM:

1. "TOPOGRAPHIC SURVEY OF 1542 BOSTON POST ROAD (AKA ROUTE #1), WESTBROOK, CONNECTICUT, PREPARED FOR CONNECTICUT WATER, PREPARED BY GESICK & ASSOCIATES, P.C., SURVEYORS|MAPPERS|PLANNERS|, 19 CEDAR ISLAND AVE., CLINTON, CONNECTICUT 06413, OFFICE: (860) 669-7799 FAX: (860) 669-5833, WWW.GESICKSURVEYORS.COM.
2. BASE MAPPING SUPPLEMENTED W/ FIELD MEASUREMENTS TAKEN BY ALL-POINTS TECHNOLOGY CORP. ON 04-21-2017.

SITE AREAS & VOLUMES OF EARTHWORK

SITEWORK ENTAILS APPROXIMATELY 0 CY OF FILL. THE PROPOSED WORK WILL ONLY CONSIST OF THE NEW FOUNDATION ASSOCIATED WITH THE PROPOSED MONOPOLE. THE EXISTING WATERTANK AND FOOTINGS WILL BE REMOVED AND THE SITE WILL BE BACKFILLED TO EXISTING ELEVATIONS.

COMPOUND AREA SLOPES:
EXISTING - 0.5%-3%
PROPOSED - 0.5%-3%

TOTAL AREA OF DISTURBANCE = 4,300± SF

STORMWATER VELOCITY:
PRIOR TO GROUND COVER < 3.0 FT/SEC
FOLLOWING GROUND COVER < 3.0 FT/SEC

STORMWATER VOLUME:
PROPOSED IMPERVIOUS AREA = N/A
WATER QUALITY STD VOLUME (1") = N/A
STORAGE VOLUME (6" DEPTH, 40% VOIDS) = N/A

GROUND COVER TO BE ESTABLISHED AS FOLLOWS (U,O,N):
- WHITE CLOVER @ 0.20#/- SF
- TALL FESCUE @ 0.45#/- SF
- RYEGRASS @ 0.10#/- SF

MCM HOLDINGS, LLC
P.O. BOX 320361
HARTFORD, CT 06132
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ALL-POINTS TECHNOLOGY CORPORATION
3 SADDLEBROOK DRIVE PHONE: (860)-663-1697
KILLINGWORTH, CT 06419 FAX: (860)-663-0935
WWW.ALLPOINTSTECH.COM

DEVELOPMENT & MANAGAMENT PLANS

NO	DATE	REVISION
0	10/08/19	FOR REVIEW: RCB
1	10/21/19	CLIENT COMMENTS: RCB
2		
3		
4		
5		
6		

STATE OF CONNECTICUT
ROBERT CHARLES BURNS
No. 20071
LICENSED
PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 3 SADDLEBROOK DRIVE KILLINGWORTH, CT 06419

OWNER: THE CONNECTICUT WATER COMPANY
ADDRESS: 93 WEST MAIN STREET CLINTON, CONNECTICUT 06413

MCM SITE
WESTBROOK H20 TANK

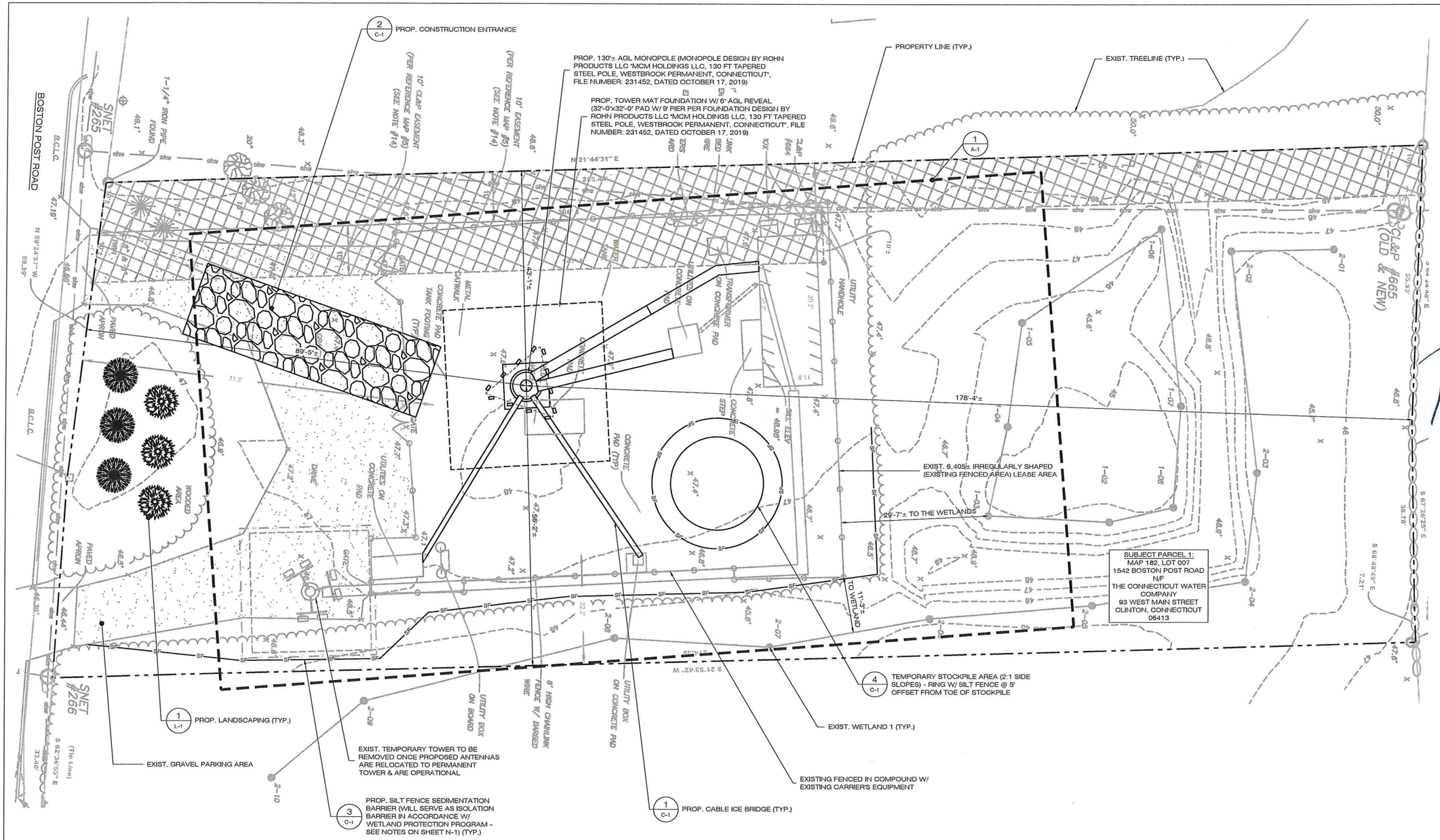
SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

DRAWN BY: CSH
DATE: 10/08/19
CHECKED BY: RCB

SHEET TITLE:
ABUTTERS MAP

SHEET NUMBER:
R-1



THE CONTRACTOR IS RESPONSIBLE FOR MANAGING GROUNDWATER LEVELS IN THE VICINITY OF EXCAVATIONS TO PROTECT ADJACENT PROPERTIES AND NEW WORK. GROUNDWATER SHALL BE DRAINED IN ACCORDANCE WITH LOCAL SEDIMENTATION & EROSION CONTROL GUIDELINES.

BASE MAPPING FOR SHEETS A-1 & SP-1 FROM:

1. "TOPOGRAPHIC SURVEY OF 1542 BOSTON POST ROAD (AKA ROUTE #1), WESTBROOK, CONNECTICUT, PREPARED FOR CONNECTICUT WATER, PREPARED BY GESICK & ASSOCIATES, P.C., SURVEYORS|MAPPERS|PLANNERS|, 19 CEDAR ISLAND AVE., CLINTON, CONNECTICUT 06413, OFFICE: (860) 669-7799 FAX: (860) 669-5833, WWW.GESICKSURVEYORS.COM.
2. BASE MAPPING SUPPLEMENTED W/ FIELD MEASUREMENTS TAKEN BY ALL-POINTS TECHNOLOGY CORP. ON 04-21-2017.

N

1 SP-1 **PARTIAL SITE PLAN**
SCALE : 1" = 10'-0"

10 0 5 10 20
(IN FEET) 1 inch = 10 ft.

MCM HOLDINGS, LLC
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DEVELOPMENT & MANAGAMENT PLANS

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STATE OF CONNECTICUT
ROBERT CHARLES BURNS
NO. 20071
REGISTERED PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 3 SADDLEBROOK DRIVE KILLINGWORTH, CT 06419

OWNER: THE CONNECTICUT WATER COMPANY
ADDRESS: 93 WEST MAIN STREET CLINTON, CONNECTICUT 06413

MCM SITE
WESTBROOK H20 TANK

SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

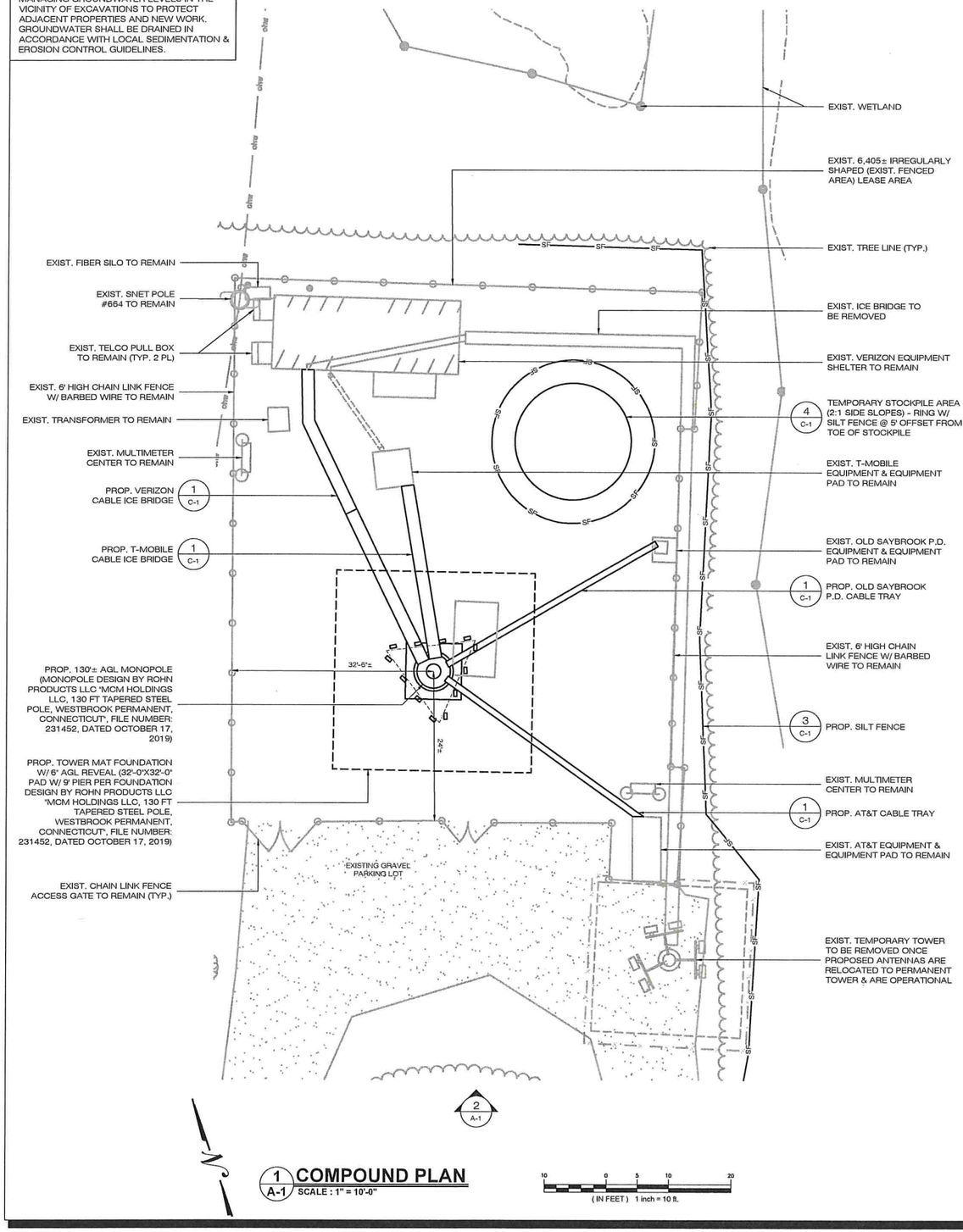
APT FILING NUMBER: CT524120

DRAWN BY: CSH
DATE: 10/08/19
CHECKED BY: RCB

SHEET TITLE:
PARTIAL SITE PLAN

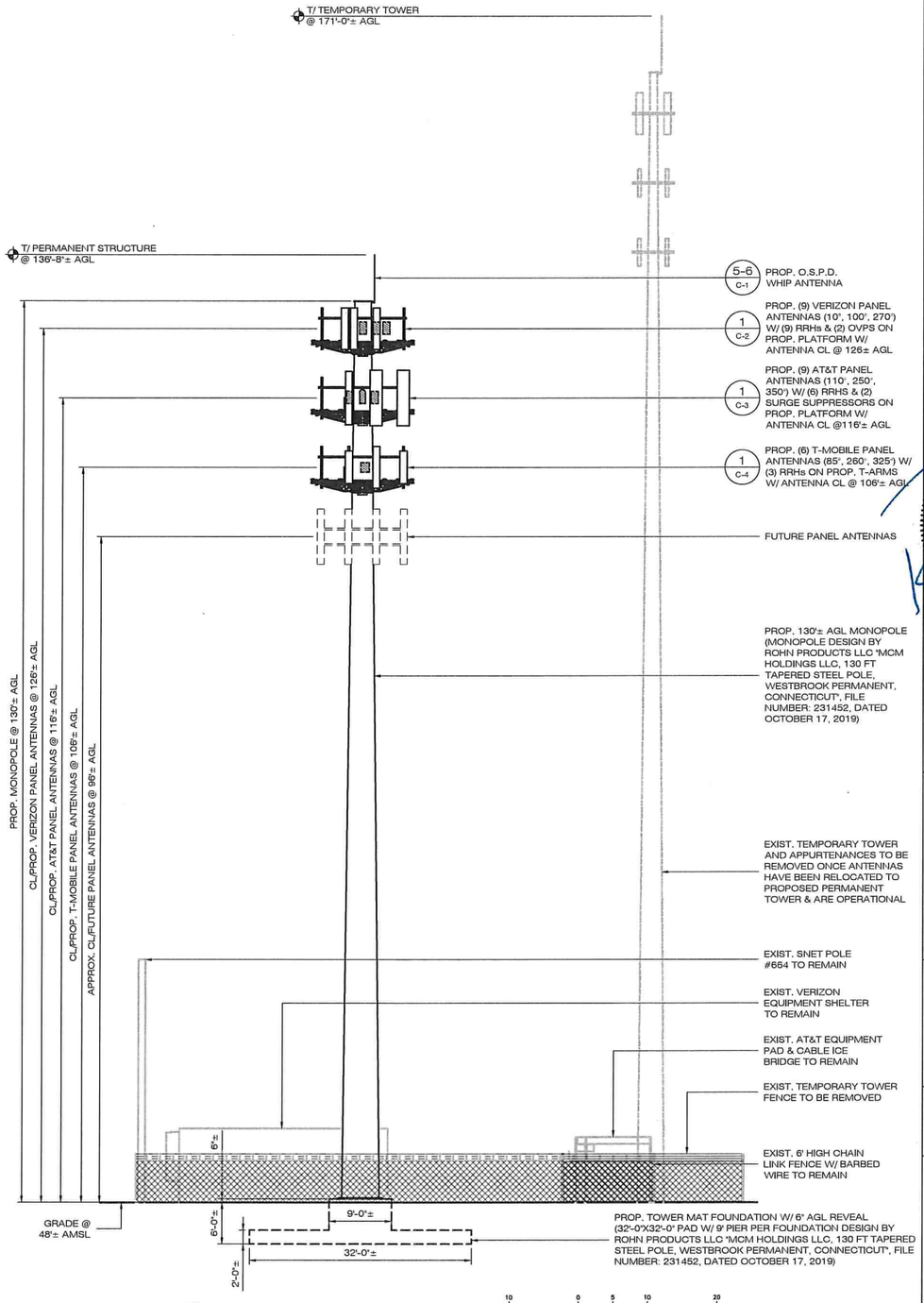
SHEET NUMBER:
SP-1

THE CONTRACTOR IS RESPONSIBLE FOR MANAGING GROUNDWATER LEVELS IN THE VICINITY OF EXCAVATIONS TO PROTECT ADJACENT PROPERTIES AND NEW WORK. GROUNDWATER SHALL BE DRAINED IN ACCORDANCE WITH LOCAL SEDIMENTATION & EROSION CONTROL GUIDELINES.



1 A-1 **COMPOUND PLAN**
SCALE : 1" = 10'-0"

10 0 5 10 20
(IN FEET) 1 inch = 10 ft.



2 A-1 **SOUTH ELEVATION**
SCALE : 1" = 10'-0"

10 0 5 10 20
(IN FEET) 1 inch = 10 ft.

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DEVELOPMENT & MANAGAMENT PLANS

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STATE OF CONNECTICUT
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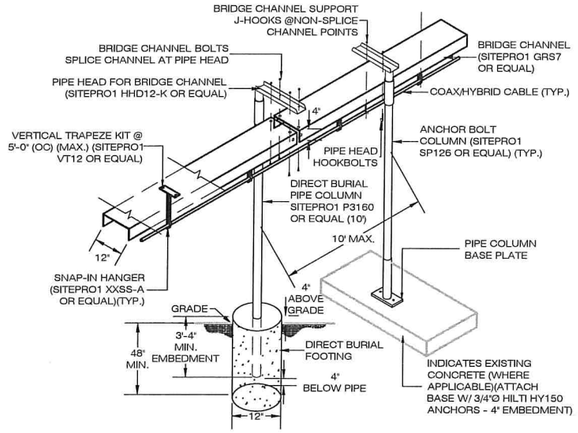
APT FILING NUMBER: CT524120

DRAWN BY: CSH
DATE: 10/08/19
CHECKED BY: RCB

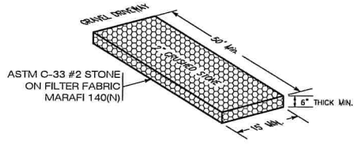
SHEET TITLE:
COMPOUND PLAN & TOWER ELEVATION

SHEET NUMBER:
A-1



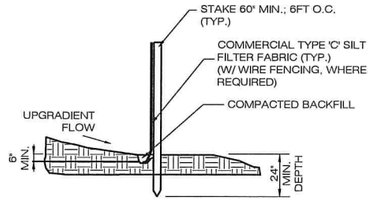
1 C-1 CABLE BRIDGE & COAX HANGER DETAIL

SCALE : N.T.S.



2 C-1 (CE) CONSTRUCTION ENTRANCE DETAIL

SCALE : N.T.S.



3 C-1 GEOTEXTILE SILT FENCE DETAIL

SCALE : N.T.S.

CONSTRUCTION SEQUENCING

CONTRACTOR TO FOLLOW THE FOLLOWING CONSTRUCTION PHASING AS CLOSELY AS POSSIBLE:

1. MOBILIZATION: BRING MATERIAL AND EQUIPMENT TO SITE. ALL CONSTRUCTION TRAFFIC AND ACTIVITIES MUST RESIDE INSIDE ACCESS PATH DELINEATED, WITHIN STAGING AND STOCKPILE AREA, OR WITHIN AREA WHERE PROPOSED WORK IS BEING COMPLETED. THE CONTRACTOR IS TO PROTECT WETLANDS FROM DISTURBANCE AT ALL TIMES AND NO CONSTRUCTION ACTIVITIES OR DUMPING SHALL OCCUR IN THE WETLANDS. HOURS OF CONSTRUCTION ARE 8 AM - 6 PM, MONDAY - SATURDAY.

2. THE CONTRACTOR SHALL HOST AND ATTEND AN ENVIRONMENTAL EDUCATION SESSION AT THE PRE-CONSTRUCTION MEETING (SEE NOTES ON DRAWING N-1).

3. INSTALL TEMPORARY EROSION AND SEDIMENTATION CONTROL AND ISOLATION BARRIERS.

4. INSTALL CONSTRUCTION ENTRANCE.

5. EXCAVATE FOR TOWER FOUNDATION.

6. INSTALL BURIED GROUND RINGS, GROUND RODS & GROUND LEADS.

7. BACKFILL TOWER FOUNDATION.

8. ERECT MONOPOLE.

9. INSTALL TELECOMMUNICATIONS EQUIPMENT ON TOWER & CONNECT TO EXIST. EQUIPMENT AREAS.

10. CONNECT GROUNDING LEADS AND LIGHTENING PROTECTION.

11. REMOVE TEMPORARY TOWER.

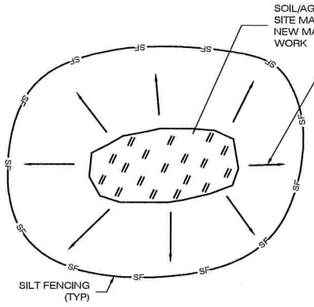
12. FINAL GRADE AROUND COMPOUND.

13. LOAM AND SEED DISTURBED AREAS OUTSIDE COMPOUND, AS REQUIRED.

14. REMOVE TEMPORARY EROSION & SEDIMENTATION CONTROL BARRIER AFTER SEEDED AREAS HAVE ESTABLISHED VEGETATION.

15. FINAL CLEANUP AND EQUIPMENT TESTING.

THE ESTIMATED TIME FOR COMPLETION OF THE WORK IS APPROXIMATELY FOUR (4) WEEKS. THE EXACT PROCESS MAY VARY DEPENDING ON THE CONTRACTOR'S AND SUBCONTRACTOR'S AVAILABILITY TO COMPLETE WORK AND WEATHER DELAYS.



NOTES:
1. ALL EXISTING EXCAVATED MATERIAL THAT IS NOT TO BE REUSED IN THE WORK IS TO BE IMMEDIATELY REMOVED FROM THE SITE AND PROPERLY DISPOSED OF.

2. SOIL/AGGREGATE STOCKPILE SITES TO BE WHERE SHOWN ON THE DRAWINGS.

3. RESTORE STOCKPILE SITES TO PRE-EXISTING PROJECT CONDITION AND RESEED AS REQUIRED.

4. STOCKPILE HEIGHTS MUST NOT EXCEED 35'. STOCKPILE SLOPES MUST BE 2:1 OR FLATTER.

4 C-1 TEMPORARY STOCKPILE DETAIL

SCALE : N.T.S.

Fiberglass Omnidirectional Antennas

BOA9025 antenna (left).
Bottom view (top right).
BWC1005 mount (bottom right)

PCTEL Heavy Duty Fiberglass Base Station Omnidirectional Antennas

The BOA omnidirectional base station antennas consist of a linear array, encapsulated in a heavy duty fiberglass radome with a thick walled 6061-T6 aluminum mounting base for reliable long term use. This rugged design allows the antennas to withstand harsh environments and is ideal for Industrial Wireless and SCADA applications. The BOA series is DC grounded and is UPS shippable.

Features
- UV Stable Light Gray Fiberglass Radome
- Hard-Coat Anodized Mounting Base
- Galvanized Mounting Hardware
- Removable Drain Plug for Upright or Inverted Mounting

PCTEL

Technical Data

Maximum Power: 250 watts
Nominal Impedance: 50 ohms
Radome Material: Pultruded fiberglass
ESD Protection: DC grounded
Rated Wind: 125 mph
Termination: N female bulkhead
Mounting Hardware: BWC1005 (included)

Antenna Electrical Specifications

Model	Frequency Range	Nominal Gain	Return Loss	SWR	E-Plane Beamwidth
BOA4357	430-470 MHz	7 dBi/5 dBd	12 dB	<1.7	20°
BOA9025	902-928MHz	5.1 dBi/3 dBd	> 14 dB	< 1.5	25°
BOA9028	902-928MHz	8.1 dBi/6 dBd	> 14 dB	< 1.5	13°
BOA90211	902-928MHz	11.1 dBi/9 dBd	> 14 dB	< 1.5	6°

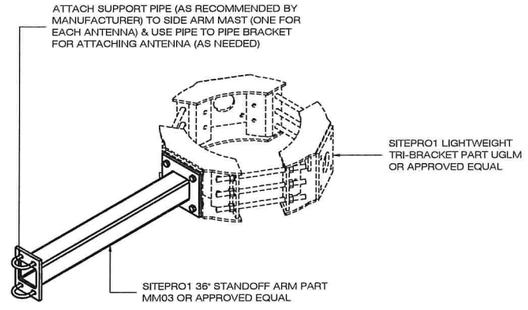
Mechanical Specifications

Model	Weight	Height	Bending Moment at Rated Wind	Lateral Thrust at Rated Wind	Equivalent Flat Plate Area
BOA4357	7.0 lbs	81"	250 ft-lbs	45 lbs	1.125 ft²
BOA9025	5.0 lbs	55"	106 ft-lbs	29 lbs	0.77 ft²
BOA9028	6.0 lbs	68"	178 ft-lbs	38 lbs	0.95 ft²
BOA90211	10.0 lbs	122"	685 ft-lbs	74 lbs	1.7 ft²

PCTEL, Inc. WEB: www.antenna.com

5 C-1 MUNICIPAL OMNI ANTENNA

SCALE : N.T.S.



NOTE:
CONTRACTOR TO COORDINATE WITH ANTENNA MANUFACTURERS FOR PROPER ANTENNA MOUNTING PROCEDURES.

6 C-1 3' SIDEARM ANTENNA MOUNT

SCALE : NTS

MCM HOLDINGS, LLC
P.O. BOX 320361
HARTFORD, CT 06132
OFFICE: (888) 973-7483

ALL-POINTS TECHNOLOGY CORPORATION
3 SADDLEBROOK DRIVE PHONE: (860)-663-1697
KILLINGWORTH, CT 06419 FAX: (860)-663-0935
WWW.ALLPOINTSTECH.COM

DEVELOPMENT & MANAGAMENT PLANS

NO	DATE	REVISION
0	10/08/19	FOR REVIEW: RCB
1	10/21/19	CLIENT COMMENTS: RCB
2		
3		
4		
5		
6		

STATE OF CONNECTICUT
ROBERT CHARLES BURNS
No. 20071
LICENSED
PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 3 SADDLEBROOK DRIVE KILLINGWORTH, CT 06419

OWNER: THE CONNECTICUT WATER COMPANY
ADDRESS: 93 WEST MAIN STREET CLINTON, CONNECTICUT 06413

MCM SITE
WESTBROOK H20 TANK

SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

DRAWN BY: CSH

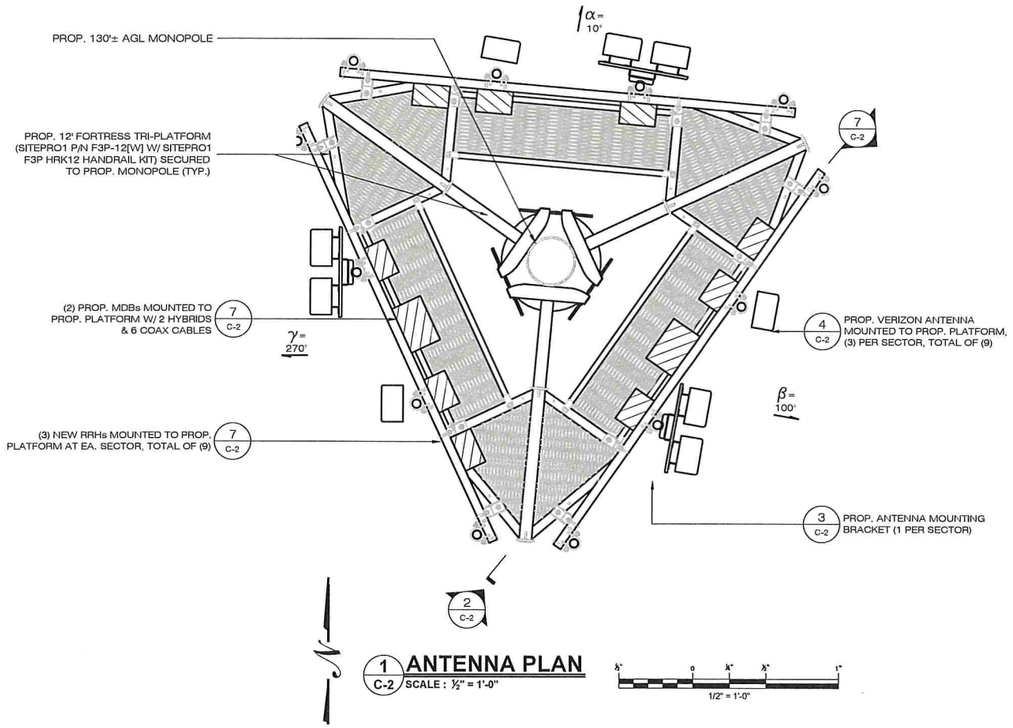
DATE: 10/08/19 CHECKED BY: RCB

SHEET TITLE:

SITE DETAILS

SHEET NUMBER:

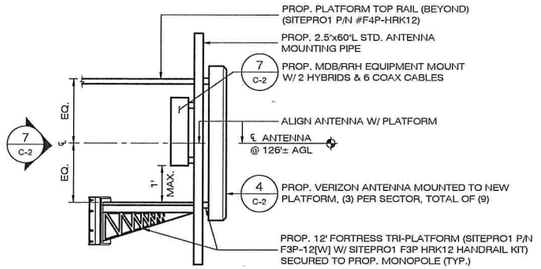
C-1



1 C-2 ANTENNA PLAN

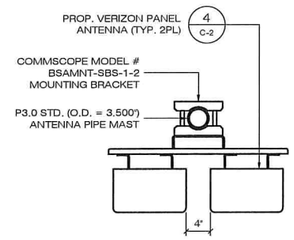
SCALE : ½" = 1'-0"

½" 0 ½" 1" 1½"
1/2" = 1'-0"



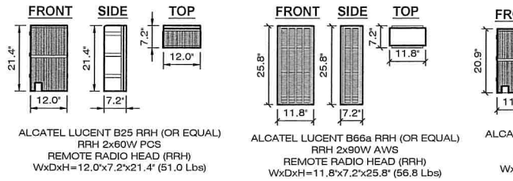
2 C-2 ANTENNA MOUNTING DETAIL

SCALE : N.T.S.



3 C-2 ANTENNA MOUNTING BRACKET DETAIL

SCALE : N.T.S.

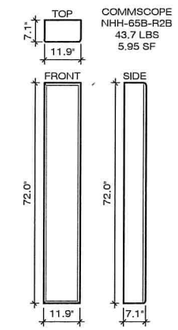


NOTES:
1. DIMENSIONS SUBJECT TO CHANGE BASED UPON AVAILABILITY AT TIME OF CONSTRUCTION.
2. MANUFACTURER'S RECOMMENDED RRH CLEARANCES: FRONT: 36"; SIDES: 12"; BOTTOM: 24".
3. SFPs ARE PROTOCOL SPECIFIC. THE CONNECTIONS BETWEEN RRHs AND BBUs ARE CPRI CONNECTIONS, AND REQUIRE CPRI SFP (ON BOTH ENDS). THE CONNECTIONS BETWEEN BBUs AND 7705 ARE ETHERNET AND REQUIRE ETHERNET SFP (ON BOTH ENDS.)

NOTE:
1) RRH=REMOTE RADIO HEAD
2) MDB=MAIN DISTRIBUTION BOX

6 C-2 RRH EQUIPMENT

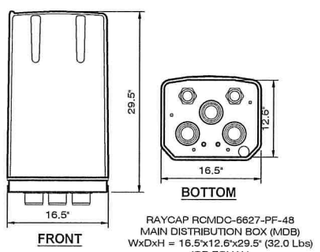
SCALE : ½" = 1'-0"



PANEL ANTENNAS

4 C-2 ANTENNA DETAIL

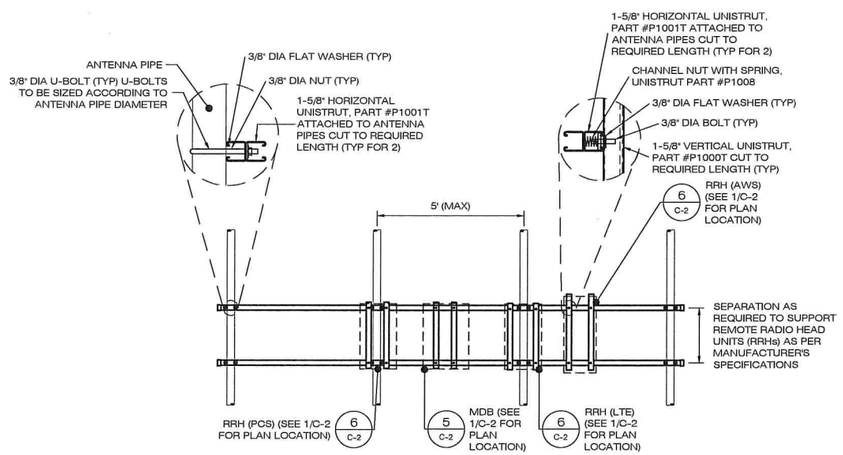
SCALE : ½" = 1'-0



RAYCAP RCMDC-6627-PF-48
MAIN DISTRIBUTION BOX (MDB)
WxDxH = 16.5"x12.6"x29.5" (32.0 Lbs)
(OR EQUAL)

5 C-2 MAIN DISTRIBUTION BOX

SCALE: 1" = 1'-0"



NOTES:
1. ALL EXPOSED UNISTRUT ENDS TO BE CAPPED WITH UNISTRUT CAP (MODEL #P2860-10)
2. ONLY 1-5/8" UNISTRUT TO BE USED FOR RACK CONSTRUCTION.
3. EXTEND UNISTRUT AS NEEDED BASED ON LENGTH OF ANTENNA SECTOR. DO NOT CANTILEVER UNISTRUT FOR MORE THAN 24" BEYOND ANTENNA MAST.

7 C-2 MDB/RRH EQUIPMENT ANTENNA MOUNT

SCALE : ½" = 1'-0"

MCM HOLDINGS, LLC
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KILLINGWORTH, CT 06419 FAX: (860)-663-0935
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DEVELOPMENT & MANAGAMENT PLANS

NO	DATE	REVISION
0	10/08/19	FOR REVIEW: RCB
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STATE OF CONNECTICUT
ROBERT CHARLES BURNS
NO. 20071
LICENSED
PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
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MCM SITE
WESTBROOK H20 TANK

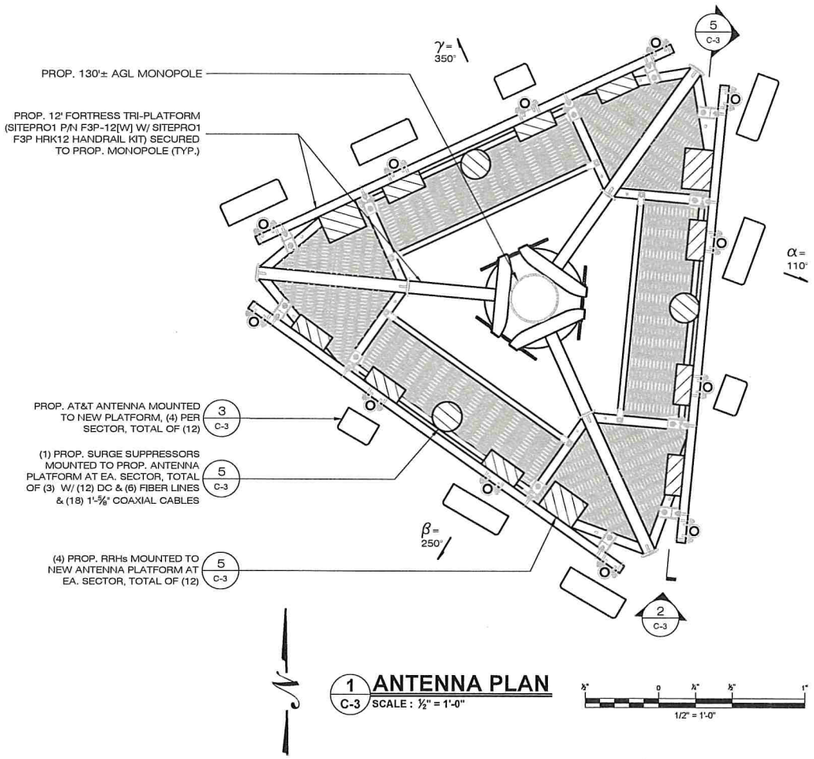
SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

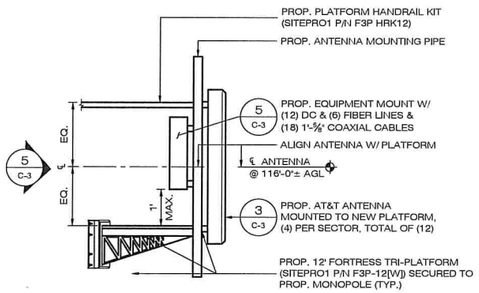
DRAWN BY: CSH
DATE: 10/08/19
CHECKED BY: RCB

SHEET TITLE:
VERIZON ANTENNA PLAN & DETAILS

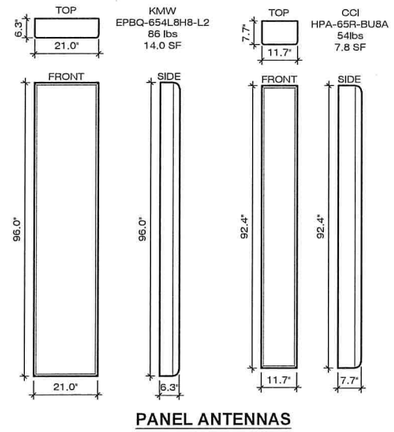
SHEET NUMBER:
C-2



1 ANTENNA PLAN
C-3 SCALE : ½" = 1'-0"



2 ANTENNA MOUNTING DETAIL
C-3 SCALE : ½" = 1'-0"



PANEL ANTENNAS

3 ANTENNA DETAIL
C-3 SCALE : ½" = 1'-0"

FRONT SIDE PLAN

13.2" × 15.0" × 5.4" × 13.2" × 5.4"

ERICSSON RADIO 4415
B30
WxDxH=13.2"x5.4"x15.0" (46.0 lbs)

FRONT SIDE PLAN

13.2" × 15.0" × 5.4" × 13.2" × 5.4"

ERICSSON RADIO 4415
B25
WxDxH=13.2"x5.4"x15.0" (46.0 lbs)

FRONT SIDE PLAN

13.2" × 17.9" × 9.4" × 13.2" × 9.4"

ERICSSON RADIO 4449
B5 & B12
WxDxH=13.2"x9.4"x17.9" (70.5 lbs)

FRONT SIDE PLAN

13.2" × 15.0" × 5.8" × 13.2" × 5.8"

ERICSSON RADIO 4426
B66
WxDxH=13.2"x5.8"x15.0" (48.4 lbs)

NOTES:
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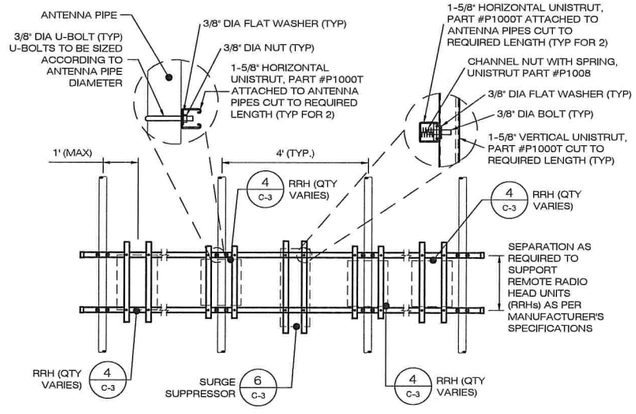
3. SFPs ARE PROTOCOL SPECIFIC. THE CONNECTIONS BETWEEN RRHs AND BBUs ARE CPRI CONNECTIONS, AND REQUIRE CPRI SFP (ON BOTH ENDS). THE CONNECTIONS BETWEEN BBUs AND 7705 ARE ETHERNET AND REQUIRE ETHERNET SFP (ON BOTH ENDS.)

4 RRH EQUIPMENT
C-3 SCALE : ½" = 1'-0"



NOTES:
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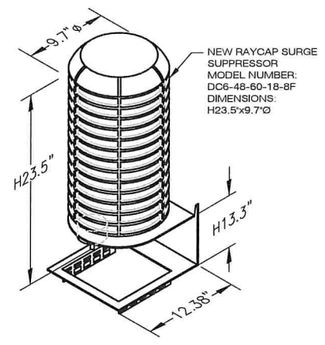
2. ONLY 1-5/8" UNISTRUT TO BE USED FOR RACK CONSTRUCTION.
3. EXTEND UNISTRUT AS NEEDED BASED ON LENGTH OF ANTENNA SECTOR. DO NOT CANTILEVER UNISTRUT FOR MORE THAN 24" BEYOND ANTENNA MAST.
4. FOR SPANS GREATER THAN 5'-0" USE UNISTRUT PART #P1001T.

5 EQUIPMENT ANTENNA MOUNT
C-3 SCALE : ½" = 1'-0"



RAYCAP DC6-48-60-18-8F
SURGE SUPPRESSOR)
HxDia. = 23.5"x9.7"Ø
(20.0 lbs W/O MOUNTING BRACKET)
(OR EQUAL)
COLOR: GRAY

NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

6 TYPICAL SURGE SUPPRESSOR
C-3 SCALE : N.T.S.

MCM HOLDINGS, LLC
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NO	DATE	REVISION
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STATE OF CONNECTICUT
ROBERT CHARLES BURNS
No. 20071
LICENSED PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
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MCM SITE
WESTBROOK H20 TANK

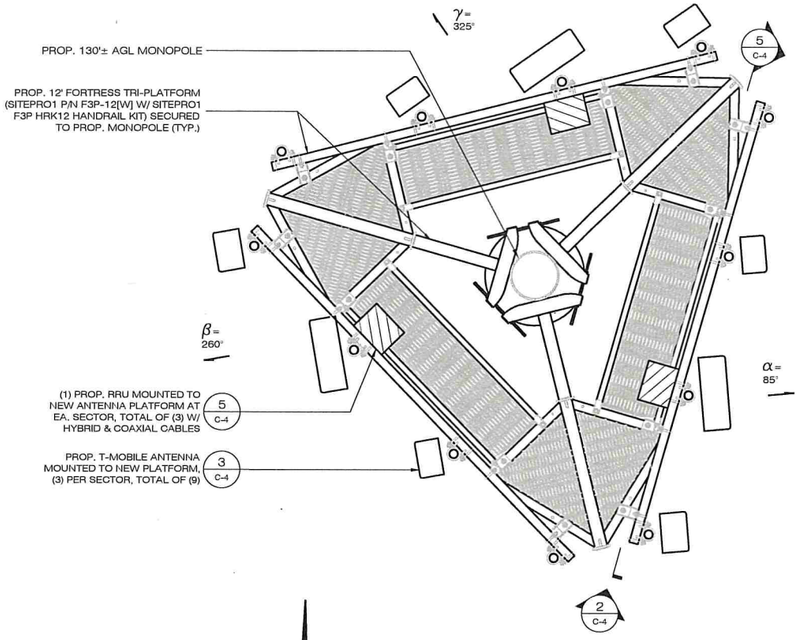
SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

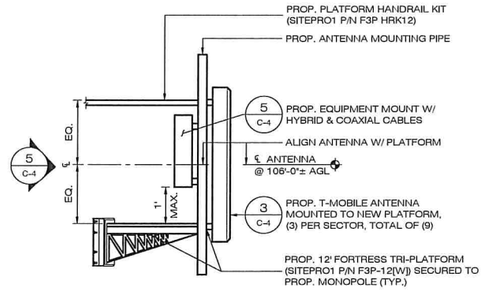
DRAWN BY: CSH
DATE: 10/08/19
CHECKED BY: RCB

SHEET TITLE:
AT&T ANTENNA PLAN & DETAILS

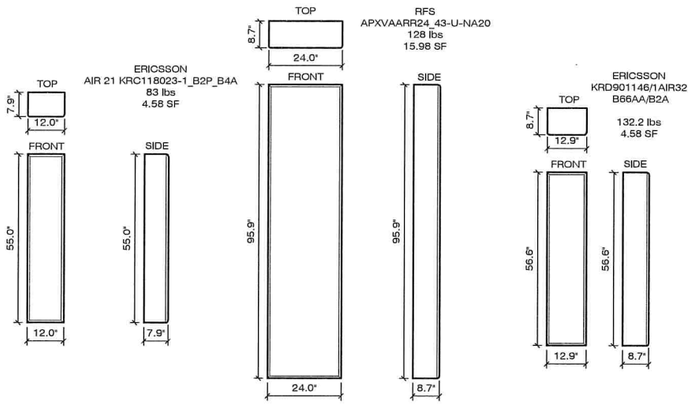
SHEET NUMBER:
C-3



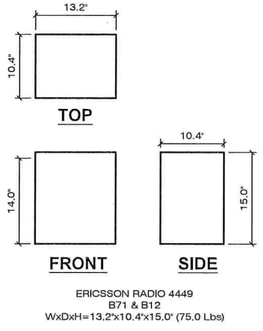
1 C-4 ANTENNA PLAN
SCALE : ½" = 1'-0"



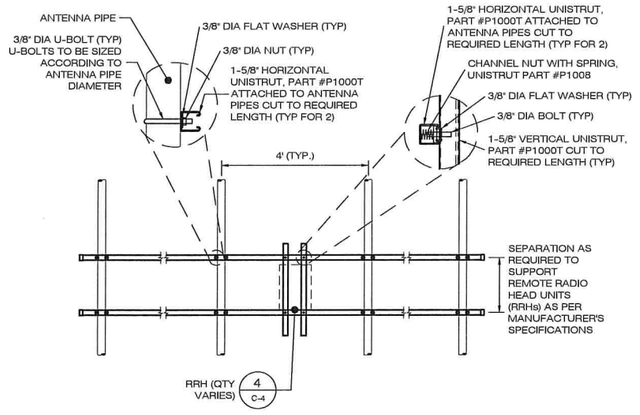
2 C-4 ANTENNA MOUNTING DETAIL
SCALE : ½" = 1'-0"



3 C-4 ANTENNA DETAIL
SCALE : ½" = 1'-0"



4 C-4 RRU EQUIPMENT
SCALE : 1" = 1'-0"



NOTES:
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2. ONLY 1-5/8" UNISTRUT TO BE USED FOR RACK CONSTRUCTION.
3. EXTEND UNISTRUT AS NEEDED BASED ON LENGTH OF ANTENNA SECTOR. DO NOT CANTILEVER UNISTRUT FOR MORE THAN 24" BEYOND ANTENNA MAST.
4. FOR SPANS GREATER THAN 5'-0" USE UNISTRUT PART #P1001T.

5 C-4 EQUIPMENT ANTENNA MOUNT
SCALE : ½" = 1'-0"

MCM HOLDINGS, LLC
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DESIGN PROFESSIONALS OF RECORD

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MCM SITE
WESTBROOK H20 TANK

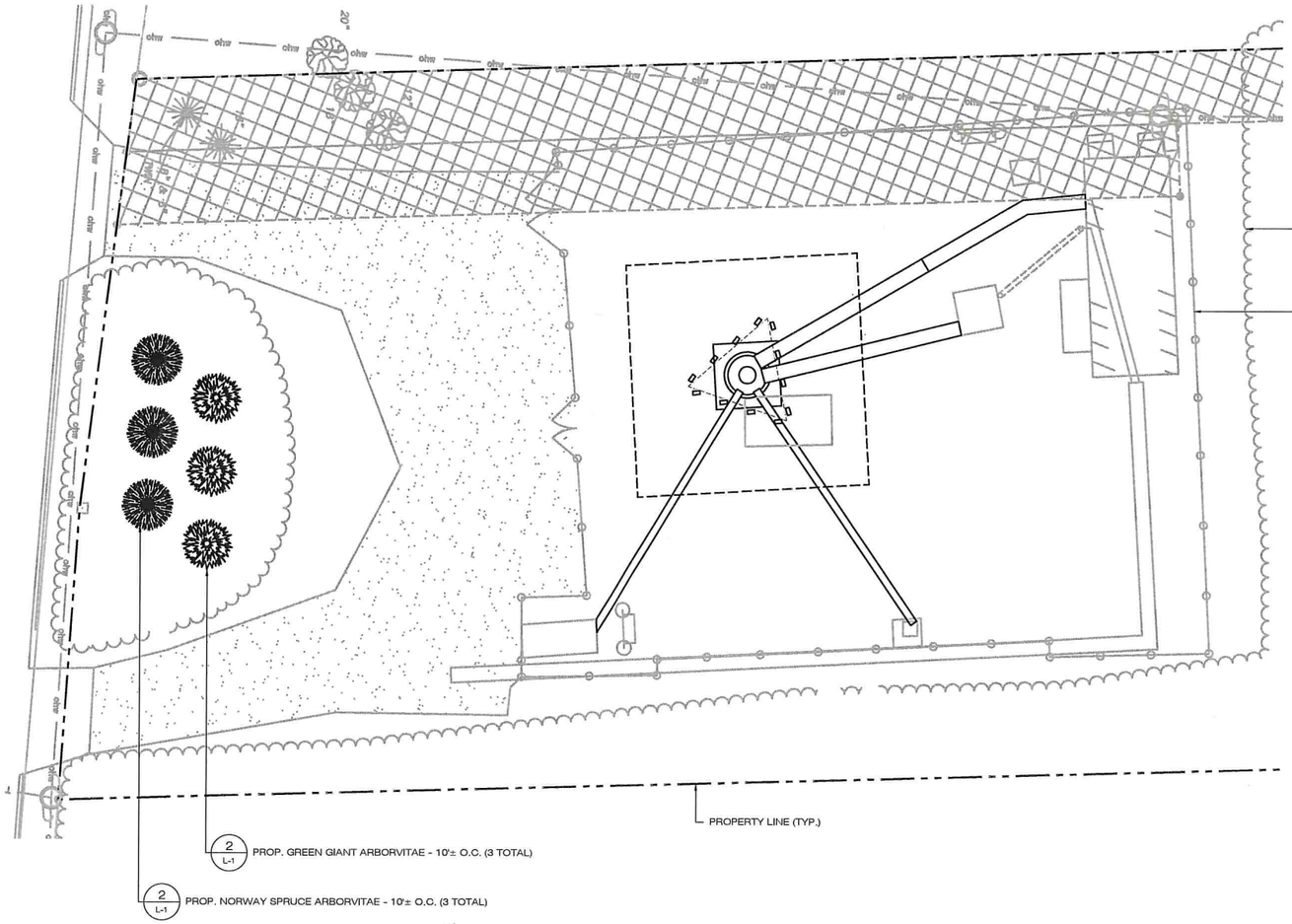
SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

DRAWN BY: CSH
DATE: 10/08/19
CHECKED BY: RCB

SHEET TITLE:
T-MOBILE ANTENNA PLAN & DETAILS

SHEET NUMBER:
C-4

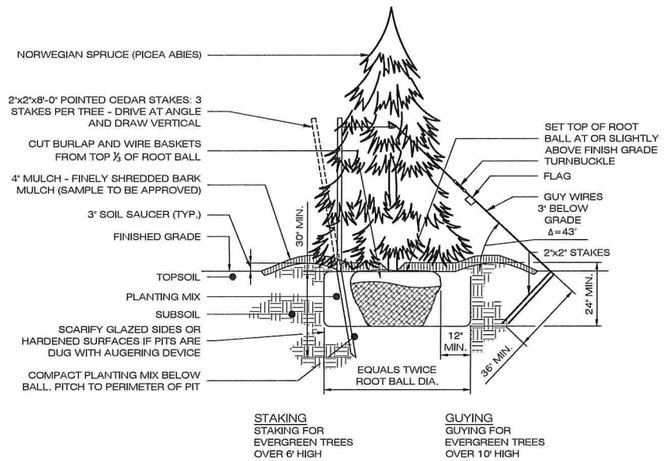


1 L-1 LANDSCAPING PLAN

SCALE : 1" = 10'-0"

10 0 5 10 20

(IN FEET) 1 inch = 10 ft.



2 L-1 EVERGREEN TREE PLANTING

SCALE : N.T.S.

MCM HOLDINGS, LLC
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ALL-POINTS TECHNOLOGY CORPORATION
3 SADDLEBROOK DRIVE PHONE: (860)-663-1697
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DEVELOPMENT & MANAGAMENT PLANS

NO	DATE	REVISION
0	10/08/19	FOR REVIEW: RCB
1	10/21/19	CLIENT COMMENTS: RCB
2		
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STATE OF CONNECTICUT
ROBERT CHARLES BURNS
No. 20071
LICENSED
PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 3 SADDLEBROOK DRIVE KILLINGWORTH, CT 06419

OWNER: THE CONNECTICUT WATER COMPANY
ADDRESS: 93 WEST MAIN STREET CLINTON, CONNECTICUT 06413

MCM SITE
WESTBROOK H20 TANK

SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

DRAWN BY: CSH
DATE: 10/08/19
CHECKED BY: RCB

SHEET TITLE:
LANDSCAPING PLAN

SHEET NUMBER:
L-1

ENVIRONMENTAL NOTES

WETLAND PROTECTION PROGRAM

PORTIONS OF THE PROPOSED MCM HOLDINGS, LLC ("MCM") WESTBROOK CT H2O TANK FACILITY'S COMPOUND ARE LOCATED IN CLOSE PROXIMITY (±10 FEET) TO A WETLAND AREA. AS A RESULT, THE FOLLOWING PROTECTIVE MEASURES SHALL BE FOLLOWED TO HELP AVOID DEGRADATION OF THE NEARBY WETLAND SYSTEM.

IT IS OF THE UTMOST IMPORTANCE THAT THE CONTRACTOR COMPLIES WITH THE REQUIREMENT FOR THE INSTALLATION OF WETLAND PROTECTIVE MEASURES AND THE EDUCATION OF ITS EMPLOYEES AND SUBCONTRACTORS PERFORMING WORK ON THE PROJECT SITE. THIS PROTECTION PROGRAM SHALL BE IMPLEMENTED REGARDLESS OF TIME OF YEAR THE CONSTRUCTION ACTIVITIES OCCUR. ALL-POINTS TECHNOLOGY CORPORATION, P.C. ("APT") WILL SERVE AS THE ENVIRONMENTAL MONITOR FOR THIS PROJECT TO ENSURE THAT WETLAND PROTECTION MEASURES ARE IMPLEMENTED PROPERLY. THE CONTRACTOR SHALL CONTACT DEAN GUSTAFSON, SENIOR ENVIRONMENTAL SCIENTIST AT APT, AT LEAST 5 BUSINESS DAYS PRIOR TO THE PRE-CONSTRUCTION MEETING. MR. GUSTAFSON CAN BE REACHED BY PHONE AT (860) 663-1697 EXT. 201 OR VIA EMAIL AT DGUSTAFSON@ALLPOINTSTECH.COM.

THE WETLAND PROTECTION PROGRAM CONSISTS OF SEVERAL COMPONENTS: USE OF APPROPRIATE EROSION CONTROL MEASURES TO CONTROL AND CONTAIN EROSION WHILE AVOIDING/MINIMIZING WILDLIFE ENTANGLEMENT; PERIODIC INSPECTION AND MAINTENANCE OF ISOLATION STRUCTURES AND EROSION CONTROL MEASURES; EDUCATION OF ALL CONTRACTORS AND SUB-CONTRACTORS PRIOR TO INITIATION OF WORK ON THE SITE; PROTECTIVE MEASURES; AND, REPORTING.

1. CONTRACTOR EDUCATION

   A. PRIOR TO WORK ON SITE, THE CONTRACTOR SHALL ATTEND AN EDUCATIONAL SESSION AT THE PRE-CONSTRUCTION MEETING WITH THE ENVIRONMENTAL MONITOR. THIS ORIENTATION AND EDUCATIONAL SESSION WILL CONSIST OF AN INTRODUCTORY MEETING WITH THE ENVIRONMENTAL MONITOR TO UNDERSTAND THE ENVIRONMENTALLY SENSITIVE NATURE OF THE DEVELOPMENT SITE AND THE NEED TO FOLLOW THESE WETLAND PROTECTION PLAN MEASURES.

   B. THE CONTRACTOR WILL BE PROVIDED WITH CELL PHONE AND EMAIL CONTACTS FOR THE ENVIRONMENTAL MONITOR TO IMMEDIATELY REPORT ANY RELEASES OF SEDIMENT INTO NEARBY WETLANDS.

2. EROSION AND SEDIMENTATION CONTROLS

   A. THE EXTENT OF THE BARRIER FENCING WILL BE AS SHOWN ON THE SITE PLANS. THE CONTRACTOR SHALL HAVE ADDITIONAL BARRIER FENCING SHOULD FIELD CONDITIONS WARRANT EXTENDING THE FENCING AS DIRECTED BY THE ENVIRONMENTAL MONITOR.

   B. PLASTIC NETTING USED IN A VARIETY OF EROSION CONTROL PRODUCTS (I.E., EROSION CONTROL BLANKETS, FIBER ROLLS (WATTLES), REINFORCED SILT FENCE) HAS BEEN FOUND TO ENTANGLE WILDLIFE, INCLUDING REPTILES, AMPHIBIANS, BIRDS AND SMALL MAMMALS. NO PERMANENT EROSION CONTROL PRODUCTS OR REINFORCED SILT FENCE WILL BE USED ON THE MCM PROJECT. TEMPORARY EROSION CONTROL PRODUCTS THAT WILL BE EXPOSED AT THE GROUND SURFACE REPRESENT A POTENTIAL FOR WILDLIFE ENTANGLEMENT WILL USE EITHER EROSION CONTROL BLANKETS AND FIBER ROLLS COMPOSED OF PROCESSED FIBERS MECHANICALLY BOUND TOGETHER TO FORM A CONTINUOUS MATRIX (NETLESS) OR NETTING WITH A MESH SIZE <¼" SUCH AS THAT TYPICALLY USED IN COMPOST FILTER SOCKS TO AVOID/MINIMIZE WILDLIFE ENTANGLEMENT.

   C. INSTALLATION OF CONVENTIONAL SILT FENCING SHALL BE PERFORMED BY THE CONTRACTOR PRIOR TO ANY EARTHWORK. THE ENVIRONMENTAL MONITOR WILL INSPECT THE WORK ZONE AREA FOLLOWING BARRIER INSTALLATION TO ENSURE EROSION CONTROLS ARE PROPERLY INSTALLED.

   D. THE FENCING WILL CONSIST OF NON-REINFORCED CONVENTIONAL EROSION CONTROL WOVEN FABRIC, INSTALLED APPROXIMATELY SIX INCHES BELOW SURFACE GRADE AND STAKED AT SEVEN TO TEN-FOOT INTERVALS USING FOUR-FOOT OAK STAKES OR APPROVED EQUIVALENT.

   E. IN ADDITION TO REQUIRED DAILY INSPECTION BY THE CONTRACTOR, THE FENCING WILL BE INSPECTED BY THE CONTRACTOR FOR TEARS OR BREECHES IN THE FABRIC FOLLOWING INSTALLATION AND FOLLOWING STORM EVENTS THAT PRODUCE A DISCHARGE. INSPECTIONS WILL BE CONDUCTED PERIODICALLY BY THE ENVIRONMENTAL MONITOR THROUGHOUT THE COURSE OF THE CONSTRUCTION PROJECT.

   F. ALL SILT FENCING AND OTHER EROSION CONTROL DEVICES SHALL BE REMOVED WITHIN 30 DAYS OF COMPLETION OF WORK AND PERMANENT STABILIZATION OF SITE SOILS SO THAT POSSIBLE REPTILE AND AMPHIBIAN MOVEMENT BETWEEN UPLANDS AND WETLANDS IS NOT RESTRICTED. IF FIBER ROLLS/WATTLES, STRAW BALES, OR OTHER NATURAL MATERIAL EROSION CONTROL PRODUCTS ARE USED, SUCH DEVICES WILL NOT BE LEFT IN PLACE TO BIODEGRADE AND SHALL BE PROMPTLY REMOVED AFTER SOILS ARE STABLE SO AS NOT TO CREATE A BARRIER TO MIGRATING WILDLIFE. SEED FROM SEEDING OF SOILS SHALL NOT BE SPREAD OVER FIBER ROLLS/WATTLES AS IT MAKES THEM HARDER TO REMOVE ONCE SOILS ARE STABILIZED BY VEGETATION.

3. PETROLEUM MATERIALS STORAGE AND SPILL PREVENTION

   A. CERTAIN PRECAUTIONS ARE NECESSARY TO STORE PETROLEUM MATERIALS, REFUEL AND CONTAIN AND PROPERLY CLEAN UP ANY INADVERTENT FUEL OR PETROLEUM (I.E., OIL, HYDRAULIC FLUID, ETC.) SPILL DUE TO THE PROJECT'S LOCATION IN PROXIMITY TO SENSITIVE WETLANDS.

   B. A SPILL CONTAINMENT KIT CONSISTING OF A SUFFICIENT SUPPLY OF ABSORBENT PADS AND ABSORBENT MATERIAL SHALL BE MAINTAINED BY THE CONTRACTOR AT THE CONSTRUCTION SITE THROUGHOUT THE DURATION OF THE PROJECT. IN ADDITION, A WASTE DRUM SHALL BE KEPT ON SITE BY THE CONTRACTOR TO CONTAIN ANY USED ABSORBENT PADS/MATERIAL FOR PROPER AND TIMELY DISPOSAL OFF SITE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL LAWS.

   C. THE FOLLOWING PETROLEUM AND HAZARDOUS MATERIALS STORAGE AND REFUELING RESTRICTIONS AND SPILL RESPONSE PROCEDURES WILL BE ADHERED TO BY THE CONTRACTOR.

   I. PETROLEUM AND HAZARDOUS MATERIALS STORAGE AND REFUELING

      a. REFUELING OF VEHICLES OR MACHINERY SHALL OCCUR A MINIMUM OF 100 FEET FROM WETLANDS OR WATERCOURSES AND SHALL TAKE PLACE ON AN IMPERVIOUS PAD WITH SECONDARY CONTAINMENT DESIGNED TO CONTAIN FUELS.

      b. ANY FUEL OR HAZARDOUS MATERIALS THAT MUST BE KEPT ON SITE SHALL BE STORED ON AN IMPERVIOUS SURFACE UTILIZING SECONDARY CONTAINMENT A MINIMUM OF 100 FEET FROM WETLANDS OR WATERCOURSES.

   II. INITIAL SPILL RESPONSE PROCEDURES

      a. STOP OPERATIONS AND SHUT OFF EQUIPMENT.

      b. REMOVE ANY SOURCES OF SPARK OR FLAME.

      c. CONTAIN THE SOURCE OF THE SPILL.

      d. DETERMINE THE APPROXIMATE VOLUME OF THE SPILL.

      e. IDENTIFY THE LOCATION OF NATURAL FLOW PATHS TO PREVENT THE RELEASE OF THE SPILL TO SENSITIVE NEARBY WATERWAYS OR WETLANDS.

      f. ENSURE THAT FELLOW WORKERS ARE NOTIFIED OF THE SPILL.

   III. SPILL CLEAN UP & CONTAINMENT

      a. OBTAIN SPILL RESPONSE MATERIALS FROM THE ON-SITE SPILL RESPONSE KIT. PLACE ABSORBENT MATERIALS DIRECTLY ON THE RELEASE AREA.

      b. LIMIT THE SPREAD OF THE SPILL BY PLACING ABSORBENT MATERIALS AROUND THE PERIMETER OF THE SPILL.

      c. ISOLATE AND ELIMINATE THE SPILL SOURCE.

      d. CONTACT THE APPROPRIATE LOCAL, STATE AND/OR FEDERAL AGENCIES, AS NECESSARY.

      e. CONTACT A DISPOSAL COMPANY TO PROPERLY DISPOSE OF CONTAMINATED MATERIALS IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS.

   IV. REPORTING

      a. CONTRACTOR SHALL COMPLETE AN INCIDENT REPORT.

      b. CONTRACTOR SHALL SUBMIT A COMPLETED INCIDENT REPORT TO APPROPRIATE LOCAL, STATE AND/OR FEDERAL AGENCIES, AS NECESSARY.

4. HERBICIDE AND PESTICIDE RESTRICTIONS

   A. THE USE OF HERBICIDES AND PESTICIDES AT THE PROPOSED WIRELESS TELECOMMUNICATIONS FACILITY SHALL BE AVOIDED WHEN POSSIBLE. IN THE EVENT HERBICIDES AND/OR PESTICIDES ARE REQUIRED AT THE PROPOSED FACILITY, THEIR USE WILL BE USED IN ACCORDANCE WITH INTEGRATED PEST MANAGEMENT ("IPM") PRINCIPLES WITH PARTICULAR ATTENTION TO MINIMIZE APPLICATIONS WITHIN 100 FEET OF WETLAND OR WATERCOURSE RESOURCES. NO APPLICATIONS OF HERBICIDES OR PESTICIDES ARE ALLOWED WITHIN ACTUAL WETLAND OR WATERCOURSE RESOURCES.

6. REPORTING

   A. INSPECTION REPORTS (BRIEF NARRATIVE AND APPLICABLE PHOTOS) WILL BE PREPARED BY THE ENVIRONMENTAL MONITOR DOCUMENTING EACH INSPECTION AND SUBMITTED TO MCM FOR COMPLIANCE VERIFICATION. ANY NON-COMPLIANCE OBSERVATIONS OF EROSION CONTROL MEASURES OR EVIDENCE OF EROSION OR SEDIMENT RELEASE WILL BE IMMEDIATELY REPORTED TO THE CONTRACTOR AND MCM'S CONSTRUCTION MANAGER AND INCLUDED IN THE REPORTS.

   B. ANY INCIDENTS OF SEDIMENT RELEASE INTO WETLAND RESOURCE AREAS SHALL BE REPORTED WITHIN 24 HOURS BY MCM TO THE TOWN OF WESTBROOK INLAND WETLAND AGENT.

   C. ANY OBSERVATIONS OF RARE SPECIES WILL BE REPORTED TO THE CONNECTICUT DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION NATURAL DIVERSITY DATA BASE.

   D. FOLLOWING COMPLETION OF THE PROJECT, A SUMMARY REPORT WILL BE PREPARED BY THE ENVIRONMENTAL MONITOR DOCUMENTING COMPLIANCE WITH THE WETLAND PROTECTION PLAN AND SUBMITTED TO MCM FOR SUBMISSION TO THE CONNECTICUT SITING COUNCIL

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STATE OF CONNECTICUT
ROBERT CHARLES BURNS
No. 20071
LICENSED
PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
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MCM SITE
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SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

DRAWN BY: CSH

DATE: 10/08/19

CHECKED BY: RCB

SHEET TITLE:
ENVIRONMENTAL NOTES

SHEET NUMBER:
N-1

DESIGN BASIS:

GOVERNING CODES/DESIGN STANDARDS:
- 2015 IBC/2018 CONNECTICUT STATE BUILDING CODE/ASCE 7-10
- TIA-222-G

DESIGN CRITERIA:

RISK CATEGORY/ : STRUCT. OCCUPANCY	II	(2015 IBC TABLE 1604.5)

SNOW LOAD:

GROUND, P_g:	30 PSF	(2018 CSBC APPENDIX N)
MINIMUM FLAT ROOF, P_{fmin} :	30 PSF	(2018 CSBC SECT. 1608.1.1)

WIND LOADS:

ULTIMATE BASIC WIND SPEED, V_{ULT}: (3-SECOND GUST)	125 MPH	(2018 CSBC APPENDIX N)
NOMINAL BASIC WIND SPEED, V_{ASD}: (3-SECOND GUST)	100-120 MPH	(TIA-222G, ANNEX B)
EXPOSURE CATEGORY	C	(2015 IBC SECT. 1609.4)
WIND IMPORTANCE FACTOR, I_w:	1.0	(TIA-222G, TABLE 2-3)

ICE LOADS:

ICE THICKNESS, t_i:	0.75	(TIA-222G, ANNEX B)
ICE THICKNESS IMPORTANCE FACTOR, I_i:	1.0	(TIA-222G, TABLE 2-3)
NOMINAL BASIC WIND SPEED W/ ICE, Vi (3-SECOND GUST)	50 MPH	(TIA-222G, ANNEX B)

SEISMIC LOAD:

REFER TO SECTION 1613 OF THE 2015 IBC/2018 CONNECTICUT STATE BUILDING CODE FOR SEISMIC CLASSIFICATION AND LOADING DETERMINATION.

01 GENERAL:

ABBREVIATIONS USED IN THESE SPECIFICATIONS INCLUDE THE FOLLOWING:

ACI	AMERICAN CONCRETE INSTITUTE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AWS	AMERICAN WELDING SOCIETY
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASTM	AMERICAN STANDARDS AND TESTING METHODS
CRSI	CONCRETE REINFORCING STEEL INSTITUTE
ICC-ES	INTERNATIONAL CODE COUNCIL EVALUATION SERVICE
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATION
UL	UNDERWRITERS LABORATORIES
NEC	NATIONAL ELECTRICAL CODE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

EVERY INDIVIDUAL TRADE, DISCIPLINE, AND CONTRACTOR SHALL INCLUDE THESE GENERAL SPECIFICATIONS.

THE ENGINEER IS NOT RESPONSIBLE FOR NOR A GUARANTOR OF THE INSTALLING CONTRACTORS WORK, ADEQUACY OF ANY SITE COMPONENT, SUPERVISION OF ANY WORK, AND SAFETY IN, ON, OR ABOUT THE WORK SITE.

ANY REFERENCE HEREIN TO AN OR EQUAL ITEM, THAT EQUAL ITEM SHALL BE PRE-APPROVED BY THE CONSTRUCTION MANAGER BEFORE INSTALLATION

ALL TRADES SHALL COORDINATE THEIR WORK WITH ALL OTHER TRADES AND OTHER WORK AND CONDITIONS AS APPROPRIATE OR REQUIRED TO AVOID CONFLICTS. RESOLVE AND COORDINATE ALL CONFLICTS WITH ALL AFFECTED WORK AND SITE OPERATIONS. COORDINATION WITH THE SITE SHALL BE WITH THE OWNER, OR OWNER'S SPECIFIED REPRESENTATIVE. FOR EVERYTHING RELATED TO THE INSTALLATION OF THIS PROJECT.

ALL WORK SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE EDITIONS OF ALL APPLICABLE CODES AND SHALL BE ACCEPTABLE TO ALL AUTHORITIES HAVING JURISDICTION (AHJ). WHERE A CONFLICT EXISTS BETWEEN CODES, PLANS, SPECIFICATIONS, AND/OR AHJ, THE MORE STRINGENT AUTHORITY SHALL APPLY. WHERE CONFLICT EXISTS BETWEEN PLANS AND SPECIFICATIONS, PLAN SHALL APPLY. WHERE CONFLICT EXISTS BETWEEN PLAN SHEETS, CONSTRUCTION MANAGER SHALL BE CONSULTED PRIOR TO COMMENCING ANY WORK.

CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR A COMPLETE AND PROPERLY OPERATIVE AND USABLE SYSTEM THROUGHOUT AND AS INDICATED ON THE DRAWINGS AND AS SPECIFIED HEREIN AND/OR OTHERWISE REQUIRED.

CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS, INSTALLATIONS, AND EQUIPMENT IN THE FIELD PRIOR TO BID, FABRICATION, AND INSTALLATION OF ANY WORK.

CONTRACTORS SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD PRIOR TO FABRICATION AND ERECTION OF ANY MATERIAL. THE ENGINEER SHALL BE NOTIFIED FOR INSPECTIONS PRIOR TO CLOSING PENETRATIONS AND OF ANY CONDITIONS WHICH PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

CONTRACTOR SHALL VISIT THE SITE TO MANAGE AND GAIN APPROVAL FOR ALL TENANT DISRUPTIONS, POWER OUTAGES, WORK SCHEDULES, DEFINITION OF WORK AREA AND WORK STORAGE, PROPER BUILDING/SITE ACCESS, NOISE AND CLEANLINESS REQUIREMENTS WITH THE BUILDING/SITE MANAGEMENT PRIOR TO ALL WORK. ANY DISRUPTIONS SHALL BE KEPT TO A MINIMUM AND SHALL BE IMPLEMENTED ONLY UPON WRITTEN APPROVAL OF THE OWNER.

THE CONTRACTOR SHALL SAFEGUARD AGAINST CREATING ANY HAZARD AFFECTING TENANT EGRESS OR COMPROMISING SITE SECURITY MEASURES.

PRIOR TO ALL BELOW-GRADE WORK AND ANY SURFACE WORK IN A NEW AREA FOR STRUCTURES OR VEHICLES, CONTRACTOR SHALL ENGAGE A MARKOUT SERVICE TO IDENTIFY ANY UNDERGROUND STRUCTURES, CONDUITS, AND PIPELINES IN THE AREA. ALL EXISTING SEWER, WATER, GAS, ELECTRIC, FIBER OPTIC, AND OTHER UNDERGROUND UTILITIES IDENTIFIED OR ENCOUNTERED, SHALL BE PROTECTED AT ALL TIMES. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN DIGGING OR EXCAVATING IN ANY MANNER AROUND OR NEAR SUCH UTILITIES. CONTRACTOR IS RESPONSIBLE FOR REPAIRS, REPLACEMENT, AND ALL DAMAGES DUE TO DAMAGE OF UTILITIES BY HIS OPERATIONS.

ALL EXISTING AND NEW EQUIPMENT AND MATERIAL LOCATIONS, ROUTING, ORIENTATION, MOUNTING, SPECIFICATIONS AND GENERAL INSTALLED CHARACTERISTICS SHALL BE CONSIDERED DIAGRAMMATIC ON THE PLANS. EXACT CONDITIONS SHALL BE DETERMINED IN THE FIELD PRIOR TO ANY INSTALLATION. ANY DIFFERENCES THAT MAY CAUSE SCHEDULE, COST, OR QUALITY SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER OR ENGINEER PRIOR TO ANY WORK.

ALL REFERENCES HEREIN TO VERIFICATION OF ANY CONDITION OF SITE, FIELD, PLANS, OR SPECIFICATIONS PRIOR TO ANY WORK SHALL BE THE FULL RESPONSIBILITY OF THE CONTRACTOR. ANY AND ALL ADDITIONS, MODIFICATIONS, CHANGES, REPAIR, OR DEMOLITION AS A RESULT OF FAILURE TO BRING ANY EXISTING CONDITION PROPERLY TO THE ATTENTION OF THE OWNER OR ENGINEER SHALL BE THE FULL RESPONSIBILITY OF THE CONTRACTOR WITHOUT DELAY, COST, OR CHANGES IN QUALITY.

ALL NOTES THIS SHEET SHALL APPLY UNLESS SPECIFICALLY NOTED OTHERWISE ON THE INCLUDED DRAWINGS OR IN SEPARATE PROJECT SPECIFICATIONS AS APPLICABLE. ALL SPECIFICATIONS SHALL BE CONSIDERED REQUIRED UNLESS APPROVED EQUAL BY THE OWNER, CONSTRUCTION MANAGER, OR ENGINEER AS APPLICABLE.

THE WORDS "PROVIDE" OR "INSTALL" SHALL MEAN FURNISH AND INSTALL.

CONTRACTOR SHALL PROVIDE ALL CUTTING AND PATCHING AS REQUIRED FOR THE INSTALLATION OF HIS WORK. ANY PATCHING SHALL MATCH EXISTING SURROUNDING AREA IN ALL RESPECTS. ALL REMOVED MATERIAL SHALL BE REMOVED FROM THE PREMISES DAILY IN AN APPROVED SAFE MANNER.

ALL SURPLUS MATERIAL SHALL BE REMOVED FROM THE SITE PROMPTLY WHEN DEEMED TO BE SURPLUS.

EVERY CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF HIS WORK AND NEWLY INSTALLED OR EXISTING WORK, INCLUDING PROTECTION OF THE SITE, ALL STRUCTURES, AND ALL OCCUPANTS. FURNISH, INSTALL, MAINTAIN, AND REMOVE AS APPROPRIATE, ALL APPROPRIATE BARRIERS, SAFETY GUARDS, SIGNAGE, AND SECURITY AS REQUIRED.

EVERY CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR RESPECTIVE FEES, PERMITS, INSPECTIONS, TESTING, CERTIFICATES, AND ALL MANAGEMENT OF SAME REQUIRED FOR COMPLETION OF AND LEGAL OCCUPANCY OF THE FINISHED PROJECT.

ALL CONTRACTORS SHALL PROVIDE ALL NECESSARY TOOLS, FIXTURES, SERVICES, MATERIALS, JOB AIDS, AND PERSONNEL REQUIRED FOR THE EXECUTION OF THEIR WORK.

EACH CONTRACTOR SHALL GUARANTEE ALL MATERIALS AND WORKMANSHIP BY THEM TO BE FREE OF DEFECTS AND MAINTAINED FOR A PERIOD OF ONE YEAR AFTER ACCEPTANCE OF THE INSTALLATION BY THE OWNER AND ENGINEER.

ALL WORK SHALL BE PERFORMED BY LICENSED CONTRACTORS IN THE TRADE HAVING JURISDICTION.

ANY DEVIATION, MODIFICATION, ADDITION, OR CHANGE IN DESIGN SHALL NOT BE MADE WITHOUT WRITTEN APPROVAL OF THE OWNER OR ENGINEER.

ALL CONTRACTORS SHALL SUBMIT SHOP DRAWINGS OF ALL EQUIPMENT AND MATERIALS TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION AND INSTALLATION, AND SHALL NOT PROCEED UNTIL ENGINEER APPROVAL IN WRITING IS RETURNED. EACH CONTRACTOR SHALL MAINTAIN ON JOB SITE A COMPLETE SET OF SHOP DRAWINGS WITH ANY DEVIATIONS FROM THE ORIGINAL DESIGN SHALL BE NOTED.

ALL MATERIALS AND EQUIPMENT SHALL BE NEW, WITHOUT BLEMISH OR DEFECT, AND SUITABLE AND LISTED FOR THE INSTALLATION AND SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS OR SPECIFICATIONS. ALL ITEMS OF EQUIPMENT OR MATERIAL THAT ARE OF ONE GENERIC TYPE SHALL BE ONE MANUFACTURER THROUGHOUT.

ALL MATERIALS, EQUIPMENT, TOOLS, AND ITEMS UNDER THE CONTRACTOR'S RESPONSIBILITY ON THE JOBSITE SHALL BE ADEQUATELY SECURED, MAINTAINED, AND PROTECTED, SO AS NOT TO BECOME DAMAGED OR CREATE ANY HAZARD TO PERSONNEL OR PROPERTY.

THE CONTRACTORS HOURS OF WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES AND ORDINANCES AND BE APPROVED BY THE OWNER.

CONTRACTOR SHALL PROVIDE SAFETY TRAINING FOR ALL OF HIS CREW AND INSURE THAT EVERY CREW MEMBER FOLLOWS SAVE WORK PRACTICES. SAFETY TRAINING SHALL INCLUDE, BUT NOT BE LIMITED TO, FALL PROTECTION, CONFINED SPACE ENTRY, ELECTRICAL SAFETY, AND TRENCHING/EXCAVATION SAFETY WHERE SUCH WORK IS EXECUTED OR ENCOUNTERED.

ALL TEMPORARY WORK REQUIRED OR SPECIFIED AS A PART OF THIS WORK, SHALL MEET ALL OF THE SAME REQUIREMENTS AS PERMANENT INSTALLATIONS, SHALL MEET ALL APPLICABLE CODE REQUIREMENTS, AND SHALL BE COMPLETELY REMOVED AFTER ITS PURPOSES HAVE BEEN SERVED.

ANY EXISTING UTILITY, SERVICE, STRUCTURE, EQUIPMENT, OR FIXTURE OBSTRUCTING THE WORK SHALL BE REMOVED AND/OR RELOCATED AS DIRECTED BY THE CONSTRUCTION MANAGER.

IF ASBESTOS IS ENCOUNTERED DURING WORK EXECUTION, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER AND CEASE ALL ACTIVITIES IN AFFECTED AREAS UNTIL NOTIFIED BY THE CONSTRUCTION TO RESUME OPERATIONS.

EXIST. ELECTRICAL AND MECHANICAL FIXTURES, PIPING, WIRING AND EQUIPMENT OBSTRUCTING THE WORK SHALL BE REMOVED AND/OR RELOCATED AS DIRECTED BY THE CONSTRUCTION MANAGER. TEMPORARY SERVICE INTERRUPTIONS MUST BE COORDINATED WITH OWNER.

04 CONCRETE:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

ALL CONCRETE CONSTRUCTION SHALL BE DONE IN ACCORDANCE WITH THE AMERICAN CONCRETE INSTITUTE (ACI) CODES 301 & 318, LATEST REVISION.

ALL CONCRETE USED SHALL BE 4000 PSI (28 DAY COMP STRENGTH). THE CONCRETE MIX SHALL BE BASED ON USING THE FOLLOWING MATERIALS AND PARAMETERS:

PORTLAND CEMENT:	ASTM C150, T1
AGGREGATE:	ASTM C33, 1 INCH MAX
WATER:	POTABLE
ADMIXTURE:	NON-CHLORIDE
AIR:	6%*
SLUMP:	4 INCH

*ALL CONCRETE EXPOSED TO FREEZING WEATHER SHALL CONTAIN ENTRAINED AIR PER ACI 211 TABLE 4.2.1 OF ACI 318-05.

ALL REINFORCING STEEL SHALL BE ASTM A615, GR 60 (DEFORMED). WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185 WELDED STEEL WIRE FABRIC. SPLICES SHALL BE CLASS 'B' AND ALL HOOKS SHALL BE ACI STANDARD UNO. REINFORCING BARS SHALL BE COLD BENT WHERE REQUIRED AND TIED (NOT WELDED).

THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCING STEEL:
- CONCRETE CAST AGAINST EARTH = 3 IN.
- CONCRETE EXPOSED TO EARTH OR WEATHER:
  - #6 AND LARGER = 2 IN.
  - #5 AND SMALLER = 1 1/2 IN.
- CONCRETE NOT EXPOSED TO EARTH OR WEATHER OR NOT CAST AGAINST THE GROUND:
  - SLAB AND WALL = 3/4 IN.
  - BEAMS AND COLUMNS = 1 1/2 IN.

A 3/4 IN. CHAMFER SHALL BE PROVIDED AT ALL EXPOSED EDGES OF CONCRETE, IN ACCORDANCE WITH ACI 301 SECTION 4.2.4.

CONCRETE SHALL BE PLACED IN A UNIFORM MANNER AND CONSOLIDATED IN PLACE.

CONCRETE FOOTINGS SHALL BE CAST AGAINST LEVEL, COMPACTED, NON-FROZEN BASE SOIL FREE OF STANDING WATER.

05 ANCHORS:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

EXPANSION ANCHORS SHALL BE USED WHERE ATTACHING TO CONCRETE. MASONRY MOUNTS SHALL HAVE INJECTION ADHESIVE ANCHORING.

EXPANSION BOLTS SHALL BE HILTI KWIK BOLT 3 OR EQUAL. MINIMUM EMBEDMENT 4 INCHES.

INJECTION ADHESIVE ANCHORING IN MASONRY WITH VOIDS SHALL BE HILTI HIT HY-70 OR EQUAL WITH THREADED ROD AND SCREEN TUBES. ANCHORING IN BRICKS WITH HOLES SHALL HAVE ANCHORS SPACED 2 COMPLETE BRICKS APART MINIMUM, SHALL MAINTAIN 2 COMPLETE BRICKS OR 16 INCHES FROM FREE EDGES (WHICHEVER IS LESS), AND SHALL BE EMBEDDED 3-1/2 INCHES MINIMUM. ANCHORING IN HOLLOW CONCRETE BLOCK SHALL USE 50% MORE ANCHORS THAN SHOWN IN DETAIL, SHALL LIMIT ONE ANCHOR MAXIMUM PER BLOCK CELL, SHALL MAINTAIN 12" SPACING FROM FREE EDGES, AND SHALL BE EMBEDDED THROUGH FACE.

INJECTION ADHESIVE ANCHORING IN SOLID MASONRY AND GROUT FILLED BLOCK SHALL BE HILTI HIT HY-200 OR EQUAL WITH THREADED ROD. MAINTAIN 12 INCHES BETWEEN ANCHORS AND ALL FREE EDGES. MINIMUM SPACING BETWEEN ANCHORS IS 8 INCHES.

ANCHORS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS AND SHALL NOT BE INSTALLED IN MORTAR JOINTS.

GRATING SHALL BE ATTACHED USING FOUR GRATING CLAMPS OR 1/4 FILLET WELDS PER SECTION.

05 POST-INSTALLED ANCHORS:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

EXCEPT WHERE INDICATED ON THE DRAWINGS, POST-INSTALLED ANCHORS SHALL CONSIST OF THE FOLLOWING ANCHOR TYPES AND INSTALLED IN ACCORDANCE WITH THEIR RESPECTIVE ICC-ES REPORT AND MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS:

APPLICATION	ANCHORING SYSTEM
CONCRETE	HILTI HY 200 ADHESIVE WITH SAFE SET (HDB) SYSTEM
REBAR DOWELING	HILTI RE 500v3 ADHESIVE WITH SAFE SET (HDB) SYSTEM
SOLID GROUTED MASONRY	HILTI HY 70 ADHESIVE WITH SCREEN TUBE
HOLLOW / MULTI-WIDTH MASONRY	HILTI HY 70 ADHESIVE WITH HILTI HY 70 ADHESIVE WITH SCREEN TUBE

ANCHOR CAPACITY USED IN DESIGN SHALL BE BASED ON THE TECHNICAL DATA PUBLISHED BY HILTI OR SUCH OTHER METHOD AS APPROVED BY THE STRUCTURAL ENGINEER OF RECORD. SUBSTITUTION REQUESTS FOR ALTERNATE PRODUCTS MUST BE APPROVED IN WRITING BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO USE. CONTRACTOR SHALL PROVIDE CALCULATIONS DEMONSTRATING THAT THE SUBSTITUTED PRODUCT IS CAPABLE OF ACHIEVING THE PERFORMANCE VALUES OF THE SPECIFIED PRODUCT INCLUDING AN ICC-ES REPORT SHOWING COMPLIANCE WITH THE RELEVANT BUILDING CODE, SEISMIC USE, LOAD RESISTANCE, INSTALLATION CATEGORY, IN-SERVICE TEMPERATURE, INSTALLATION TEMPERATURE, ETC.

ADHESIVE ANCHORS INSTALLED IN A HORIZONTALLY OR UPWARDLY INCLINED ORIENTATION INTO CONCRETE AND SUPPORTING A SUSTAINED TENSION LOAD SHALL BE INSTALLED BY A CERTIFIED ADHESIVE ANCHOR INSTALLER, PER SECTION 9.2.2 OF ACI-318-14. INSTALLER SHALL BE CERTIFIED THROUGH THE ACI/CRSI ADHESIVE ANCHOR INSTALLER CERTIFICATION PROGRAM.

ANCHORS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS AND SHALL NOT TO BE INSTALLED IN MORTAR JOINTS.

AS PER OSHA 29 CFR 1926.1153 SILICA DUST CONTROL REGULATIONS, DRILLED HOLES FOR POST INSTALLED ANCHORS IN CONCRETE AND MASONRY SHALL BE INSTALLED USING HILTI SAFE SET INSTALLATION SYSTEM WHICH COMPRISES OF A CODE APPROVED HILTI HOLLOW DRILL BIT AND VACUUM. ALTERNATE INSTALLATION METHODS ARE ALSO ALLOWED WITH AN APPROVED DUSTLESS SYSTEM THAT MAINTAINS SILICA DUST EMISSION BELOW THE PERMISSIBLE LEVELS.

CONTRACTOR SHALL ARRANGE AN ANCHOR MANUFACTURER'S REPRESENTATIVE TO PROVIDE ON-SITE ANCHOR INSTALLATION TRAINING FOR ALL OF THEIR ANCHORING PRODUCTS SPECIFIED. CONTRACTOR SHALL SUBMIT DOCUMENTED CONFIRMATION THAT ALL OF THE CONTRACTOR'S PERSONNEL INSTALLING ANCHORS HAVE RECEIVED THE REQUIRED TRAINING PRIOR TO THE COMMENCEMENT OF WORK.

CONTINUOUS OR PERIODIC SPECIAL INSPECTION FOR POST INSTALLED ANCHORS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 4.3/4.4 OF THE ICC-ES REPORT FOR THE INDIVIDUAL ANCHOR. SPECIAL INSPECTOR SHALL BE NOTIFIED PRIOR TO COMMENCEMENT OF WORK TO COORDINATE INSPECTION EFFORTS.

05 STEEL:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

MATERIALS:

WIDE FLANGE	ASTM A992, GR 50
TUBING	ASTM A500, GR B
PIPE	ASTM A53, GR B
BOLTS	ASTM A325
GRATING	TYPE GW-2 (1-1/4"x3/16" BARS)
EXISTING METALS	ASTM A36

PROVIDE CERTIFICATION THAT WELDERS TO BE USED IN WORK ARE LICENSED AND HAVE SATISFACTORILY PASSED AWS QUALIFICATION TEST UNDER THE PROVISIONS OF APPENDIX D, PARTS II AND III OF THE AWS CODE FOR WELDING IN BUILDING CONSTRUCTION.

ALL BUILDING CONNECTION POINTS TO BE CENTERED ON EXISTING STRUCTURAL BEARING POINTS AND THE LOCATIONS ARE TO BE VERIFIED IN FIELD PRIOR TO THE FABRICATION OF STEEL.

DESIGN AND CONSTRUCTION OF STRUCTURAL STEEL SHALL CONFORM TO THE LATEST EDITION OF AISC SPECIFICATION FOR *'THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS'*.

NON-STRUCTURAL CONNECTIONS FOR STEEL GRATING MAY USE 5/8" DIAMETER GALVANIZED ASTM A 307 BOLTS UNLESS OTHERWISE NOTED.

ALL STEEL MATERIAL SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 'ZINC (HOT-DIPPED GALVANIZED) COATINGS' ON IRON AND STEEL PRODUCTS WITH A COATING WEIGHT OF 2 OZ/SF.

ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE EXPOSED TO WEATHER SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 'ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE.'

DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED BY TOUCHING UP ALL DAMAGED GALVANIZED STEEL WITH COLD ZINC, 'GALVANOX', 'DRY GALV', OR 'ZINC IT', IN ACCORDANCE WITH MANUFACTURERS GUIDELINES. TOUCH UP DAMAGED NON-GALVANIZED STEEL WITH SAME PAINT APPLIED IN SHOP OR FIELD.

THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NONCONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW. FIELD CUTTING OF STRUCTURAL STEEL IS NOT PERMITTED EXCEPT WITH THE PRIOR APPROVAL OF THE ENGINEER.

CONTRACTOR TO REMOVE AND RE-INSTALL ALL FIRE PROOFING AS REQUIRED DURING CONSTRUCTION.

THE STEEL STRUCTURE SHALL BE DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER COMPLETION. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE BUILDING AND ITS COMPONENT PARTS DURING ERECTION.

ALL STEEL ELEMENTS SHALL BE INSTALLED PLUMB AND LEVEL.

TOWER MANUFACTURER'S DESIGNS SHALL PREVAIL FOR TOWER.

CONNECTIONS SHALL BE DESIGNED BY THE FABRICATOR AND CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF THE AISC *'MANUAL OF STEEL CONSTRUCTION'*. CONNECTIONS SHALL BE PROVIDED TO CONFORM TO THE REQUIREMENTS OF TYPE 2 CONSTRUCTION.

STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE MINIMUM 3/4" DIAMETER AND EACH CONNECTION SHALL HAVE MINIMUM TWO BOLTS. LOCK WASHERS ARE NOT PERMITTED FOR A325 STEEL ASSEMBLIES. IF TENSION CONTROL BOLTS ARE USED, CONNECTIONS SHALL BE DESIGNED FOR SLIP CRITICAL BOLT ALLOWABLE LOAD VALUES.

DESIGN CONNECTIONS AT BEAM ENDS FOR 10 KIPS (MIN).

ALL U-BOLTED CONNECTIONS SHALL BE COMPLETED WITH DOUBLE NUTS OR A LOCK WASHER.

CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES, APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS *'STANDARD QUALIFICATION PROCEDURES'*. ALL WELDING SHALL BE PERFORMED USING E70XX ELECTRODES AND SHALL CONFORM TO AISC AND D1.1. WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE LARGER OF 1/4" FILLET OR MINIMUM SIZE PER TABLE J2.4 IN THE AISC *'MANUAL OF STEEL CONSTRUCTION'*. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED. SEE NOTE REGARDING DAMAGED GALVANIZED SURFACES.

ALL ARC AND GAS WELDING SHALL BE DONE BY A LICENSED AND CERTIFIED WELDER IN ACCORDANCE WITH AWS.

SEAL ALL PENETRATIONS AND SEAMS BETWEEN MASONRY AND STEEL WITH DOW CORNING 790 SILICONE BUILDING SEALANT OR EQUAL.

07 THERMAL & MOISTURE PROTECTION:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

FIRE-STOP ALL PENETRATIONS THROUGH BUILDING WALLS, FLOORS, AND CEILINGS, WITH LISTED AND ACCEPTED MATERIALS TO MAINTAIN THE FIRE RATING OF THE EXISTING ASSEMBLY. ALL FILL MATERIAL SHALL BE SHAPED, FITTED, AND PERMANENTLY SECURED IN PLACE. FIRESTOPPING SHALL BE INSTALLED IN ACCORD WITH ASTM E814.

HILTI CP620 FIRE FOAM OR 3M FIRE BARRIER PRODUCTS, OR EQUAL, SHALL BE USED TO FILL ALL VOIDS AND CAVITIES AND SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND ASSOCIATED UL SYSTEM NUMBER.

FIRESTOPPING SHALL BE APPLIED AS SOON AS PRACTICABLE AFTER PENETRATIONS ARE MADE AND EQUIPMENT INSTALLED.

FIRESTOPPED PENETRATIONS SHALL BE LEFT EXPOSED AND MADE AVAILABLE FOR INSPECTION BEFORE APPLYING FINISHES THAT MAY CONCEAL SUCH PENETRATION. FIRESTOPPING MATERIAL CERTIFICATES SHALL BE MADE AVAILABLE AT THE TIME OF INSPECTION.

ANY BUILDING ROOF PENETRATION OR RESTORATION SHALL BE PERFORMED SO THAT ROOF WARRANTY IN PLACE IS NOT COMPROMISED. CONTRACTOR SHALL ARRANGE FOR OWNER'S ROOFING CONTRACTOR TO PERFORM ANY AND ALL ROOFING WORK IF SO REQUIRED BY EXISTING ROOF WARRANTY. OTHERWISE, ROOF SHALL BE MADE WATERTIGHT WITH LIKE CONSTRUCTION AS SOON AS PRACTICABLE AND AT COMPLETION OF CONSTRUCTION.

ALL PENETRATIONS INTO OR THROUGH BUILDING, SHELTER, EQUIPMENT, CABINET, AND SIMILAR ENCLOSURE EXTERIOR WALLS, SHALL BE SEALED WITH SILICONE SEALER.

26 ELECTRICAL:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

ALL ELECTRICAL CONDUCTORS:
- INSULATION SHALL BE MINIMUM 600V TYPE THHN, THWN-2, OR XHHW.
- BRANCH CIRCUIT CONDUCTORS SHALL BE SOFT DRAWN 98% MINIMUM CONDUCTIVITY PROPERLY REFINED COPPER.
- FEEDER CIRCUIT CONDUCTORS SHALL BE EITHER COPPER OR ALUMINUM OF THE APPROPRIATE SIZE FOR THE APPLICATION, OR AS SPECIFICALLY NOTED.
- PERMANENTLY LABEL OR TAG ALL CONDUCTORS WITH THEIR CIRCUIT DESIGNATION AT ALL TERMINATION ENDS, SPLICES, AND VISIBLE AS PASS-THROUGH IN ALL ENCLOSURES.

ALL CONDUIT, RACEWAY, WIREWAYS, DUCTS, ETC. SHALL BE LISTED AND SUITABLE FOR THE APPLICATION. ONLY THE FOLLOWING CONDUITS AS APPROVED AND LISTED FOR THE APPLICATION SHALL BE ACCEPTABLE:
- ELECTRICAL METALLIC TUBING (EMT).
- COMPRESSION COUPLINGS AND CONNECTORS ONLY MADE UP WRENCH TIGHT.
- FLEXIBLE METAL CONDUIT (FMC) AND LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC).
- FINAL CONNECTIONS TO VIBRATING OR ADJUSTABLE EQUIPMENT INCLUDING, BUT NOT LIMITED TO, LIGHT FIXTURES, HVAC UNITS, TRANSFORMERS, MOTORS, ETC. OR WHERE EQUIPMENT IS PLACED UPON SLAB ON-GRADE.
- RIGID GALVANIZED STEEL (RGS).
- ALL FITTINGS, CONNECTORS, AND COUPLINGS SHALL BE THREADED MADE UP WRENCH TIGHT.
- RIGID POLYVINYL CHLORIDE (PVC) SCHEDULE 40 OR SCHEDULE 80.
- MAY BE USED FOR SERVICES, EXTERIOR, BELOW GRADE, AND WET LOCATIONS.
- SHALL NOT BE USED IN CONCRETE SLABS NOR EXPOSED WITHIN A BUILDING OR STRUCTURE.
- METAL-CLAD CABLE (MC)
- CONCEALED INSTALLATIONS ONLY.
- WITHIN A DUCT WITH SMOOTH OR CORRUGATED METAL JACKET AND NO OUTER COVERING OVER THE METAL JACKET.

IN FINISHED SPACES, ALL CONDUITS SHALL BE CONCEALED EXCEPT TO MAKE A FINAL CONNECTION TO EQUIPMENT NOT MOUNTED IN OR AGAINST FINISH MATERIAL.

ALL FEEDER AND BRANCH CIRCUITS SHALL HAVE A SEPARATE PROPERLY SIZED AND MARKED GROUNDING CONDUCTOR, PER APPLICABLE CODES, THAT BONDS ALL ENCLOSURES, BOXES, ETC. CONDUIT SHALL NOT BE USED AS A GROUNDING OR BONDING CONDUCTOR.

IF EXISTING ELECTRIC SERVICE IS TO REMAIN, CONTRACTOR SHALL BE VERIFY THAT IT MEETS PROJECT REQUIREMENTS WITHOUT MODIFICATION. IF IT IS TO BE ADDED OR REPLACED AS A PART OF THIS WORK, CONTRACTOR SHALL ORDER FROM, COORDINATE WITH, AND GAIN APPROVAL FROM THE ELECTRICAL UTILITY. ALL ELECTRICAL EQUIPMENT SHALL BE AS SPECIFIED AND AS APPROVED BY THE LOCAL UTILITY WHERE APPLICABLE.

ALL EQUIPMENT, ENCLOSURES, ETC. SHALL BE SUITABLE FOR THE INSTALLED ENVIRONMENT, MINIMUM NEMA 3R FOR ALL EXTERIOR INSTALLATIONS.

WIRING DEVICES SHALL BE SPECIFICATION GRADE AND WIRING DEVICE COVER PLATES SHALL BE PLASTIC WITH ENGRAVING AS SPECIFIED. COLOR SHALL BE IVORY. ALL DEVICES AND COVER PLATES SHALL BE OF THE SAME MANUFACTURER.

ALL FIRE-RATED PENETRATIONS SHALL BE SEALED USING A SUITABLE AND LISTED FIRE SEALING DEVICE OR GROUT THAT WILL MAINTAIN THE FIRE RATING OF THE STRUCTURE PENETRATED.

PROVIDE PERMANENTLY AFFIXED ENGRAVED NAMEPLATES FOR ALL CODE REQUIRED LABELING AND ON ALL PANELS, METERING, DISCONNECTS, AND ELECTRICAL EQUIPMENT THAT IDENTIFIES EQUIPMENT SERVED, ELECTRICAL SOURCE WITH CIRCUIT IDENTIFICATION, AND VOLTAGES WITHIN.

ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL FINAL TERMINATIONS TO ALL EQUIPMENT.

ALL ELECTRICAL APPURTENANCES THAT ARE DISCONNECTED SHALL BE COMPLETELY REMOVED WITH EXISTING STRUCTURES TO REMAIN, REPAIRED, FINISHED, FILLED, PAINTED, ETC. ALL PANEL SCHEDULES, EQUIPMENT LABELING, AND CODE-REQUIRED LABELING, SHALL BE VERIFIED AND PROPERLY COMPLETED TO MATCH THE INSTALLATION.

26 GROUNDING:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

GROUND ALL SYSTEMS AND EQUIPMENT IN ACCORDANCE WITH BEST INDUSTRY PRACTICE, THE REQUIREMENTS OF THE NFPA 70 NATIONAL ELECTRICAL CODE (NEC), AND ALL OTHER APPLICABLE CODES AND REGULATIONS.

ALL GROUNDING ELECTRODES PRESENT AT EACH SERVICE LOCATION SHALL BE BONDED TOGETHER TO FORM THE GROUNDING ELECTRODE SYSTEM.

ALL EQUIPMENT ENCLOSURES, DEVICES, AND CONDUITS SHALL BE GROUNDED BY THE INSTALLATION OF A SEPARATE GROUNDING CONDUCTOR FOR ALL FEEDER AND BRANCH CIRCUITS THAT IS SIZED PER CODE OR IS OF THE SIZE INDICATED ON THE DRAWINGS. SHALL BE CONTINUOUS IN LENGTH, AND SHALL BE BONDED TO EACH ENCLOSURE PASSED THROUGH. CONDUIT SHALL NOT BE USED AS A GROUNDING OR BONDING WIRE OR CIRCUIT.

BOND ALL METALLIC CONDUITS TOGETHER THAT ARE CONNECTED TO NON-METALLIC ENCLOSURES, IN-GROUND BOXES, AND TO AN ENCLOSURE WHERE A GROUND BUS IS SPECIFIED OR SUPPLIED. ACCOMPLISH THIS BOND WITH GROUNDING CONDUCTORS MINIMUM SIZED TO THE LARGEST GROUNDING CONDUCTOR PRESENT IN THE ENCLOSURE CONNECTED TO A GROUNDING TYPE BUSHING EQUALLY SIZED OR MAXIMUM GROUND WIRE ACCOMMODATION AVAILABLE IN STANDARD MANUFACTURE FOR THE CONDUIT SIZE, WHICHEVER IS LESS.

EQUIPMENT GROUNDING AND LOAD SIDE BONDING CONDUCTORS SHALL BE SIZED PER THE CIRCUIT'S OVER-CURRENT PROTECTIVE DEVICE (OCPD) SIZE. WHERE THE UNGROUNDED CONDUCTORS ARE INCREASED IN SIZE ABOVE THE STANDARD FOR THE CIRCUIT'S OCPD, INCREASE THE GROUNDING CONDUCTOR PROPORTIONATELY TO THE CROSS-SECTIONAL AREA OF THE UNGROUNDED CONDUCTORS.

SERVICE MAIN BONDING JUMPERS AND GROUNDING ELECTRODE CONDUCTORS SHALL BE SIZED AND INSTALLED PER THE MINIMUM OF ALL APPLICABLE CODES AND REGULATIONS.

26 LIGHTNING PROTECTION:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS AND THE GROUNDING SPECIFICATIONS HEREIN.

THE LIGHTNING PROTECTION GROUNDING SYSTEM (LPGS) SHALL CONSIST OF BONDING ALL EQUIPMENT AND CONDUCTIVE STRUCTURES TO LOCALIZED SINGLE-POINT GROUNDING CONNECTIONS (TYPICALLY GROUND BARS) WHICH ARE BONDED TOGETHER AND TO AN IN-GROUND SYSTEM. IF THE LPGS IS ON A BUILDING, IT SHALL BE EFFECTIVELY BONDED TO THE ELECTRICAL SERVICE MAIN BONDING JUMPER AND TO ADDITIONAL IN-GROUND ELECTRODES AS MAY BE REQUIRED OR INDICATED. IF THE LPGS IS ON A DEDICATED COMMUNICATION SITE, ALL EQUIPMENT AREAS AND TOWERS SHALL EACH HAVE THEIR OWN IN-GROUND RING WITH EVERY RING BONDED TOGETHER, AND ALL CONDUCTIVE STRUCTURES IN CLOSE PROXIMITY (FENCES, ICE BRIDGES, ISOLATED EQUIPMENT, ETC.) ALSO BONDED TO PROVIDE A COMMON ELECTRICAL EQUIPOTENTIAL SYSTEM FOR ALL CONDUCTIVE ELEMENTS AND STRUCTURES.

CONDUCTORS:
- MIN #2 AWG SOLID BARE TINNED COPPER (SBTC) FOR ALL IN-GROUND CONDUCTORS.
- MIN #2 AWG COPPER GREEN STRANDED FOR BONDING STRUCTURES, AND FOR INTER-SYSTEM BONDING OF INDIVIDUAL ELEMENTS SUCH AS GROUND BAR TO GROUND BAR.
- MIN #6 AWG COPPER GREEN STRANDED OR ALL EQUIPMENT BONDING.
- INSTALL ALL IN-GROUND CONDUCTORS IN THE SAME HORIZONTAL PLANE OR IN A DOWNWARD DIRECTION AWAY FROM THE TOWER AND EQUIPMENT AREAS.
- AVOID LONG RUNS. MAKE DIRECT RUNS AS MUCH AS POSSIBLE.
- PLACE THROUGH NON-METALLIC SLEEVES WHEN PASSING THROUGH FLOORS, WALLS, CEILINGS, AND SIMILAR STRUCTURES.
- MAKE ALL CONNECTIONS IN CONTACT WITH EARTH WITH EXOTHERMIC WELDING. MAKE ALL OTHER CONNECTIONS WITH EXOTHERMIC WELDING, IRREVERSIBLE COMPRESSION CONNECTORS, OR LISTED COMPRESSION TWO-HOLE LUGS.
- INSTALL ALL CONDUCTORS WITH A MINIMUM 18 INCH BEND RADIUS AND NO BEND LONGER THAN A 90 DEGREE ARC. ALL BENDS SHALL BE HORIZONTAL, OR DOWNWARD TOWARDS EARTH.
- ALL CONDUCTORS PASSING FROM ABOVE-GROUND TO IN-GROUND CONNECTIONS, WHERE EXPOSED, SHALL BE COVERED AND PROTECTED WITH A NON-METALLIC CONDUIT SEALED AT BOTH ENDS.
- IF 2 OR MORE IN-GROUND CONDUCTOS ARE IN THE SAME PATH (2 RINGS OVERLAPPING, BONDING FOLLOWING ANOTHER RING OR RADIAL, OR SIMILAR), COMBINE WITH A SHARED SINGLE CONDUCTOR.

EQUIPMENT AND TOWER GROUND RINGS SHALL BE:
- BONDED TO ANY CONDUCTIVE OBJECT OR STRUCTURE WITHIN 5 FEET OF EQUIPMENT GROUND RINGS AND WITHIN 20 FEET OF TOWER GROUND RINGS.
- INSTALLED MINIMUM 18 INCHES FROM FOUNDATIONS, FOOTINGS, AND SIMILAR.

INSTALL ALL IN-GROUND RINGS, RADIALS, BONDS CONNECTING THEM, AND ALL SIMILAR GROUNDING:
- MIN 30 INCHES BELOW GRADE, OR 6 INCHES BELOW THE FROST LINE, WHICHEVER IS GREATER DEPTH.
- MIN 2 FEET FROM FOUNDATIONS, FOOTINGS, OTHER GROUNDING SYSTEMS, AND SIMILAR STRUCTURES, EXCEPT WHEN MAKING A BOND TO ANY OF THESE STRUCTURES. DO NOT BOND TO FOUNDATION INTERNAL REINFORCEMENT.

ALL EQUIPMENT GROUPED IN A COMMON AREA, COMPOUND, STRUCTURE, OR SIMILAR SHALL BE BONDED TO A SINGLE-POINT GROUND, PREFERABLY AN ISOLATED GROUND BAR. BOND THE GROUND BAR TO THE SYSTEM WITH MINIMUM SINGLE BONDING CONDUCTOR. IF BONDING TO AN IN-GROUND RING, INSTALL 2 BONDING CONDUCTORS MINIMUM WITH EACH CONDUCTOR INSTALLED DIRECTIONALLY AWAY FROM EACH OTHER AND PARALLEL TO THE IN-GROUND CONDUCTOR, WITH NO TEE CONNECTIONS.

TOWER GROUNDING:
- EACH TOWER LEG SHALL BE BONDED TO ITS RING. SINGLE-LEGGED TOWERS, OR MONOPOLES, SHALL HAVE 2 BONDS ON OPPOSITE SIDES.
- BOND TO TOWER BASE, NOT TO VERTICAL TOWER STRUCTURE, AWAY FROM TOWER MOUNTING HARDWARE.
- EACH BOND SHALL HAVE A CORRESPONDING GROUND ROD ON THE RING.
- EACH BOND SHALL CONSIST OF 2 CONDUCTORS FROM THE TOWER TO ITS RING WITH EACH CONDUCTOR DIRECTED IN OPPOSITE DIRECTIONS WITH A PARALLEL CONNECTION ON THE RING ON OPPOSITE SIDES OF THE GROUND ROD.

EQUIPMENT AREA GROUNDING:
- COMMUNICATION AREAS ON EARTH SHALL HAVE A GROUND RING.
- BOND ALL EQUIPMENT TO A SINGLE-POINT GROUND (GROUND BAR).
- BOND THE EQIPMENT SINGLE-POINT GROUND TO THE EQUIPMENT GROUND RING WITH MINIMUM 2 CONDUCTORS DIRECTED IN OPPOSITE DIRECTIONS WITH PARALLEL CONNECTIONS ON THE RING.
- IF EQUIPMENT IS ENCLOSED IN A SHELTER:
- IF THE SHELTER IS CONSIDERED TO BE EXPOSED TO A DIRECT LIGHTNING STRIKE, INSTALL A BUILDING LIGHTNING PROTECTION SYSTEM PER APPLICABLE VERSION OF NFPA 780.
- BOND ALL FIXED CONDUCTIVE BUILDING COMPONENTS TOGETHER AND TO THE BUILDING RING GROUND AT THE CORNERS. THIS IS TYPICALLY CALLED THE HALO GROUND. DO NOT BOND EQUIPMENT TO THE HALO GROUND.
- BOND ALL EQUIPMENT TOGETHER TO A SINGLE-POINT OR INTERIOR EQUIPMENT RING GROUND (IEGR). BOND THE SINGLE-POINT OR IEGR TO THE EXTERNAL EQUIPMENT RING GROUND.
- PLACE GROUND RODS AT THE EQUIPMENT GROUND RING CORNERS.

GROUND RODS:
- SEPARATION SPACE BETWEEN ANY 2 GROUND RODS SHALL BE NO CLOSER THAN THEIR DEPTH. THIS APPLIES TO ALL RODS IN THE COMPLETE SYSTEM.
- DRIVE VERTICALLY IN UNDISTURBED SOIL WITH THE TOP AT SAME DEPTH AS THE IN-GROUND CONDUCTOR. IF NOT POSSIBLE TO INSTALL VERTICALLY, PLACE AS CLOSE TO VERTICAL AS POSSIBLE AND IN A DIRECTION AWAY FROM THE NEAREST ABOVE-GROUND CONDUCTIVE ELEMENT (TOWER, EQUIPMENT, ETC.).

RADIALS (TYP. NEW DEDICATED COMMUNICATION SITES):
- WHERE FEASIBLE WITH ENOUGH SPACE AVAILABLE, INSTALL A MINIMUM OF 4, MAXIMUM 10 RING RADIALS.
- EACH RADIAL'S LENGTH SHALL BE MIN 20 FT, MAX 80 FT.
- EXTEND RADIALS PERPENDICULAR FROM RINGS IN AS STRAIGHT LINE AS POSSIBLE, AWAY FROM OTHER RING GROUNDS, RADIALS, BONDS, AND SIMILAR.
- A COMMON PRACTICE IS TO PLACE 4 RADIALS FROM THE TOWER RING TO THE 4 CORNERS OF THE AVAILABLE AREA.

AT A MINIMUM, BOND ALL COMPOUND CONDUCTIVE FENCE CORNER POSTS AND GATE POSTS TO THE LPGS. PREFERABLY, INSTALL A GROUND RING THAT FOLLOWS THE FENCE LINE, BONDING ALL POSTS TO THE RING.

27 ANTENNAS & CABLES:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

THE CONTRACTOR SHALL FURNISH AND INSTALL ALL TRANSMISSION CABLES, JUMPERS, CONNECTORS, GROUNDING STRAPS, ANTENNAS, MOUNT AND HARDWARE. ALL MATERIALS SHALL BE INSPECTED BY THE CONTRACTOR FOR DAMAGE UPON DELIVERY. JUMPERS SHALL BE SUPPLIED AT ANTENNAS AND EQUIPMENT INSIDE SHELTER. COORDINATE LENGTH OF JUMPER CABLES WITH OWNER. COORDINATE AND VERIFY ALL OF THE MATERIALS TO BE PROVIDED WITH OWNER PRIOR TO SUBMITTING BID AND ORDERING MATERIALS.

AFTER INSTALLATION, THE TRANSMISSION LINE SYSTEM SHALL BE PIM / SWEEP TESTED FOR PROPER INSTALLATION AND DAMAGE WITH ANTENNAS CONNECTED. CONTRACTOR SHALL OBTAIN AND USE LATEST TESTING PROCEDURES FROM OWNER OR MANUFACTURER PRIOR TO BIDDING.

ANTENNA CABLES SHALL BE UNIQUELY COLOR-CODED AT THE ANTENNAS, BOTH SIDES OF EQUIPMENT SHELTER WALL, AND JUMPER CABLES AT THE EQUIPMENT.

THE CONTRACTOR SHALL FURNISH AND INSTALL ALL CONNECTORS, ASSOCIATED CABLE MOUNTING AND GROUNDING HARDWARE, WALL MOUNTS, STANDOFFS, AND ALL ASSOCIATED HARDWARE TO INSTALL ALL CABLES AND ANTENNAS TO THE MANUFACTURER'S AND OWNER'S SPECIFICATIONS.

ANTENNA CABLES SHALL BE FOAM DIELECTRIC COAXIAL CABLES AS FOLLOWS:
- BASE STATION ANTENNAS:
  - 7/8" DIAMETER FOR CABLE LENGTHS UP TO 100 FT.
  - 1-5/8" DIAMETER FOR CABLE LENGTHS GREATER THAN 100 FT.
  - GPS ANTENNAS:
  - 7/8" DIAMETER FOR CABLE LENGTHS UP TO 200 FT.
  - 1-5/8" DIAMETER FOR CABLE LENGTHS GREATER THAN 200 FT.

MINIMUM BENDING RADIUS FOR COAXIAL CABLES SHALL BE:
- 15 FT FOR 7/8" COAXIAL CABLES.
- 25 FT FOR 1-5/8" COAXIAL CABLES.

CABLE SHALL BE INSTALLED WITH A MINIMUM NUMBER OF BENDS WHERE POSSIBLE. CABLE SHALL NOT BE LEFT UNTERMINATED AND SHALL BE SEALED IMMEDIATELY AFTER BEING INSTALLED.

ALL EXTERIOR CABLE CONNECTIONS SHALL BE COVERED WITH A WATERPROOF SPLICING KIT.

CONTRACTOR SHALL VERIFY EXACT LENGTH AND DIRECTION OF TRAVEL IN FIELD PRIOR TO CONSTRUCTION.

CABLE SHALL BE FURNISHED AND INSTALLED WITHOUT SPLICES AND WITH CONNECTORS AT EACH END.

27 CABLE TRAY:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

CABLE TRAY SHALL BE MADE OF EITHER CORROSION RESISTANT METAL OR WITH A CORROSION RESISTANT FINISH.

CABLE TRAY SHALL BE OF LADDER TRAY TYPE WITH FLAT COVER CLAMPED TO SIDE RAILS.

CABLE LADDER SHALL BE SIZED TO FIT ALL CABLES IN ACCORDANCE WITH NEC AND NEMA 11-15-84.

CABLE LADDER TRAYS SHALL BE NEMA CLASS 12A BY PW INDUSTRIES, INC. OR EQUAL.

CABLE LADDER TRAY SHALL BE SUPPORTED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

ALL WORKMANSHIP SHALL CONFORM TO THESE REQUIREMENTS AND ALL LOCAL CODES AND STANDARDS TO ENSURE SAFE AND ADEQUATE GROUNDING SYSTEM.

31 EXCAVATION & FILL:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

CONTRACTOR SHALL GRADE ONLY AREAS SHOWN TO BE MODIFIED AS A PART OF THIS WORK AND ONLY TO THE EXTENT REQUIRED TO SHED OVERLAND WATER FLOW AWAY FROM SITE. ALL MADE SLOPES SHALL NOT BE STEEPER THAN 3:1 (HORIZONTAL:VERTICAL). SEDIMENTATION AND EROSION CONTROLS SHOWN AND SPECIFIED SHALL BE ESTABLISHED BEFORE STRIPPING EXISTING VEGETATION.

ORGANIC MATERIAL AND DEBRIS SHALL BE STRIPPED AND STOCKPILED BEFORE ADDING FILL MATERIAL.

NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.

ALL FILL SHALL BE PLACED IN ONE FOOT LIFTS AND COMPACTED IN PLACE. STRUCTURAL FILL SHALL BE COMPACTED TO 95% OF ITS MAXIMUM DRY UNIT WEIGHT TESTED IN ACCORDANCE WITH ASTM D1557.

EXCAVATIONS FOR FOOTINGS SHALL BE CUT LEVEL TO THE REQUIRED DEPTH AND TO UNDISTURBED SOIL. REPORT UNSUITABLE SOIL CONDITIONS TO THE CONSTRUCTION MANAGER.

TRENCH EXCAVATIONS SHALL BE BACKFILLED AT THE END OF EACH DAY.

TOWER FOUNDATION EXCAVATION, BACKFILL AND COMPACTION SHALL BE IN ACCORDANCE WITH TOWER MANUFACTURER'S DESIGNS AND SPECIFICATIONS.

NATIVE GRAVEL MATERIAL MAY BE USED FOR TRENCH BACKFILL WHERE SELECT MATERIAL IS NOT SPECIFIED. GRAVEL MATERIAL FOR CONDUIT TRENCH BACKFILL SHALL NOT CONTAIN ROCK GREATER THAN 2 INCHES IN DIAMETER.

BANK OR CRUSHED GRAVEL SHALL CONSIST OF TOUGH, DURABLE PARTICLES OF CRUSHED OR UNCRUSHED GRAVEL FREE OF SOFT, THIN, ELONGATED OR LAMINATED PIECES AND MEET THE SPECIFIED GRADATION.

PROCESSED AGGREGATE BASE SHALL CONSIST OF COURSE AND FINE AGGREGATES COMBINED AND MIXED SO THAT THE RESULTING MATERIAL CONFORMS TO THE GRADATION. COURSE AGGREGATE SHALL BE EITHER GRAVEL OR BROKEN STONE AND FINE AGGREGATE SHALL CONSIST OF SAND.

BANK GRAVEL FILL SHALL PASS WITH THE FOLLOWING SIZE SQUARE MESH SIEVES:
- 25-60% WITH PASS 1/4"
- 15-45% WITH PASS #10
- 2-25% WITH PASS #40
- 0-10% WITH PASS #100
- 0-5% WITH PASS #200

BANK GRAVEL BASE SHALL PASS WITH THE FOLLOWING SIZE SQUARE MESH SIEVES:

100%	WITH PASS 5"
100%	WITH PASS 3-1/2"
100%	WITH PASS 2-1/4"
95-100%	WITH PASS 2"
55-100%	WITH PASS 1-1/2"
25-60%	WITH PASS 1/4"
15-45%	WITH PASS #10
5-25%	WITH PASS #40
0-10%	WITH PASS #100
0-5%	WITH PASS #200

PROCESSED AGG BASE SHALL PASS WITH THE FOLLOWING SIZE SQUARE MESH SIEVES:

90-100%	WITH PASS 3-1/2"
55-95%	WITH PASS 1-1/2"
50-75%	WITH PASS 3/4"
25-45%	WITH PASS 1/4"
5-20%	WITH PASS #40
2-12%	WITH PASS #100

FILL MATERIAL SHALL BE FREE OF ORGANIC MATERIAL, ICE, TRASH AND DEBRIS. REFER TO GEOTECHNICAL ENGINEERING AS APPLICABLE FOR ALL FILL MATERIAL REQUIREMENTS.

31 SEDIMENTATION & EROSION CONTROL:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXIST. SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENTATION CONTROL.

LIMITS OF CLEARING AND GRUBBING SHALL BE CLEARLY MARKED BEFORE COMMENCING WITH SUCH WORK.

SEDIMENTATION AND EROSION CONTROL (SEC) MEASURES SHOWN SHALL BE INSTALLED PRIOR TO LAND CLEARING, EXCAVATION OR GRADING OPERATIONS. REQUIREMENTS OF LOCAL WETLAND AGENCY SHALL BE MET PRIOR TO EARTHWORK OPERATIONS.

IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN SEC MEASURES THROUGHOUT DURATION OF PROJECT UNTIL DISTURBED LAND IS THOROUGHLY VEGETATED.

FAILURE OF THE SEC SYSTEMS SHALL BE CORRECTED IMMEDIATELY AND SUPPLEMENTED WITH ADDITIONAL MEASURES AS NEEDED.

TOPSOIL SHALL BE SPREAD TO FINISH GRADES AND SEEDED AS SOON AS FINISHED GRADES ARE ESTABLISHED. STRAW MULCH, JUTE NETTING OR MATS SHALL BE USED WHERE THE NEW SEED IS PLACED.

VEGETATIVE SEEDING:
- AREA TO BE SEEDED SHALL BE LOOSE AND FRIABLE TO A DEPTH OF 3". TOPSOIL SHALL BE LOOSENED BY RAKING OR DISKING BEFORE SEEDING. APPLY 50 Lbs. OF DOLOMITIC LIMESTONE AND 25 Lbs. OF 10-10-10 FERTILIZER PER 1000 SF. HARROW LIME AND FERTILIZER INTO LOOSE SOIL.
- APPLY COMMON BERMUDA AND RYE GRASS AT 50 LBS PER ACRE. USE CYCLONE SEED DRILL CULTIPACKER SEEDER OR HYDROSEEDER (SEED & FERTILIZER SLURRY) FOR STEEP SLOPES. IRRIGATE UNTIL VEGETATION IS COMPLETELY ESTABLISHED.

MCM HOLDINGS, LLC
P.O. BOX 320361
HARTFORD, CT 06132
OFFICE: (888) 973-7483

ALL-POINTS
TECHNOLOGY CORPORATION
3 SADDLEBROOK DRIVE PHONE: (860)-663-1697
KILLINGWORTH, CT 06419 FAX: (860)-663-0935
WWW.ALLPOINTSTECH.COM

DEVELOPMENT & MANAGAMENT PLANS

NO	DATE	REVISION
0	10/08/19	FOR REVIEW: RCB
1	10/21/19	CLIENT COMMENTS: RCB
2		
3		
4		
5		
6		

STATE OF CONNECTICUT
ROBERT CHARLES BURNS
No. 20071
LICENSED
PROFESSIONAL ENGINEER

DESIGN PROFESSIONALS OF RECORD

PROF: ROBERT C. BURNS P.E.
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 3 SADDLEBROOK DRIVE KILLINGWORTH, CT 06419

OWNER: THE CONNECTICUT WATER COMPANY
ADDRESS: 93 WEST MAIN STREET CLINTON, CONNECTICUT 06413

MCM SITE
WESTBROOK H20 TANK

SITE ADDRESS: 1542 BOSTON POST ROAD WESTBROOK, CT 06498

APT FILING NUMBER: CT524120

	DRAWN BY: CSH
DATE: 10/08/19	CHECKED BY: RCB

SHEET TITLE:

NOTES & SPECIFICATIONS

SHEET NUMBER:

N-2

2

Geotechnical Engineering Report

Proposed Telecommunications Towers: Westbrook H2O
1542 Boston Post Road
Westbrook, Connecticut

FOR

All-Points Technology Corporation, P.C.
3 Saddlebrook Drive
Killingworth, CT 06419

BY

NOBIS ENGINEERING, INC.
122 CHURCH STREET
NAUGATUCK, CT 06770

(203) 409-1292
www.nobiseng.com

Nobis Project No. 92790.00
MARCH 18, 2017

Nobis
Engineering a Sustainable Future

Nobis
Engineering a Sustainable Future

March 18, 2017
File No. 92790.00

All-Points Technology Corporation, P.C.
Mr. Scott M. Chasse, P.E.
3 Saddlebrook Drive
Killingworth, CT 06419

Re: Transmittal of Geotechnical Engineering Report
Proposed Telecommunications Towers: Westbrook H2O
1542 Boston Post Road, Westbrook, Connecticut

Dear Scott:

This report provides the results of Nobis Engineering Inc.'s (Nobis') geotechnical engineering review for the proposed telecommunications towers to be located at 1592 Boston Post Road in Westbrook, Connecticut. Our services were performed in general accordance with our January 8, 2017, *Geotechnical Engineering Services Proposal*. This report provides geotechnical recommendations for earthwork and foundation design for the proposed permanent and temporary tower. The results of our field exploration program and geotechnical analyses are provided herein.

We appreciate the opportunity to work with you. Please call if you have any questions.

Sincerely,

NOBIS ENGINEERING, INC.

Raymond P. Janeiro, PE
Project Manager

Scott M. Carter, PE
Reviewer

Nobis Engineering, Inc.
122 Church Street
Naugatuck, CT 06770
T (203) 409-1292

Nobis
Engineering a Sustainable Future

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GEOTECHNICAL ENGINEERING REPORT
PROPOSED TELECOMMUNICATIONS TOWERS: WESTBROOK H2O
1542 BOSTON POST ROAD
WESTBROOK, CONNECTICUT

NOBIS FILE NO. 92790.00

APPENDIX

1.0 INTRODUCTION

Nobis Engineering, Inc. (Nobis) prepared this geotechnical engineering report for the two proposed telecommunications towers located at 1542 Boston Post Road in Westbrook, Connecticut ("Site") for All-Points Technology Corporation, P.C. ("Client"). A Site Locus Plan is included as **Figure 1 – Appendix A**.

Existing conditions and proposed features relating to Site development are generally based on the Client's provided drawings (*Westbrook H2O, 1542 Boston Post Road, Westbrook, CT, sheets LE-1 through LE-3A, prepared by All-Points Technology Corp., dated 12/22/2016*). Elevations referenced herein reference the NAVD88 datum. This report is subject to the limitations presented in **Appendix C**.

2.0 SITE AND PROJECT DESCRIPTIONS

2.1 Existing Site Conditions

The Site generally consists of an existing water tank currently mounted with telecommunications equipment. The Site is owned by the Connecticut Water Company and it is their intention to demolish the water tank. This will require temporary relocation of the existing telecommunications equipment until a permanent tower can be constructed within the footprint of the tank.

The Site is bordered by the Boston Post Road (U.S. Route 1) to the south and various commercial parcels to the east, north and west. Existing site grades appear to be relatively level in the area of existing Site improvements at about El. 47± according to the referenced drawings. Existing site conditions consist of an unpaved parking area and fenced compound around the existing tank and equipment shelters.

2.2 Proposed Construction

The project will initially consist of constructing a 165-foot temporary monopole tower supported on a 24-foot by 24-foot ballasted frame. Once the equipment is relocated and the water tank is demolished, a permanent 130-foot monopole tower will be constructed within the former tank footprint. Minor adjustments to the existing chain link fence at the perimeter of the compound will be required to accommodate the proposed improvements. It is our understanding that the existing equipment shelters will remain.

The estimated vertical load of the permanent tower is assumed to be about 30 kips, and the ballast lot for the temporary tower is proposed at 150 kips. It's anticipated that nominal cuts and fills on the order of 1-foot or less are anticipated to achieve design grade and that no significant slopes will be required. Refer to the Exploration Location Plan (**Figure 2 – Appendix A**) for additional proposed development details.

3.0 SUBSURFACE CONDITIONS

3.1 Geologic Information

We reviewed available subsurface/geological information in the vicinity of the project area (*Surficial Geologic Map of the Essex Quadrangle, Connecticut, Richard Flint, 1972* and *Bedrock Geology of the Essex Quadrangle, Lawrence Lundgren, Jr., 1964)*.

The surficial material within the area of the proposed telecommunications compound is mapped as glacial till consisting of a variable mixture of gravel, sand, silt, and clay that is intermixed with cobbles and boulders. The underlying bedrock is classified as light- to dark-gray, medium-grained plagioclase-quartz gneiss (Monson Formation).

3.2 Subsurface Exploration Program

The subsurface exploration program coordinated and logged by Nobis included the observation of two test borings (NB-1 and NB-2) and three test probes (NP-1 through NP-3). The test borings and probes were completed on March 8 and 9, 2017, by New England Boring Contractors, Inc. of Derry, New Hampshire. Test borings were completed to assess in-situ soil conditions, and, if encountered, groundwater and bedrock conditions at the Site. The explorations were field located using taped measurements referencing existing site features. The approximate, as-drilled exploration locations are depicted on the attached **Figure 2**, *Exploration Location Plan.*

The explorations were completed using an Acker Soil Scout ATV-mounted drill rig utilizing drive and wash drilling methods to advance the test borings to a depth of approximately 36 feet (El. 11.5) below ground surface (bgs) at NB-1, and approximately 26 feet bgs (El. 21) at NB-2. Upon encountering equipment refusal at NB-1, at a depth of approximately 31 feet bgs, a rock core sample was obtained to aid in bedrock confirmation and evaluating the type and quality of bedrock. The core samples were drilled using a five foot, double-barrel, NQ-size core barrel. The

core times were recorded every foot of core length and rock quality was determined using visual classification.

The test probes were advanced using a series of 2-inch outside diameter split-spoon samplers to a depth of 6 feet bgs. The objective of the probes was to asses fill thickness, relative density, and soil consistency within the area of the proposed temporary tower.

Soil samples were obtained in the explorations by split-spoon sampling procedures in general accordance with ASTM D-1586. The split-spoon sampling procedure utilizes a standard 2-inch O.D. split-barrel sampler that is driven into the bottom of the boring with a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampler the middle 12-inches of a typical 24-inch penetration is recorded as the Standard Penetration Resistance Value (N). The blows are indicated on the boring log at their depth of occurrence and provide an indication of the relative consistency of the material.

3.3 Generalized Subsurface Profile

Excluding the presence of fill, the explorations were generally consistent with published geologic mapping. A silt stratum was also encountered at the northern limits of the existing compound (near an area of flagged wetlands). The generalized subsurface profile in the area of the proposed telecommunications compound, as inferred from the subsurface exploration data, is summarized as follows:

- Fill: Loose to medium dense, dark brown, silty SAND with gravel, containing very few organic fibers and wood debris (SM)
  – 1.5 to 5.5 feet thick (to about Elev. 45.5 to 42); over

- Silt (encountered in NP-1 and NP-3): Loose, black, SILT with sand, containing very few organic fibers (ML)
  – 0.5 to 1.5 feet thick (to about Elev. 44 to 43.5); over

- Glacial Till: Dense to very dense, brown, silty SAND with gravel (SM)
  – 14.5 to 16.5 feet thick (to about Elev. 28.5 to 25.5); over

- Decomposed Rock: Very dense, gray-white, well-graded SAND with gravel (SW)
  – 14 feet thick in NB-1 (to about Elev. 11.5). A core barrel was advanced within the Decomposed Rock stratum in NB-1. Bedrock was classified as soft, extremely weathered, white/gray Gneiss. The core recovery and rock quality designation (RQD), was 20% and 0%, respectively, indicating a very poor rock mass quality.

Visual classifications of soil and rock, and conditions encountered at each exploration location can be found in the provided boring and test probes logs, included as **Appendix B**.

3.4 Groundwater

Groundwater levels were measured in the boreholes at the times and under the conditions stated on the logs. Water was encountered at about 5 feet bgs (NB-1) during drilling at the permanent tower location. Water was encountered at about 4 feet bgs during probing at the temporary tower location. Groundwater could not be determined at NB-2, since drive and wash drilling methods introduced water to the borehole prior to encountering the groundwater table.

Groundwater observations were measured at the time of drilling and may not be indicative of stabilized groundwater elevation. Additionally, the drilling method utilized introduces water to the borehole which may result in an elevated groundwater measurement. Groundwater levels will vary due to seasonal factors, temperature, precipitation, construction activity and other conditions which may be different from the time of the exploration program. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

3.5 Soil Resistivity Testing

On February 24 and March 1, 2017, Nobis field personnel conducted in-situ soil resistivity testing in accordance with accepted engineering practices using the Wenner electrode configuration. Electrodes were spaced at 5, 10, 20, 30 and 40 feet, where possible. Two sets of two approximately perpendicular resistivity lines were completed in the general vicinity of the proposed tower location. The approximate locations and orientations of the resistivity lines are shown on the attached **Figure 2**. The results of the resistivity tests are as follows:

	Resistivity (ohm-cm)			
Electrode Spacing (ft)	Line 1	Line 2	Line 3	Line 4
5	68,940	27,768	60,323	42,130
10	22,980	5,745	30,640	32,555
20	3,830	3,830	19,150	11,490
30	5,745	5,745	11,490	11,490
40	7,660	-*	7,660	-*

*The proximity of the property lines did not allow completion of this spacing interval.

Field resistivity results may be influenced by boulders, concrete, foundations, and underground utilities within the test area. Resistivity results will also fluctuate depending on the degree of compaction, moisture content, constituent solubility, and temperature. Field resistivity values may also vary depending upon season, precipitation, and other conditions that may differ from those at the time of testing.

4.0 GEOTECHNICAL DESIGN AND CONSTRUCTION RECOMMENDATIONS

4.1 Geotechnical Evaluation

Based on the results of our subsurface investigation, it is our opinion the proposed 130-foot permanent steel monopole telecommunications tower may be supported on a monolithic mat or a pier-and-pad foundation bearing on the glacial till, or compacted Structural Fill or Crushed Stone (see *Section 4.5 Materials and Compaction*) placed over a prepared glacial till subgrade. Alternatively, the permanent telecommunications tower may be supported on a drilled shaft foundation extending into competent glacial till and weathered bedrock.

We understand the proposed 165-foot temporary tower will be supported on a 24-feet by 24-feet ballasted frame foundation. Referenced drawings indicated the foundation system will bear at finish grade at approximately El 47 and not have embedment. We recommend that the ballasted frame foundation bear on compacted Structural Fill or Crushed Stone placed over glacial till. Design recommendations and construction considerations for the recommended foundation systems are presented in the following sections.

4.2 Seismic Design Recommendations

Based on the density/consistency of the soils encountered in the explorations, it is our opinion that Site soils are not considered susceptible to liquefaction. Seismic forces on foundations should be designed in accordance with the Connecticut State Building Code. We recommend using the following seismic design values based on the 2016 Connecticut State Building Code:

- Site Class: C;
- MCE Spectral Response Accelerations: S_s = 0.167g and S_1 = 0.059g;
- Site Coefficients: F_a = 1.2 and F_v = 1.7; and
- Seismic Design Parameters: S_{MS} = 0.200 and S_{M1} = 0.100; S_{DS} = 0.134 and S_{D1} = 0.067.

4.3 Permanent Tower Foundation Design Recommendations

4.3.1 Shallow Foundation (Mat/Pad) Alternative

The proposed permanent monopole communications tower may be supported on a mat or pad-and-pier foundation bearing on proof-rolled glacial till, or compacted Structural Fill or Crushed Stone placed on above a proof-rolled glacial till subgrade. Crushed stone, if used, should be separated from soil subgrades, excavation sidewalls and backfill using a geotextile separation fabric such as Mirafi 140N, or equivalent.

Nobis recommends a maximum net allowable bearing pressure of 6 kips per square foot (ksf). Foundations should be embedded a minimum of 42 inches below final grades for frost protection. The total settlement is anticipated to be less than 1 inch and differential settlement to be less than 0.5 inches. Foundation settlement will depend on the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the foundation, the thickness of compacted fill, and the quality of earthwork operations.

We recommend an ultimate passive pressure coefficient (Kp) of 3.0. Calculated passive pressures should be reduced by a minimum factor of safety of 3, to reflect the amount of movement required to mobilize the passive resistance. We also recommend an ultimate coefficient of sliding friction of 0.5. A factor of safety of at least 1.5 should be applied to calculated sliding resistance.

To summarize, we recommend the following static design parameters:

Description	Value
Maximum Net Allowable Bearing Pressure	6 kips per square foot
Minimum Foundation Width	Isolated Spread Footing/Mat Foundation: 2 feet
Minimum Embedment Below Finished Grade	42 inches
Estimated Total Settlement	<1 inch
Estimated Differential Settlement	<½ inch
Total Soil Unit Weight	130 pounds per cubic foot
Ultimate Passive Pressure Coefficient, Kp	3.0
Ultimate Coefficient of Sliding Friction	0.5

Uplift resistance for the tower foundation may be computed as the sum of the weight of the foundation element and the weight of the soil overlying the foundation.

4.3.2 Shallow Foundation (Mat/Pad) Construction Recommendations

The proposed mat/pad foundation and associated equipment areas should be cleared of existing structures and vegetation and grubbed; and existing cobbles, boulders, and any identifiable compressible or deleterious materials should be removed. Existing fill (including re-worked parent materials), and other unsuitable materials (e.g., silt deposit), must be removed from beneath footing zones of influence to the top of firm, natural glacial till prior to construction. Over-excavation below foundations should include the zone of influence, defined as the area beneath 1 horizontal to 1 vertical (1H:1V) lines extending downward and outward from footing edges. Footings shall bear on a prepared subgrade of firm natural glacial till, or compacted Structural Fill or Crushed Stone (over firm natural soil). Refer to *Section 4.5 Materials and Compaction* for material placement recommendations.

The proposed project area is partially occupied with the existing water tank and associated underground utilities. The existing water tank will be demolished prior to construction of the permanent communications tower. Existing foundation elements and underground utilities should be removed where they conflict with the planned development. Areas disturbed during removal of foundations and utilities should be undercut and the excavations should be backfilled in systematic, compacted lifts. Fill materials and compaction efforts should be consistent with the intended future use.

Excavations for foundation subgrades are anticipated to consist of native glacial till containing varying amounts of silt that will be easily disturbed when wet. Earthwork should be performed in dry conditions so that disturbance to foundation subgrades is limited. During earthwork, the Contractor should be responsible for protecting subgrades from the elements and maintaining the soils in a suitable state until completion of the project. Backfill should not be placed over a subgrade with standing water or that is frozen. Standing water, if present, should be removed and any soft and yielding soil should be removed prior to backfill placement. Excavations to subgrade levels should be performed using a smooth-edged bucket to minimize possible disturbance to the in-place subgrade soils.

Soil subgrades should be proof-rolled under the observation of a qualified Geotechnical Engineer with at least four (4) passes of a smooth-drum vibratory roller (minimum 8,000 pounds, minimum centrifugal force of 12,500 pounds) or, where approved by the geotechnical engineer, a vibratory plate compactor with a minimum of 2,500 pounds of centrifugal force. Any soft or loose zones identified during proof-rolling should be excavated and replaced with compacted Structural Fill, as necessary, and as required by the Geotechnical Engineer. It is imperative that subgrade preparations occur under the observation of the Geotechnical Engineer, as applying vibratory energy to a well-prepared natural, glacial till subgrade may cause disturbance and create soft and loose zones.

4.3.3 Deep Foundation (Drilled Shaft) Alternative

We recommend the following static design parameters for a drilled shaft foundation alternative:

Description	Value
Maximum Net Allowable Bearing Capacity Glacial Till Decomposed Rock	6 kips per square foot (ksf) 8 ksf
Ultimate Side Friction Values[2] Glacial Till Decomposed Rock	20 pounds per square inch (psi) 25 psi
Coefficient of Lateral Subgrade Reaction[3] Glacial Till Decomposed Rock	80 (z/D) kips per cubic foot (kcf) 90 (z/D) kcf
Angle of Internal Friction Glacial Till Decomposed Rock	36 38
Total Soil Unit Weight Glacial Till Decomposed Rock	135 pounds per cubic foot (pcf) 140 (pcf)
Minimum Drilled Shaft Diameter	Diameter of Monopole Base
Allowable Deflection at Top of Shaft	0.5 inch

1. The allowable end bearing capacity also assumes that loose, disturbed material has been removed from the base of the shaft.
2. Contribution to shaft capacity from soil above a depth of 4 feet should be ignored. The uplift capacity should be based on the dead weight of the shaft and side resistance provided by the glacial till and decomposed rock. It's assumed that applied loading will not have a significant Poissons-effect on the shaft.
3. z represents the depth below ground surface (feet) and D is the diameter of the foundation element (feet).

We anticipate that the design length of the shaft will be primarily dependent on the embedment/lateral capacity required to resist live loading. The base of the drilled shaft should be at least 15 feet below ground surface. The drilled shaft will be subject to tension loads and therefore should have reinforcing steel that extend through the entire length of the shaft.

4.3.4 Deep Foundation (Drilled Shaft) Construction Recommendations

Technical specifications should be prepared by the specialty Contractor that require detailed material and construction submittals and proof of experience in drilled shaft installation. The drilling method or combination of methods selected by the contractor should be submitted for review by the geotechnical engineer, prior to mobilization of drilling equipment.

A section of temporary casing may be required to reduce the likelihood of caving of the side walls of the shaft hole. Concrete should be placed by directing the concrete down the center of the shaft to reduce the likelihood of hitting the reinforcing steel and segregating. Groundwater, if encountered in the shaft, should be removed prior to placing concrete; alternatively, concrete may be placed by tremie methods.

4.4 Temporary Tower Foundation Design Recommendations

4.4.1 Ballasted Frame Alternative

Based on anticipated loading and the conditions encountered during our subsurface investigation, it is our opinion that the proposed ballasted frame foundation system cannot derive support on the encountered silt stratum located beneath the existing fill. The variable presence and thickness of the soft, compressible silt stratum would result in unpredictable, differential settlements within the ballasted frame area. Support should instead be derived from a minimum 12-inch layer of compacted structural fill placed above natural, glacial till as described in *Section 4.3.2 Shallow Foundation (Mat/Pad) Construction Recommendations*. This will require replacing existing soil within the foundation zone of influence [defined as the area beneath 1 horizontal to 1 vertical (1H:1V) lines extending downward and outward from the foundation edge] with compacted nonfrost-susceptible structural fill, which will also reduce the potential for frost action. A non-woven geotextile, such as Mirafi 140N, or equivalent, is recommended over stable, prepared subgrade and beneath the Structural Fill.

We recommend a maximum net allowable bearing pressure of 5 kips per square foot (ksf) for the 24-foot by 24-foot foundation. This allowable bearing capacity is based on the complete removal/replacement of existing fill and silt below the ballasted frame foundation. Deeper excavation may be required if exposed subgrades have an appreciable amount of organic content or appear unsuitable for bearing. Nobis should be retained to evaluate exposed subgrade conditions prior to placing fill.

We recommend an ultimate coefficient of sliding friction of 0.5. A factor of safety of at least 1.5 should be applied to the sliding resistance.

The total settlement is anticipated to be less than 1 inch and differential settlement to be less than 0.5 inch. Based on the granular nature of bearing materials, much of the settlement is anticipated settlement to occur as load is applied. Foundation settlement will depend on the variations within the subsurface soil profile, the structural loading conditions, frost susceptibility of subgrade soils, the embedment depth of the foundation, the thickness of compacted fill, and the quality of earthwork operations.

4.5 Materials and Compaction

Recommended earthwork materials are as follows:

Structural Fill is to be used beneath footings, and other areas as appropriate, or as directed by the Geotechnical Engineer or his/her representative. The material shall consist of hard, inert, durable particles of stone and coarse sand. It shall be free from ice and snow, roots, surface coatings, sod, loam, clay, rubbish, and other deleterious or organic matter, and shall conform to the following gradation requirements:

Sieve Size	Percent Passing by Weight
3-inch	100
½-inch	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-10*

*To be considered nonfrost-susceptible, structural fill should have a maximum of 3 percent of particles by weight smaller than 0.02mm in effective diameter.

Crushed Stone shall consist of either angular fragments of crushed rock or durable crushed gravel stone, be reasonably free of loam, clay, or other deleterious or organic matter, and shall conform to the following gradation requirements:

Sieve Size	Percent Passing by Weight
¾-inch	100
½-inch	10-50
⅝-inch	0-20
No. 4	0-5

Nonfrost-Susceptible Material shall consist of granular fill or crushed stone containing less than 3 percent smaller than 0.02 mm.

Structural Fill and Crushed Stone should be placed in loose lifts not exceeding 8 inches in depth, and compacted to at least 95 percent of its maximum dry density, and within 2% of optimum moisture content, as determined by ASTM D1557, Method C (Modified Proctor).

4.6 Additional Construction Considerations

Based on information obtained from the subsurface exploration program, groundwater may be encountered during construction. We anticipate that water can be managed with conventional sump pumps and trenches in the excavations; however, the contractor should review the plans and borings and make his/her own interpretation of the means and methods needed to control water during construction. Stormwater runoff should not be permitted to accumulate on/within exposed subgrades and the runoff should be directed away from the exposed subgrade areas.

Where space permits and as needed, temporary slopes no steeper than 1.5H:1V appear to be appropriate. Excavation geometry should conform to OSHA excavation regulations contained in 29 CFR Part 1926. Temporary earth support is not anticipated for the excavations. If needed, temporary earth support systems should be designed by a Professional Engineer registered in the State of Connecticut.

We recommend that Nobis be provided the opportunity to review the final design plans and specifications to ensure that the recommendations of this report have been incorporated as intended. We further recommend that Nobis observes excavation to subgrade levels, subgrade preparation, and fill placement and compaction. This is recommended to evaluate and document the bearing material for the foundation subgrades. We also recommend that Nobis be retained to monitor the construction of the drilled shaft, if selected as the foundation alternative. The geotechnical engineer in the field should observe the work for compliance with the recommendations in this report, identify changes in subsurface conditions from those observed in the explorations should they become apparent, and assist in the development of design changes should subsurface conditions differ from those anticipated prior to the start of construction.

5.0 CLOSURE

This report is subject to the Limitations, included as **Appendix C**.

APPENDIX A – Figures

NORTH

USGS TOPOGRAPHIC MAP

7.5 MINUTE QUADRANGLE: ESSEX, CT
1977

APPROX. SCALE IN FEET
0 2000' 4000'

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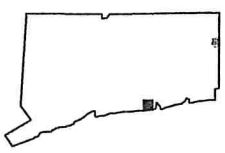
Naugatuck, CT 06770
T(203) 409-1292
www.nobiseng.com
Client-Focused, Employee-Owned



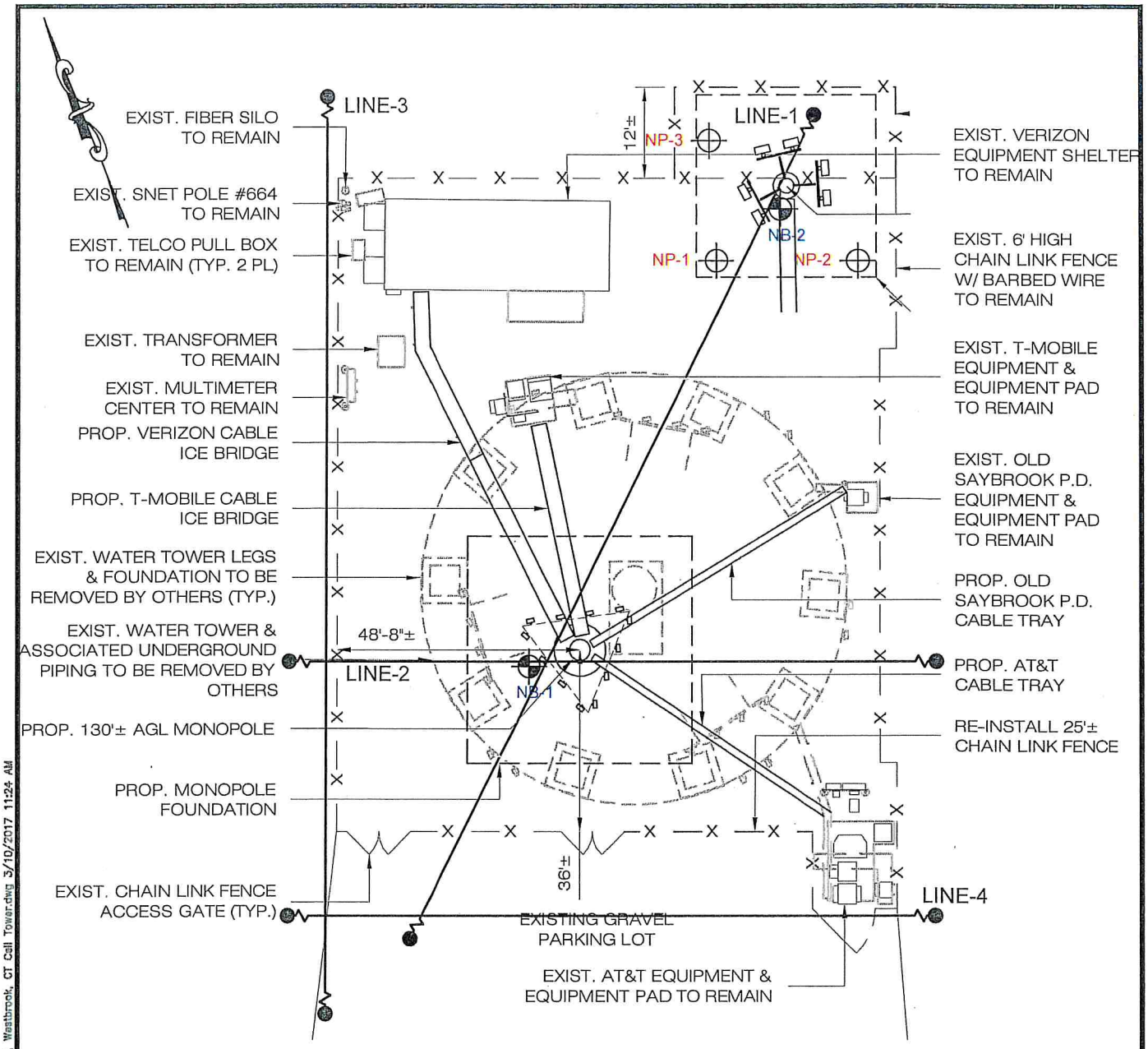
QUADRANGLE LOCATION

FIGURE 1

LOCUS PLAN
WESTBROOK H2O
1542 BOSTON POST ROAD
WESTBROOK, CT 06498

PROJECT NO. 92790.00 | DATE: MARCH 2017

J:\92790.00 -- Westbrook H2O Cell Tower, Westbrook, CT\CAD\1542 Boston Post Road, Westbrook, CT Cell Tower.dwg 3/2/2017 9:44 AM



NOTES:

1. THE BASE PLAN WAS DEVELOPED FROM FIGURE ENTITLED, "COMPOUND PLAN," PREPARED BY ALL-POINTS TECHNOLOGY ENGINEERING CORPORATION, P.C., REVISION DATED DECEMBER 22, 2016.
2. TEST BORINGS AND PROBES WERE DRILLED BY NEW ENGLAND BORING CONTRACTORS OF GLASTONBURY, CONNECTICUT, AND OBSERVED BY NOBIS ON MARCH 8, 2017.
3. RESISTIVITY TESTING WAS PERFORMED ON FEBRUARY 24 2017 AND MARCH 1, 2017 BY NOBIS FIELD STAFF.
4. THE APPROXIMATE LOCATIONS OF THE TEST BORINGS, TEST PROBES, AND RESISTIVITY TESTS WERE TAPED FROM EXISTING SITE FEATURES. THE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

NP-1 TEST PROBE LOCATION

NB-1 TEST BORING LOCATION

LINE-1 RESISTIVITY TEST LOCATION (TYP.)

Nobis
Engineering a Sustainable Future
Nobis Engineering, Inc.
122 Church Street
Naugatuck, CT 06770
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APPROX. SCALE IN FEET
0 20' 40'

DRAWN BY: JDV

CHECKED BY: RPJ

FIGURE 2

EXPLORATION LOCATION PLAN
WESTBROOK H2O
1542 BOSTON POST ROAD
WESTBROOK, CONNECTICUT 06498

PROJECT NO. 92790.00

DATE: MARCH 2017

J:\92790.00 – Westbrook H2O Cell Tower, Westbrook, CT\CAD\1542 Boston Post Road, Westbrook, CT Cell Tower.dwg 3/10/2017 11:24 AM

APPENDIX B – Exploration Logs

Nobis
Engineering a Sustainable Future

BORING LOG

Project: Westbrook H2O Towers
Location: 1542 Boston Post Rd, Westbrook, CT
Nobis Project No.: 92790.00

Boring No.: NB-1
Boring Location: See Boring Location Plan
Checked by: R. Janeiro
Date Start: March 8, 2017
Date Finish: March 8, 2017

Contractor: New England Boring Contractors
Driller: Bub Thompson
Nobis Rep.: R. Janeiro

Rig Type / Model: ATV/ Acker Soil Scout
Hammer Type: Donut Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 47.5
Datum: NAVD 88

	Drilling Method	Sampler
Type	Flush Joint Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Standard Rotary	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 03/08/17	10:05	5	N/A	N/A	Wet Sample

Depth (ft.)	Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	REC % / RQD %	Drilling Rate (min/ft)	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	13	0-2	3						S-1 (4"): Dark Brown, TOPSOIL.	
2				4						S-1 (9"): Loose, brown, fine to coarse SAND and SILT, trace fine Gravel, very few organic fibers.	
3	S-2	18	2-4	5					FILL	S-2: Loose, brown, SILT and fine to medium SAND, trace fine Gravel, very few organic fibers. moist.	
4				2							
5	S-3	14	4-6	3			▼			S-3 (11"): Loose to medium dense, brown, fine to coarse SAND and SILT, trace fine Gravel, very few decomposed wood fragments. wet.	
6				3						S-3 (3"): Loose to medium dense, orange brown, fine to coarse SAND, little Silt. wet.	
7				3							
8				8							
9				21							
10	S-4	8	9-9.8	30/3"						S-4: Very dense (refusal), brown, fine to coarse SAND, trace Silt, few weathered rock fragments, with a piece of weathered rock in sample tip.	
11											
12											
13											
14									TILL		
15	S-5	19	14-15.8	50						S-5: Very dense (refusal), brown, fine to coarse SAND and GRAVEL, little Silt, few weathered rock fragments.	
16				52							
17				55							
18				50/4"							1
19											
20	S-6	8	19-19.8	42						S-6: Very dense (refusal), brown, fine to coarse SAND, little fine Gravel, little Silt.	
21				50/4"							
22											
23											2
24											
25	S-7	4	24-24.3	100/4"						S-7: Very dense (refusal), gray/ orange/ white, fine to coarse SAND and GRAVEL, trace Silt.	
26											
27											
28											
29									DECOMPOSED ROCK		
30	S-8	2	29-29.2	50/2"						S-8: Very dense (refusal), gray-white, fine to coarse GRAVEL and SAND, trace Silt.	
31											
32	C-1	12	31-36		20/0	2				C-1: Very Poor Quality, Soft, Extremely Weathered, gray-white, coarse grained, GNEISS.	
33						2					
34						3					
35						2					
36						2			11.5 / 36.0		
37										Boring terminated at 36 feet.	
38											
39											
40											

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Rig chatter observed from 17 to 31 feet below grade (fbg).
2) Driller notes increased drilling resistance at 22 fbg.

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

Nobis
Engineering a Sustainable Future

BORING LOG

Project: Westbrook H2O Towers
Location: 1542 Boston Post Rd, Westbrook, CT
Nobis Project No.: 92790.00

Boring No.: NB-2
Boring Location: See Boring Location Plan
Checked by: R. Janeiro
Date Start: March 8, 2017
Date Finish: March 8, 2017

Contractor: New England Boring Contractors
Driller: Bub Thompson
Nobis Rep.: R. Janeiro

Rig Type / Model: ATV/ Acker Soil Scout
Hammer Type: Donut Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 47
Datum: NAVD 88

	Drilling Method	Sampler
Type	Flush Joint Casing	Split-Spoon
Size ID (in.)	4	1-3/8
Advancement	Standard Rotary	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
03/09/17	00:00	Not Documented			

Depth (ft.)	Sample Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Graphic	Stratum Elev. / Depth (ft.)	Sample Description and Remarks (Classification System: Modified Burmister)	Notes
1	S-1	8	0-2	2				S-1 (3"): Very dense, dark brown, TOPSOIL. moist.	
2				36				S-1 (8"): Very dense, white-gray, pulverized coarse GRAVEL fragments, (inferred boulder), dry.	
3	S-2	0	2-2	35 28 60/0"			FILL	S-2: Very dense (refusal), No Recovery.	
4									
5	S-3	20	4-6	23				S-3: Very dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, with pulverized rock fragments at sample tip. wet.	
6				32					
7				53					
8				50					
9									
10	S-4	16	9-11	19				S-4: Dense, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel.	
11				15					
12				18 20			TILL		
13									
14									
15	S-5	19	14-16	13				S-5: Very dense, brown, fine to coarse SAND and SILT, trace fine Gravel.	
16				27					
17				44 65					
18									
19									
20	S-6	13	19-20.3	36				S-6: Very dense (refusal), white-brown-gray, fine to coarse SAND and GRAVEL, trace Silt.	2 3
21				88 100/3"					
22							DECOMPOSED ROCK		
23									
24									
25	S-7	14	24-25.8	43				S-7: Very dense, orange - gray, fine to coarse SAND and GRAVEL, little Silt.	
26				53 39			21.2 / 25.8		
27				50/4"				Boring terminated at 25.8 feet.	
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:
1) Groundwater not documented. Had to introduce water to drill through boulder.
2) Driller notes increased drilling resistance observed at 18.5 feet below grade (fbg).
3) Intermittent rig chatter observed from 19 fbg to end of exploration.

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Nobis — Engineering a Sustainable Future

Project: Westbrook H2O Towers
Location: 1542 Boston Post Rd, Westbrook, CT
Nobis Project No.: 92790.00

Boring No.: NP-1
Boring Location: See Boring Location Plan
Checked by: R. Janeiro
Date Start: March 8, 2017
Date Finish: March 8, 2017

Contractor: New England Boring Contractors
Driller: Bub Thompson
Nobis Rep.: R. Janeiro

Rig Type / Model: ATV/ Acker Soil Scout
Hammer Type: Donut Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 46.5
Datum: NAVD 88

	Drilling Method	Sampler
Type	N/A	Split-Spoon
Size ID (in.)	N/A	1-3/8
Advancement	N/A	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 03/08/17	00:00	3	NP-1	N/A	Wet Sample

Depth (ft.)	Sample Info: Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	Lithology: Graphic	Stratum Elev. / Depth (ft.)	Sample Description and Remarks (Classification System: Modified Burmister)	Notes
1	S-1	17	0-2	2				S-1 (4"): Loose, dark brown, TOPSOIL, with few stone process fragments.	
				3				S-1 (13"): Loose, dark brown, fine to coarse SAND and SILT, trace fine Gravel, very few organic fibers. moist.	
2				3			FILL		
				2					
3	S-2	18	2-4	2				S-2 (10"): Loose, brown, fine to coarse SAND, some fine Gravel, some Silt, very few organic fibers. moist.	
				2	▼			S-2 (4"): Loose, black, SILT, little fine Sand, very few organic fibers. moist.	
4				2			SILT	S-2 (4"): Loose, brown, fine to coarse SAND and SILT, trace fine Gravel. wet.	
				6					
5	S-3	19	4-6	18				S-3: Medium dense to dense, brown, fine to coarse SAND, some Silt, trace fine Gravel. wet.	
				16			TILL		
6				14					
				15			40.5 / 6.0		
7								Boring terminated at 6 feet.	
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

BORING LOG

Nobis — Engineering a Sustainable Future

Project: Westbrook H2O Towers
Location: 1542 Boston Post Rd, Westbrook, CT
Nobis Project No.: 92790.00

Boring No.: NP-2
Boring Location: See Boring Location Plan
Checked by: R. Janeiro
Date Start: March 8, 2017
Date Finish: March 8, 2017

Contractor: New England Boring Contractors
Driller: Bub Thompson
Nobis Rep.: R. Janeiro

Rig Type / Model: ATV/ Acker Soil Scout
Hammer Type: Donut Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 46.5
Datum: NAVD 88

	Drilling Method	Sampler
Type	N/A	Split-Spoon
Size ID (in.)	N/A	1-3/8
Advancement	N/A	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 03/08/17	00:00	4	NP-2	N/A	Wet Sample

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	12	0-2	3 2				S-1 (3"): Very loose, dark brown, TOPSOIL, with few stone process fragments. S-1 (9"): Very loose, dark brown, fine to coarse SAND and SILT, little fine Gravel, very few organic fibers. moist.	
2				2 3					
3	S-2	14	2-4	9 4			FILL	S-2 (10"): Loose, dark brown, fine to coarse SAND and SILT, little fine Gravel, very few organic fibers and decomposed wood fragments. moist. S-2 (4"): Loose, olive, fine to medium SAND and SILT, (mottled), very few organic fibers. moist.	
4				2 3	▼				
5	S-3	15	4-6	8 23			TILL	S-3: Dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. wet.	
6				24 24			40.5 / 6.0		
7								Boring terminated at 6 feet.	
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

Nobis
Engineering a Sustainable Future

BORING LOG

Project: Westbrook H2O Towers
Location: 1542 Boston Post Rd, Westbrook, CT
Nobis Project No.: 92790.00

Boring No.: NP-3
Boring Location: See Boring Location Plan
Checked by: R. Janeiro
Date Start: March 8, 2017
Date Finish: March 8, 2017

Contractor: New England Boring Contractors
Driller: Bub Thompson
Nobis Rep.: R. Janeiro

Rig Type / Model: ATV/ Acker Soil Scout
Hammer Type: Donut Hammer
Hammer Hoist: Rope & Cathead

Ground Surface Elev.: (+/-) 47
Datum: NAVD 88

	Drilling Method	Sampler
Type	N/A	Split-Spoon
Size ID (in.)	N/A	1-3/8
Advancement	N/A	140-lb Hammer

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time
▼ 03/08/17	00:00	4	NP-3	N/A	Wet Sample

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	16	0-2	2			FILL	S-1 (3"): Loose, dark brown, TOPSOIL, very few organic fibers.	
				2				S-1 (7"): Loose, brown, fine to coarse SAND, some fine to coarse Gravel, some Silt, very few organic fibers. moist.	
2				3				S-1 (6"): Loose, black, SILT, little fine to medium Sand, few organic fibers. moist.	
				6			SILT		
3	S-2	7	2-4	3				S-2: Medium dense, black, SILT, some fine to coarse Sand, very few organic fibers.	
				4					
4				15					
				27	▼		TILL	S-3: Very dense, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel, with a piece of fractured coarse gravel at top of sample.	
5	S-3	14	4-6	42					
				27					
6				24					
				24			41.0 / 6.0		
7								Boring terminated at 6 feet.	
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

APPENDIX C – Limitations

GEOTECHNICAL LIMITATIONS

Explorations and Subsurface Conditions

1. The analyses and design recommendations submitted in this report are based in part upon the data obtained from subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

   In preparing this report, Nobis relied on certain information provided by the Client and other parties referenced therein which were made available to Nobis at the time of our evaluation. Nobis did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the exploration logs.

3. Water level readings have been made in the explorations at times and under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors occurring since the time measurements were made. The water table encountered in the course of the work may differ from that indicated in the Report.

   Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

4. Nobis' geotechnical services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

Additional Services

5. Nobis recommends that we be retained to provide services during future site observations, design, implementation activities, construction and/or property development/ redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our recommendations, design concepts and/or opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design recommendations; and iv) assess the consequences of changes in technologies and/or regulations.

Use of Report

6. Nobis prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in our proposal and/or report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to Nobis.

   This report is for design purposes only and is not sufficient to prepare an accurate construction bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

7. Nobis' findings and conclusions are based on the work conducted as part of the scope of work set forth in our proposal and/or report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions considering the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the project design has been altered in any way, Nobis shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.

8. Nobis' services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Compliance with Codes and Regulations

9. Nobis used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Opinion of Cost

10. This report may contain or be based on comparative cost opinions for the purpose of evaluating alternative foundation schemes. These opinions may also involve approximate quantity evaluations. It should be noted that quantity estimates may not be accurate enough for construction bids. In addition, since we are not professional estimators of labor and materials cost, the evaluation of construction costs should be considered as approximate guidelines and could vary significantly from actual costs. Nobis does not guarantee the accuracy of our cost opinions as compared to contractor's bids for construction costs.

END OF LIMITATIONS

3

1 Fairholm Avenue
Peoria, IL 61603 USA
Phone 309-566-3000
FAX 309-566-3079

October 17, 2019

MCM Holdings LLC
Attn: Virginia King
40 Woodland Street
Hartford, CT. 06105

Reference: 130' Future 150' Tapered Steel Pole
Westbrook Permanent, Middlesex County, CT.

File Number: 231452

Copies	Drawing Number	Description
1	231452-01-D1R5	Design Drawing Sealed for the State of Connecticut
1	231452-01-F1R5	Foundation
1		Sealed Letter

Email Only: vking@mcmgmt.com

Sincerely,

JD Long

crp

1 Fairholm Avenue
Peoria, IL 61603 USA
Phone: (309)-566-3000
Fax: (309)-566-3079

DATE: OCTOBER 17, 2019

PURCHASER: MCM HOLDINGS LLC

PROJECT: 130 FT TAPERED STEEL POLE
WESTBROOK PERMANENT, CONNECTICUT

FILE NUMBER: 231452

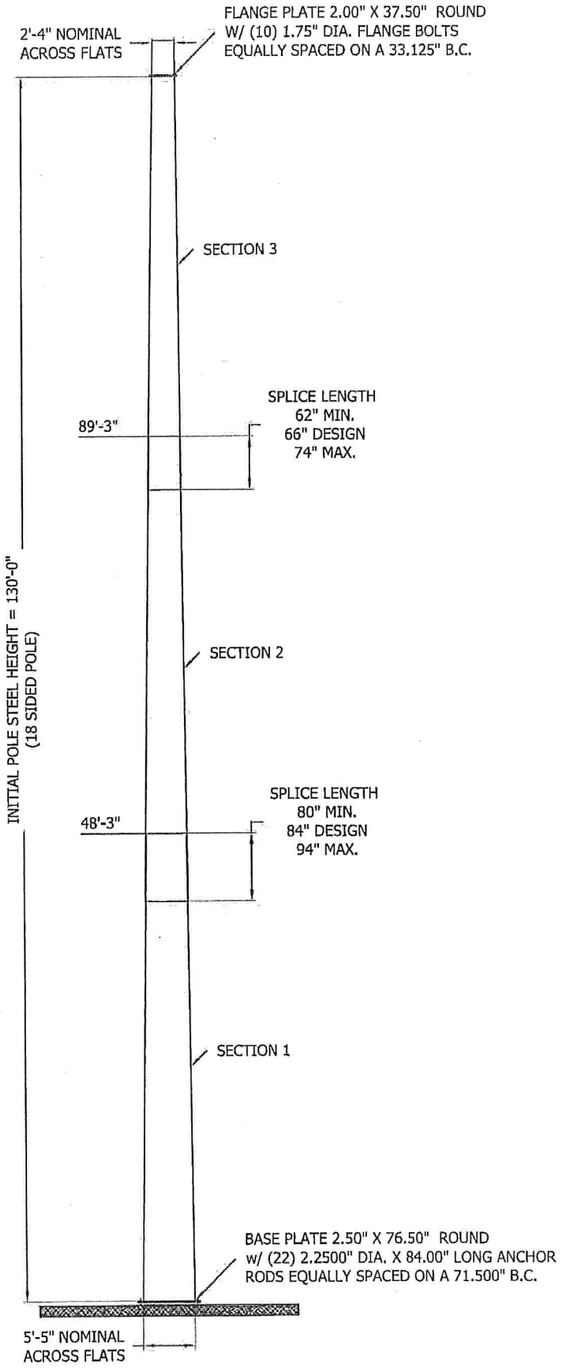
DRAWINGS: 231452-01-D1 R5, 231452-01-F1 R5

I CERTIFY THAT THE REFERENCED DRAWINGS WERE PREPARED UNDER MY SUPERVISION IN ACCORDANCE WITH THE DESIGN AND LOADING CRITERIA SPECIFIED BY THE PURCHASER AND THAT I AM A REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CONNECTICUT.

CERTIFIED BY: _____

DATE: 10/17/19

STATE OF CONNECTICUT
No. 20757
LICENSED
PROFESSIONAL ENGINEER



POLE DESIGN LOADING
DESIGN WIND LOAD PER ANSI/TIA-222-G & **2018 CONNECTICUT STATE BUILDING CODE** USING THE FOLLOWING DESIGN CRITERIA: ASCE 7-10 FACTORED WIND SPEED (NO ICE): 135 MPH BASIC WIND SPEED (WITH ICE): 50 MPH PER ASCE 7-10 DESIGN ICE THICKNESS: 0.75" PER ASCE 7-10 EXPOSURE CATEGORY: D STRUCTURE CLASSIFICATION: II TOPOGRAPHIC CATEGORY: 1 EARTHQUAKE SPECTRAL RESPONSE ACCELERATION, S_S: 0.167, S_1: 0.059
DESIGN PER ANSI/TIA-222-H & **2018 CONNECTICUT STATE BUILDING CODE**: RISK CATEGORY: II BASIC WIND SPEED (NO ICE): 135 MPH PER ASCE 7-16 BASIC WIND SPEED (W/ ICE): 50 MPH PER ASCE 7-16 DESIGN ICE THICKNESS: 1.0 INCHES PER ASCE 7-16 EXPOSURE CATEGORY: D TOPOGRAPHIC METHOD: 1, CATEGORY 1 GROUND ELEVATION, Z_S: 47 FT SEISMIC DESIGN PARAMETERS, S_S: 0.167, S_1: 0.059, T_L: 6, SITE CLASS: C THIS STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE FOLLOWING LOADS:

ELEVATION (FT)	ANTENNA TYPE	LINE SIZE (NOM)
TOP	LIGHTNING ROD	-
150 [FUTURE]	(1) OMNI [6 SQFT MAX EPA]	(1) 1-5/8"
146 [FUTURE[	(12) 8 FT PANELS, (6) RRU'S, & (3) RAYCAPS ON A LP PLATFORM	(3) 1-5/8"
136 [FUTURE]	(12) 8 FT PANELS, (6) RRU'S, & (3) RAYCAPS ON A LP PLATFORM	(3) 1-5/8"
130	(1) PCTEL 430-470	(1) 7/8"
126	(9) NHH-65B-R2B, (3) UHBA, (3) UHFA, (3) UHIE, & (2) RAAYCAPS ON LP PLATFORM	(9) 1-5/8"
116	(6) EPBQ-654L8H8-L2, (3) HPA-65R-BU8A (1) 4426 B66, (1) 4415 B30, (1) 4449 B5/B12, (1) 4415 B25, (1) 4478 B14, (1) RRUS E2, & (3) RAYCAPS ON A LP PLATFORM	(8) 3/4"
106	(3) AIR32 KRD901146-1 B66A, (3) APXVAARR24-43-U-NA20, & (3) 4449 B12/B71 ON A LP PLATFORM	(3) 1-5/8"
96 (FUTURE)	(12) 8 FT PANELS, (6) RRU'S, & (3) RAYCAPS ON A LP PLATFORM	(3) 1-5/8"

GENERAL NOTES:

1. ROHN PRODUCTS POLE DESIGNS CONFORM TO ANSI/TIA-222-G/H UNLESS OTHERWISE SPECIFIED UNDER POLE DESIGN LOADING.
2. THE DESIGN LOADING CRITERIA INDICATED HAS BEEN PROVIDED TO ROHN. THE DESIGN LOADING CRITERIA HAS BEEN ASSUMED TO BE BASED ON SITE-SPECIFIC DATA IN ACCORDANCE WITH ANSI/TIA-222-G/H AND MUST BE VERIFIED BY OTHERS PRIOR TO INSTALLATION.
3. ANTENNAS AND LINES LISTED IN POLE DESIGN LOADING TABLE ARE PROVIDED BY OTHERS UNLESS OTHERWISE SPECIFIED.
4. STEP BOLTS AND SAFETY CLIMB SYSTEM ARE PROVIDED AS A CLIMBING FACILITY FOR THE INSTALLATION OF THE STRUCTURE.
5. POLE MEMBER DESIGN DOES NOT INCLUDE STRESSES DUE TO ERECTION SINCE ERECTION EQUIPMENT AND CONDITIONS ARE UNKNOWN. DESIGN ASSUMES COMPETENT AND QUALIFIED PERSONNEL WILL ERECT THE POLE.
6. WORK SHALL BE IN ACCORDANCE WITH ANSI/TIA-222-G/H, "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES".
7. FIELD CONNECTIONS SHALL BE BOLTED. NO FIELD WELDS SHALL BE ALLOWED.
8. STRUCTURAL BOLTS SHALL CONFORM TO GRADE A325 PER ASTM F3125, EXCEPT WHERE NOTED.
9. A NUT LOCKING DEVICE SHALL BE PROVIDED FOR ALL STRUCTURAL BOLTS ON THE POLE.
10. STRUCTURAL STEEL AND CONNECTION BOLTS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ANSI/TIA-222-G/H.
11. ALL HIGH STRENGTH BOLTS ARE TO BE TIGHTENED TO A "SNUG TIGHT" CONDITION AS DEFINED IN THE RCSC "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS". NO OTHER MINIMUM BOLT TENSION OR TORQUE VALUES ARE REQUIRED.
12. PURCHASER SHALL VERIFY THE INSTALLATION IS IN CONFORMANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS FOR OBSTRUCTION MARKING AND LIGHTING.
13. TOLERANCE ON POLE STEEL HEIGHT IS EQUAL TO PLUS 1% OR MINUS 1/2%.
14. DESIGN ASSUMES THAT, AS A MINIMUM, MAINTENANCE AND INSPECTION WILL BE PERFORMED OVER THE LIFE OF THE STRUCTURE IN ACCORDANCE WITH ANSI/TIA-222-G/H.
15. DESIGN ASSUMES LEVEL GRADE AT POLE SITE.
16. FOUNDATIONS SHALL BE DESIGNED TO SUPPORT THE REACTIONS SHOWN FOR THE CONDITIONS EXISTING AT THE SITE.
17. DESIGN ASSUMES ALL TRANSMISSION LINES ARE ROUTED INTERNALLY.
18. POLE SHAFT CONFORMS TO ASTM A572 GR 65. POLE BASE PLATE AND TOP PLATE STEEL CONFORMS TO ASTM A572 GR 50. POLE ANCHOR BOLTS CONFORM TO ASTM A615 GR 75.
19. POLE DESIGN INCLUDES A FUTURE 20 FT EXTENSION TO 150 FT WITH FUTURE ANTENNA LOADING AND LINES.
20. POLE DESIGN INCLUDES CONSIDERATION OF A CONTAINED FALL RADIUS EQUAL TO 43 FEET BY PROVIDING STRONGER SECTIONS THAN REQUIRED BY ANALYSIS IN THE LOWER PORTION OF THE POLE.

MAXIMUM ADJUSTED FACTORED REACTIONS	
DOWNLOAD =	140.7 KIPS
SHEAR =	84.8 KIPS
O.T.M. =	9230.4 FT-KIPS

SECTION SCHEDULE

SECTION	LENGTH (FT)	DIAMETER		WALL THICK (IN)	Fy (KSI)	WEIGHT (KIPS)
		BOT	TOP			
3	46.29	41.53	28.00	0.3125	65.0	5.7
2	48.00	53.78	39.06	0.6250	65.0	15.8
1	48.21	65.00	50.22	0.7500	65.0	23.6

FOR POLYGONAL POLES, DIAMETER IS MEASURED ACROSS FLATS.

NOTE: TABULATED WEIGHTS ARE APPROXIMATE. REFER TO ASSEMBLY DRAWING FOR FINAL WEIGHTS. ALL WEIGHTS SHALL BE VERIFIED PRIOR TO LIFTING.

FILE NO.
231452

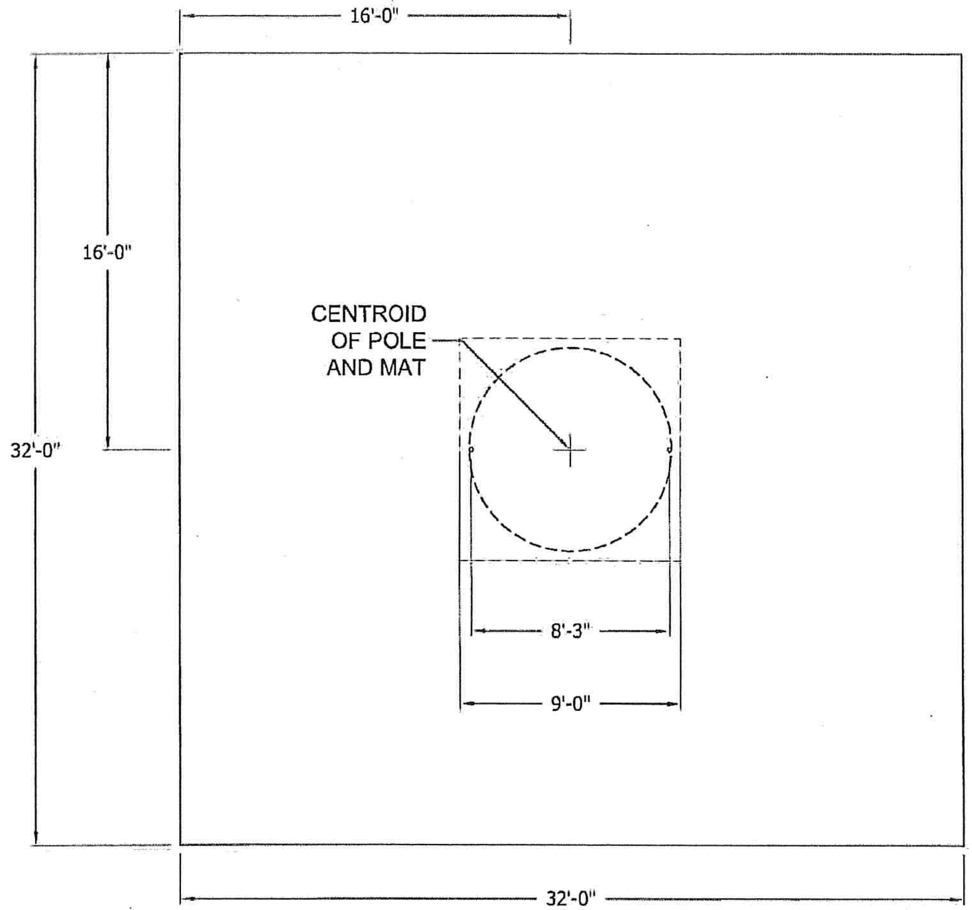
REVISIONS

REV.	DESCRIPTION	DWN	CHK	APP
5	ADDED 43 FT FALL RADIUS; REVISED POLE DESIGN DATE: 10/15/2019	SWG	HA	HA

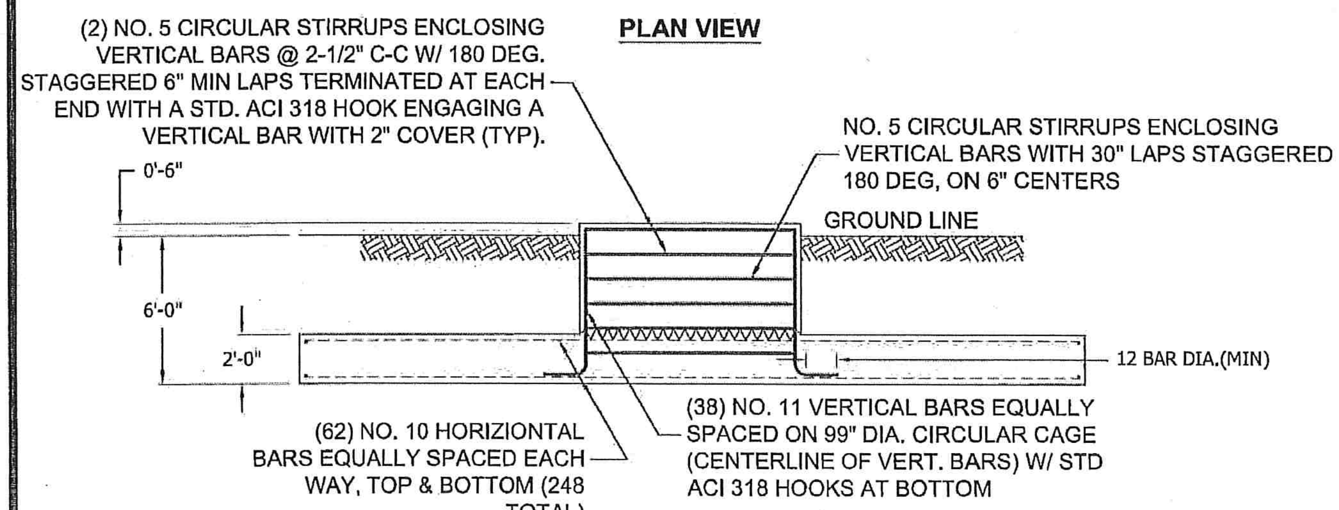
ROHN® PRODUCTS LLC
PO BOX 5999
PEORIA, IL 61601-5999
TOLL FREE 800-727-ROHN

MCM HOLDINGS LLC
DESIGN PROFILE
130' TAPERED STEEL POLE
WESTBROOK PERMANENT, CT

DWN:	CHK'D:	DATE:
AS	HA	8/30/2019
ENG'R: HA	SHEET #: 1 OF 1	
PRJ. ENG'R: AS	PRJ. MANG'R:	
DRAWING NO: 231452-01-D1		REV: 5



PLAN VIEW



ELEVATION VIEW

FACTORED REACTIONS

O.T.M. =	9,230.4 FT-K
DOWNLOAD =	140.7 KIPS
SHEAR =	84.8 KIPS

CONCRETE VOLUME

SQUARE PIER	13.5	CU.YDS
PAD	75.9	CU.YDS
TOTAL	89.4	CU.YDS

GENERAL NOTES

1. FOUNDATION DESIGN HAS BEEN DEVELOPED IN ACCORDANCE WITH GENERALLY ACCEPTED PROFESSIONAL ENGINEERING PRINCIPLES AND PRACTICES WITHIN THE LIMITS OF THE SUBSURFACE DATA PROVIDED. FOUNDATION DESIGN MODIFICATIONS MAY BE REQUIRED IN THE EVENT THE FOLLOWING DESIGN PARAMETERS ARE NOT APPLICABLE FOR THE SUBSURFACE CONDITIONS ENCOUNTERED.

A) ULTIMATE SOIL BEARING PRESSURE AT 6 FT DEPTH = 12,000 PSF.

B) GROUND WATER TABLE IS AT 4.0 FT BELOW GRADE.

C) MAXIMUM FROST PENETRATION DEPTH LESS THAN FOUNDATION DEPTH.

2. WORK SHALL BE IN ACCORDANCE WITH THE PROJECT CONSTRUCTION DOCUMENTS, LOCAL CODES, SAFETY REGULATIONS AND UNLESS OTHERWISE NOTED, THE LATEST REVISION OF ACI 318, "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE". PROCEDURES FOR THE PROTECTION OF EXCAVATIONS, EXISTING CONSTRUCTION AND UTILITIES SHALL BE ESTABLISHED PRIOR TO FOUNDATION INSTALLATION.

3. CONCRETE MATERIALS SHALL CONFORM TO THE APPROPRIATE STATE REQUIREMENTS FOR EXPOSED STRUCTURAL CONCRETE.

4. PROPORTIONS OF CONCRETE MATERIALS SHALL BE SUITABLE FOR THE INSTALLATION METHOD UTILIZED AND SHALL RESULT IN DURABLE CONCRETE FOR RESISTANCE TO LOCAL ANTICIPATED AGGRESSIVE ACTIONS. THE DURABILITY REQUIREMENTS OF ACI 318 SHALL BE SATISFIED BASED ON THE CONDITIONS EXPECTED AT THE SITE. AS A MINIMUM, CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4,500 PSI IN 28 DAYS.

5. MAXIMUM SIZE OF AGGREGATE SHALL NOT EXCEED SIZE SUITABLE FOR INSTALLATION METHOD UTILIZED OR 3/4 CLEAR DISTANCE BEHIND OR BETWEEN REINFORCING. WORKABILITY AND METHODS OF CONSOLIDATION SUCH AS VIBRATING SHALL BE UTILIZED TO PREVENT HONEYCOMBS OR VOIDS.

6. REINFORCEMENT SHALL BE DEFORMED AND CONFORM TO THE REQUIREMENTS OF ASTM A615 GRADE 60 UNLESS OTHERWISE NOTED. SPLICES IN REINFORCEMENT SHALL NOT BE ALLOWED UNLESS OTHERWISE INDICATED.

7. WELDING IS PROHIBITED ON REINFORCING STEEL AND EMBEDMENTS.

8. MINIMUM CONCRETE COVER FOR REINFORCEMENT SHALL BE 3 INCHES UNLESS OTHERWISE NOTED. APPROVED SPACERS SHALL BE USED TO INSURE A 3 INCH MINIMUM COVER ON REINFORCEMENT.

9. CONCRETE COVER FROM TOP OF FOUNDATION TO ENDS OF VERTICAL REINFORCEMENT SHALL NOT EXCEED 3 INCHES NOR BE LESS THAN 2 INCHES.

10. FOUNDATION DESIGN ASSUMES STRUCTURAL BACKFILL TO BE COMPACTED IN 8 INCH MAXIMUM LAYERS TO 95% OF MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT IN ACCORDANCE WITH ASTM D1557. ADDITIONALLY, STRUCTURAL BACKFILL MUST HAVE A MINIMUM COMPACTED UNIT WEIGHT OF 110 POUNDS PER CUBIC FOOT.

11. FOUNDATION DESIGN HAS BEEN BASED ON GEOTECHNICAL REPORT NO. **92790.00** DATED **3/18/2017** BY **NOBIS ENGINEERING, INC.**

12. FOUNDATION DEPTH INDICATED IS BASED ON THE GRADE LINE DESCRIBED IN THE REFERENCED GEOTECHNICAL REPORT. FOUNDATION MODIFICATION MAY BE REQUIRED IN THE EVENT CUT OR FILL OPERATIONS HAVE TAKEN PLACE SUBSEQUENT TO THE GEOTECHNICAL INVESTIGATION.

13. FOUNDATION DESIGN ASSUMES THE RECOMMENDATIONS IN THE REFERENCED GEOTECHNICAL REPORT CONCERNING VERIFICATION OF SUBSURFACE CONDITIONS ARE IMPLEMENTED PRIOR TO PLACEMENT OF CONCRETE.

14. FOUNDATION INSTALLATION SHALL BE SUPERVISED BY PERSONNEL KNOWLEDGEABLE AND EXPERIENCED WITH THE PROPOSED FOUNDATION TYPE. CONSTRUCTION SHALL BE IN ACCORDANCE WITH GENERALLY ACCEPTED INSTALLATION PRACTICES.

15. ALL CONSTRUCTION AND SAFETY EQUIPMENT AND TEMPORARY SUPPORTS REQUIRED FOR CONSTRUCTION SHALL BE DETERMINED, FURNISHED AND INSTALL BY THE CONTRACTOR BASED ON THE MEANS AND METHODS CHOSEN BY THE CONTRACTOR. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED BY COMPETENT, QUALIFIED AND TRAINED PERSONNEL.

16. FOUNDATION DESIGN ASSUMES INSTALLATION PROCEDURES WILL INCORPORATE THE PROCEDURES RECOMMENDED IN THE REFERENCED GEOTECHNICAL REPORT.

17. FOUNDATION DESIGN ASSUMES FIELD INSPECTIONS WILL BE PERFORMED TO VERIFY THAT CONSTRUCTION MATERIALS, INSTALLATION METHODS AND ASSUMED DESIGN PARAMETERS ARE ACCEPTABLE BASED ON CONDITIONS EXISTING AT THE SITE.

18. FOR FOUNDATION AND ANCHOR TOLERANCES SEE ANCHOR ROD LAYOUT DRAWING.

19. LOOSE MATERIAL SHALL BE REMOVED FROM BOTTOM OF EXCAVATION PRIOR TO CONCRETE PLACEMENT. SIDES OF EXCAVATION SHALL BE ROUGH AND FREE OF LOOSE CUTTINGS.

20. CONCRETE SHALL BE PLACED IN A MANNER THAT WILL PREVENT SEGREGATION OF CONCRETE MATERIALS, INFILTRATION OF WATER OR SOIL AND OTHER OCCURRENCES WHICH MAY DECREASE THE STRENGTH OR DURABILITY OF THE FOUNDATION.

21. CONCRETE PREFERABLY SHALL BE PLACED AGAINST UNDISTURBED SOIL. WHEN FORMS ARE NECESSARY, THEY SHALL BE REMOVED PRIOR TO PLACING STRUCTURAL BACKFILL.

22. CONSTRUCTION JOINTS, IF REQUIRED AT THE BASE OF THE PIERS, SHALL BE INTENTIONALLY ROUGHENED TO A FULL AMPLITUDE OF 1/4 INCH. FOUNDATION DESIGN ASSUMES NO OTHER CONSTRUCTION JOINTS.

23. TOP OF FOUNDATION SHALL BE SLOPED TO DRAIN WITH A FLOATED FINISH.

24. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" X 3/4" MINIMUM.

NOTE: SEE STRUCTURE ASSEMBLY DRAWING FOR FOUNDATION LAYOUT AND ANCHORAGE EMBEDMENT DRAWING NUMBER.

FILE NO. 231452

REVISIONS

REV	DESCRIPTION	DWN	CHK	APP
5	POLE REVISED TO MEET FALL RADIUS REQ. DATE: 10/17/2019	SWG	HA	HA

ROHN® PRODUCTS LLC
PO BOX 5999
PEORIA, IL 61601-5999
TOLL FREE 800-727-ROHN

MCM HOLDINGS LLC
MAT W/RAISED PIER
FOUNDATION DESIGN
WESTBROOK PERMANENT, CT

DWN: AS	CHK'D: HA	DATE: 8/30/2019
ENG'R: HA	SHEET #: 1 OF 1	
PRJ. ENG'R: AS	PRJ. MANG'R:	
DRAWING NO: 231452-01-F1	REV: 5	

ROHN™
Products LLC

1 Fairholm Avenue
Peoria, IL 61603 USA
Phone 309-566-3000
FAX 309-566-3079
Toll Free 800-727-ROHN

October 17, 2019

MCM Holdings
40 Woodland St
Hartford, CT 06105

Attn: Virginia King

Reference: 130' Tapered Steel Pole
Site Name: Westbrook Permanent
Middlesex County, CT
File # 231452

Dear Ms. King

The referenced pole is designed to meet the specified loading requirements in accordance with ANSI/TIA-222-G & H for a 135 MPH ASCE 7-16 Factored wind speed with no ice and a 50 MPH 3-second gust wind speed with 1.0 inch radial ice, Structure Class: II; Exposure Category: D and Topographic Category: 1.

It is our understanding that the design of the referenced pole requires consideration of a contained fall radius in the event that a catastrophic wind speed would result in collapse. Although the pole is not designed to fail, stronger sections than required by analysis is provided in the lower sections of the pole. This will result in an increased safety factor in the lower sections. This design enables the pole to fail through a combination of bending and buckling in the upper portion of the pole under a catastrophic wind loading. Failure in this manner will result in the upper portion of the pole folding over the lower portion, resulting in a fall radius no greater than **43** ft. The failure mode will theoretically be a local buckling failure involving a crippling of the pole wall on one side of the pole as opposed to the pole shearing off or completely breaking off and hitting the ground.

Please contact us at your convenience should you have further questions concerning the safety of pole structures or other aspects of pole design.

Sincerely,

Habib Azouri, P.E.
Engineering Manager

cc: JD Long

TowerSoft ENGINEERING SOFTWARE

TSTower - v 5.8.5 Tower Analysis Program
(c) 1997-2019 TowerSoft www.TSTower.com

ROHN Products

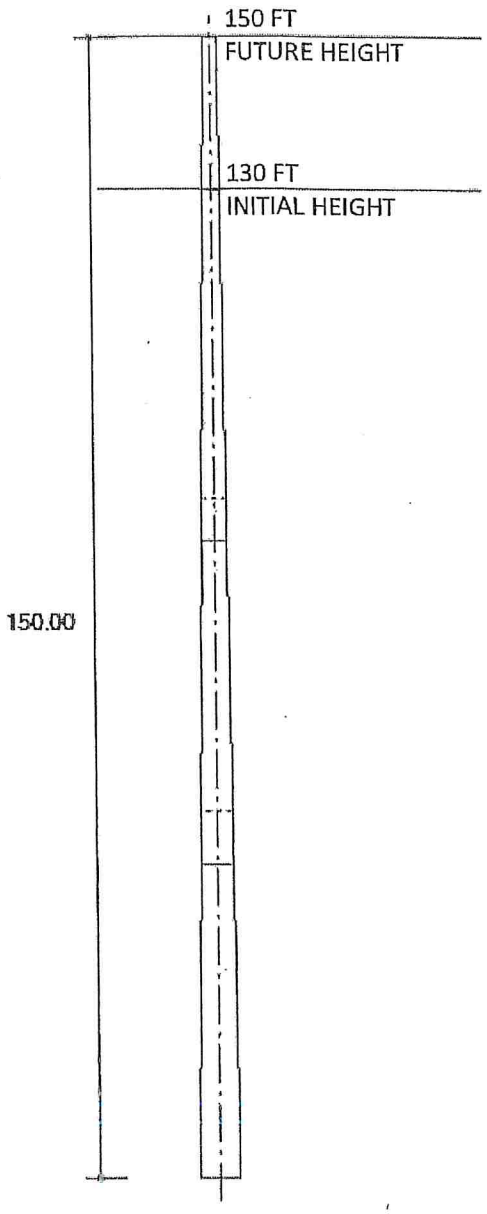
Licensed to: ROHN Products LLC
Peoria, IL

File: W:\Jobs\2019\231452\231452 REV H R5.out
Contract: 231452
Project: 130 FT OF 150 FT TSP
Date and Time: 10/17/2019 9:46:26 AM

Revision: 4
Site: WESTBROOK PERMANENT- CT
Engineer: AS HA

DESIGN SPECIFICATION

Sct	Length (ft)	Overlap (ft)	Top Dia. (in)	Bot Dia. (in)	Thick. (in)	
4	20.00	0.00	22.00	28.00	0.2500	(FUTURE)
3	46.29	0.00	28.00	41.84	0.3125	
2	48.00	5.50	39.57	53.93	0.6250	
1	48.21	7.00	50.58	65.00	0.7500	



MAXIMUM BASE REACTIONS

		ADJUSTED REACTIONS
Download (Kips)	124.1	140.7
Shear (Kips)	74.8	84.8
Moment (Kipsft)	8140.3	9230.4

Section A: PROJECT DATA

Project Title:	130 FT OF 150 FT TSP
Customer Name:	MCM HOLDINGS LLC
Site:	WESTBROOK PERMANENT- CT
Contract No.:	231452
Revision:	4
Engineer:	AS
Date:	Oct 17 2019
Time:	09:46:07 AM

Design Standard: ANSI/TIA-222-H-2017

GENERAL DESIGN CONDITIONS

Start wind direction:	0.00 (Deg)
End wind direction:	315.00 (Deg)
Increment wind direction:	45.00 (Deg)
Elevation above ground:	0.00(ft)
Gust Response Factor Gh:	1.10
Structure class:	II
Exposure category:	D
Topographic category:	1
Material Density:	490.1(lbs/ft^3)
Young's Modulus:	29000.0(ksi)
Poisson Ratio:	0.30
Weight Multiplier:	1.06

WIND ONLY CONDITIONS:

Basic Wind Speed (No Ice):	135.00(mph)
Directionality Factor Kd:	0.95
Importance Factor I:	1.00
Wind Load Factor:	1.00
Dead Load Factor:	1.20

WIND AND ICE CONDITIONS:

Basic Wind Speed (With Ice):	50.00(mph)
Directionality Factor Kd:	0.95
Wind Load Importance Factor Iw:	1.00
Ice Thickness Importance Factor Ii:	1.00
Ice Thickness:	1.00(in)
Ice Density:	56.19(lbs/ft^3)
Wind Load Factor:	1.00
Dead Load Factor:	1.20
Ice Load Factor:	1.00

WIND ONLY SERVICEABILITY CONDITIONS:

Serviceability Wind Speed:	60.00(mph)
Directionality Factor Kd:	0.85
Importance Factor I:	1.00
Wind Load Factor:	1.00
Dead Load Factor:	1.00

EARTHQUAKE CONDITIONS:

Site class definition:	C
Spectral response acceleration Ss:	0.167
Spectral response acceleration S1:	0.059
Accelaration-based site coefficient Fa:	1.300
Velocity-based site coefficient Fv:	1.500
Design spectral response acceleration Sds:	0.145
Design spectral response acceleration Sd1:	0.059
Seismic analysis method:	1
Fundamental frequency of structure f1:	0.578

Total seismic shear Vs (Kips) : 2.12

Analysis performed using: TowerSoft Finite Element Analysis Program

Section B: STRUCTURE GEOMETRY

Total Height (ft)	Bottom Diameter (in)	Top Diameter (in)
150.00	65.00	22.00

Sect. No	Length (ft)	Overlap (ft)	Bot Dia. (in)	Top Dia. (in)	Thick. (in)	Sides	Joint Type	Yield Stress (ksi)	Mass (lbs)	Calculated Taper (in/ft)	Corner Radius (in)
4	20.00	0.00	28.00	22.00	0.2500	18-sided	Flange	65.0	1416.8	0.30000	1.88
3	46.29	0.00	41.84	28.00	0.3125	18-sided	Telescopic	65.0	5731.9	0.29904	1.88
2	48.00	5.50	53.93	39.57	0.6250	18-sided	Telescopic	65.0	15842.8	0.29904	2.50
1	48.21	7.00	65.00	50.58	0.7500	18-sided	Flange	65.0	23613.9	0.29904	2.50
Total Mass:									46605.4		

Section D: TRANSMISSION LINE DATA

Transmission Lines Position

No.	Bot El (ft)	Top El (ft)	Desc.	Radius (ft)	Az.	Orient.	No.	Shielded	Shielded Lines	Antenna
1	0.00	150.00	3/8" CABLE	3.00	0.00	0.00	1	No	0	
2	0.00	150.00	LDF7P-50A	0.00	0.00	0.00	1	Yes	1	
3	0.00	146.00	LDF7P-50A	0.00	0.00	0.00	3	Yes	3	
4	0.00	136.00	LDF7P-50A	0.00	0.00	0.00	3	Yes	3	
5	0.00	130.00	LDF5P-50A	0.00	0.00	0.00	1	Yes	1	
6	0.00	126.00	LDF7P-50A	0.00	0.00	0.00	9	Yes	9	
7	0.00	116.00	LDF5P-50A	0.00	0.00	0.00	8	Yes	8	
8	0.00	106.00	LDF7P-50A	0.00	0.00	0.00	3	Yes	3	
9	0.00	96.00	LDF7P-50A	0.00	0.00	0.00	3	Yes	3	

Transmission Lines Details

No.	Desc.	Width (in)	Depth (in)	Unit Mass (lb/ft)
1	3/8" CABLE	0.38	0.38	1.00
2	LDF7P-50A	2.01	2.01	0.92
3	LDF7P-50A	2.01	2.01	0.92
4	LDF7P-50A	2.01	2.01	0.92
5	LDF5P-50A	1.10	1.10	0.33
6	LDF7P-50A	2.01	2.01	0.92
7	LDF5P-50A	1.10	1.10	0.33
8	LDF7P-50A	2.01	2.01	0.92
9	LDF7P-50A	2.01	2.01	0.92

Utilization of the cross-section for TX Lines: 7.24%

Section F: POINT LOAD DATA

Structure Azimuth from North:0.00

POINT LOADS

No.	Description	Elev. (ft)	Radius (ft)	Azim. (Deg)	Orient. (Deg)	Vertical Offset (ft)	Tx Line	Comments
1	LIGHTNING ROD	150.00	0.00	0.0	0.0	0.00		
2	(1) OMNI [6 SQFT]	150.00	0.00	0.0	0.0	0.00		
3	CARRIER	146.00	1.00	0.0	0.0	0.00		
4	CARRIER	136.00	1.00	120.0	120.0	0.00		
5	(1) 430-470	130.00	1.00	0.0	0.0	0.00		
6	CARRIER	126.00	1.00	240.0	240.0	0.00		
7	CARRIER	116.00	1.00	0.0	0.0	0.00		
8	CARRIER	106.00	1.00	120.0	120.0	0.00		
9	CARRIER	96.00	1.00	240.0	240.0	0.00		

POINT LOADS WIND AREAS AND WEIGHTS

No.	Description	Frontal Bare Area (ft^2)	Lateral Bare Area (ft^2)	Frontal Iced Area (ft^2)	Lateral Iced Area (ft^2)	Weight Bare (Kips)	Weight Iced (Kips)	Gh
1	LIGHTNING ROD	1.00	1.00	2.00	2.00	0.10	0.20	1.10
2	(1) OMNI [6 SQFT]	6.00	6.00	12.00	12.00	0.10	0.20	1.10
3	CARRIER	138.00	138.00	206.50	206.50	3.60	8.90	1.10
4	CARRIER	138.00	138.00	206.50	206.50	3.60	8.90	1.10
5	(1) 430-470	1.50	1.50	3.00	3.00	0.05	0.10	1.10
6	CARRIER	97.00	97.00	154.00	154.00	3.35	8.60	1.10
7	CARRIER	132.50	132.50	193.50	193.50	3.30	7.65	1.10
8	CARRIER	83.00	83.00	131.50	131.50	3.30	7.70	1.10
9	CARRIER	138.00	138.00	206.50	206.50	3.60	8.90	1.10

Section H: STRUCTURE DISPLACEMENT DATA

Load Combination: Wind Only - Serviceability

Wind Direction: Maximum displacements

Elev. (ft)	N-S Disp (in)	W-E Disp (in)	Vert.Disp (in)	N-S Rot (deg)	W-E Rot (deg)	Twist Rot (deg)
150.00	-16.5	16.6	-0.1	1.06	1.06	0.01
146.67	-15.8	15.8	-0.1	1.06	1.06	0.01
143.33	-15.1	15.1	-0.1	1.06	1.06	0.01
140.00	14.3	14.3	-0.1	1.05	1.05	0.01
136.67	13.6	13.6	-0.1	1.04	1.04	0.01
133.33	12.9	12.9	-0.1	1.03	1.02	-0.01
130.00	12.2	12.2	-0.1	1.01	1.00	0.00
121.84	10.5	10.5	-0.1	0.95	0.95	0.00
113.68	8.9	8.9	-0.1	0.89	0.88	0.00
105.53	7.5	7.5	0.0	0.80	-0.80	0.00
97.37	6.2	-6.2	0.0	0.71	-0.71	0.00
89.21	5.1	-5.1	0.0	-0.61	-0.61	0.00
83.71	4.4	-4.4	0.0	-0.54	-0.54	0.00
76.61	3.6	-3.6	0.0	-0.49	-0.49	0.00
69.51	3.0	-2.9	0.0	-0.43	-0.43	0.00
62.41	2.3	-2.3	0.0	-0.38	-0.38	0.00
55.31	1.8	-1.8	0.0	-0.33	-0.33	0.00
48.21	1.4	-1.4	0.0	-0.28	-0.28	0.00
41.21	1.0	-1.0	0.0	-0.23	-0.23	0.00
34.34	0.7	-0.7	0.0	-0.19	-0.19	0.00
27.47	0.4	-0.4	0.0	-0.15	-0.15	0.00
20.61	0.2	-0.2	0.0	-0.11	-0.11	0.00
13.74	0.1	-0.1	0.0	-0.07	-0.07	0.00
6.87	0.0	0.0	0.0	-0.04	-0.04	0.00
0.00	0.0	0.0	0.0	0.00	0.00	0.00

Section K: POLE OUTPUT LOAD DATA

Load Combination: Max Envelope
Wind Direction: Maximum

Elev. (ft)	Axial Ld. (kips)	Shear Ld. (kips)	Torque (kipsft)	Bend Mom. (kipsft)
150.00	0.63	0.71	0.00	0.00
146.67	0.63	0.71	0.00	2.36
146.67	8.68	9.56	8.52	8.37
143.33	8.68	9.56	8.52	37.38
143.33	11.01	12.04	10.65	38.22
140.00	11.01	12.04	10.65	78.35
140.00	11.44	12.39	10.64	78.33
136.67	11.44	12.39	10.64	119.24
136.67	19.55	21.17	9.70	118.87
133.33	19.55	21.17	9.69	189.46
133.33	21.94	23.65	10.24	189.67
130.00	21.94	23.65	10.23	268.52
130.00	27.75	28.20	6.67	266.51
121.84	27.75	28.20	6.66	495.15
121.84	36.21	35.59	5.13	494.01
113.68	36.21	35.59	5.12	783.66
113.68	44.35	43.95	11.35	786.17
105.53	44.35	43.95	11.36	1143.96
105.53	54.07	50.74	11.64	1144.19
97.37	54.07	50.74	11.64	1555.56
97.37	64.06	59.90	4.36	1552.70
89.21	64.06	59.90	4.37	2040.53
89.21	67.44	62.36	3.55	2040.83
83.71	67.44	62.36	3.55	2383.55
83.71	70.76	63.26	3.54	2383.70
76.61	70.76	63.26	3.55	2830.74
76.61	75.01	64.34	3.54	2830.90
69.51	75.01	64.34	3.55	3285.63
69.51	78.42	65.39	3.54	3285.77
62.41	78.42	65.39	3.54	3750.09
62.41	81.98	66.44	3.54	3750.21
55.31	81.98	66.44	3.54	4219.90
55.31	85.68	67.49	3.54	4220.00
48.21	85.68	67.49	3.54	4699.43
48.21	89.49	68.53	3.54	4699.52
41.21	89.49	68.53	3.54	5177.48
41.21	95.56	69.59	3.54	5177.55
34.34	95.56	69.59	3.54	5653.85
34.34	101.99	70.60	3.54	5653.91
27.47	101.99	70.60	3.54	6139.62
27.47	106.67	71.56	3.54	6139.66
20.61	106.67	71.56	3.54	6629.71
20.61	111.49	72.47	3.54	6629.74
13.74	111.49	72.47	3.54	7126.22
13.74	116.45	73.36	3.54	7126.23
6.87	116.45	73.36	3.54	7631.37
6.87	121.54	74.24	3.54	7631.30
0.00	121.54	74.24	3.54	8140.29
Base	124.10	74.82	3.54	8140.30

File: W:\Jobs\2019\231452\231452 REV H R5.out
Contract: 231452
Project: 130 FT OF 150 FT TSP
Date and Time: 10/17/2019 9:46:26 AM

Revision: 4
Site: WESTBROOK PERMANENT- CT
Engineer: AS

Section L: STRENGTH ASSESSMENT DATA

Load Combination: Max Envelope
Wind Direction: Maximum

Elev. (ft)	Axial Ld. (kips)	Axial Cap (kips)	Moment (kipsft)	Mom. Cap (kipsft)	Assess.
150.00	0.63	1282.19	0.00	571.60	0.000
146.67	0.63	1341.14	2.36	625.68	0.002
146.67	8.68	1341.14	8.37	625.68	0.020
143.33	8.68	1400.09	37.38	682.19	0.029
143.33	11.01	1400.09	38.22	682.19	0.060
140.00	11.01	1459.04	78.35	741.16	0.110
140.00	11.44	1459.04	78.33	741.16	0.110
136.67	11.44	1511.26	119.24	799.01	0.153
136.67	19.55	1511.26	118.87	799.01	0.157
133.33	19.55	1554.11	189.46	853.87	0.230
133.33	21.94	1554.11	189.67	853.87	0.231
130.00	21.94	1595.77	268.52	909.83	0.304
130.00	27.75	2040.26	266.51	1158.08	0.239
121.84	27.75	2220.03	495.15	1372.36	0.369
121.84	36.21	2220.03	494.01	1372.36	0.371
113.68	36.21	2381.85	783.66	1592.82	0.502
113.68	44.35	2381.85	786.17	1592.82	0.507
105.53	44.35	2509.68	1143.97	1805.20	0.646
105.53	54.07	2509.68	1144.19	1805.20	0.650
97.37	54.07	2630.46	1555.56	2025.08	0.783
97.37	64.06	2630.46	1552.70	2025.08	0.786
89.21	64.06	2744.19	2040.53	2251.40	0.924
89.21	67.44	2744.19	2040.83	2251.40	0.926
83.71	70.76	5982.43	2383.70	4958.82	0.488
76.61	70.76	6295.34	2830.74	5495.14	0.522
76.61	75.01	6295.34	2830.90	5495.14	0.523
69.51	75.01	6608.25	3285.63	6059.01	0.550
69.51	78.42	6608.25	3285.78	6059.01	0.550
62.41	78.42	6921.16	3750.09	6650.41	0.571
62.41	81.98	6921.16	3750.21	6650.41	0.572
55.31	81.98	7234.07	4219.90	7269.37	0.588
55.31	85.68	7234.07	4220.01	7269.37	0.589
48.21	85.68	7546.98	4699.43	7915.86	0.602
48.21	89.49	7546.98	4699.52	7915.86	0.602
41.21	95.56	9183.40	5177.55	9746.40	0.539
34.34	95.56	9546.64	5653.85	10538.21	0.544
34.34	101.99	9546.64	5653.91	10538.21	0.544
27.47	101.99	9909.88	6139.62	11360.95	0.548
27.47	106.67	9909.88	6139.66	11360.95	0.548
20.61	106.67	10273.12	6629.71	12214.62	0.550
20.61	111.49	10273.12	6629.74	12214.62	0.551
13.74	111.49	10636.35	7126.22	13099.22	0.552
13.74	116.45	10636.35	7126.23	13099.22	0.552
6.87	116.45	10999.59	7631.37	14014.74	0.552
6.87	121.54	10999.59	7631.30	14014.74	0.553
0.00	121.54	11362.83	8140.29	14961.21	0.552

Section M: SECTION PROPERTIES DATA

Elev. (ft)	Diam. (in)	Width (in)	Thick. (in)	W/t	Area (in^2)	S (in^3)
150.0	22.0	3.4	0.250	13.5	17.3	92.32
146.7	23.0	3.6	0.250	14.2	18.1	101.06
146.7	23.0	3.6	0.250	14.2	18.1	101.06
143.3	24.0	3.7	0.250	14.9	18.8	110.19
143.3	24.0	3.7	0.250	14.9	18.8	110.19
140.0	25.0	3.9	0.250	15.6	19.6	119.71
140.0	25.0	3.9	0.250	15.6	19.6	119.71
136.7	26.0	4.1	0.250	16.3	20.4	129.63
136.7	26.0	4.1	0.250	16.3	20.4	129.63
133.3	27.0	4.3	0.250	17.0	21.2	139.94
133.3	27.0	4.3	0.250	17.0	21.2	139.94
130.0	28.0	4.4	0.250	17.7	22.0	150.65
130.0	28.0	4.3	0.313	13.8	27.5	187.05
121.8	30.4	4.7	0.313	15.2	29.9	221.66
121.8	30.4	4.7	0.313	15.2	29.9	221.66
113.7	32.9	5.2	0.313	16.6	32.3	259.21
113.7	32.9	5.2	0.313	16.6	32.3	259.21
105.5	35.3	5.6	0.313	17.9	34.7	299.69
105.5	35.3	5.6	0.313	17.9	34.7	299.69
97.4	37.8	6.0	0.313	19.3	37.1	343.11
97.4	37.8	6.0	0.313	19.3	37.1	343.11
89.2	40.2	6.5	0.313	20.7	39.6	389.47
89.2	40.2	6.5	0.313	20.7	39.6	389.47
83.7	41.8	6.8	0.313	21.6	41.2	422.38
83.7	41.2	6.0	0.625	9.6	80.5	800.94
76.6	43.3	6.4	0.625	10.2	84.7	887.56
76.6	43.3	6.4	0.625	10.2	84.7	887.56
69.5	45.5	6.8	0.625	10.8	88.9	978.64
69.5	45.5	6.8	0.625	10.8	88.9	978.64
62.4	47.6	7.1	0.625	11.4	93.2	1074.16
62.4	47.6	7.1	0.625	11.4	93.2	1074.16
55.3	49.7	7.5	0.625	12.0	97.4	1174.13
55.3	49.7	7.5	0.625	12.0	97.4	1174.13
48.2	51.8	7.9	0.625	12.6	101.6	1278.55
48.2	51.8	7.9	0.625	12.6	101.6	1278.55
41.2	53.9	8.3	0.625	13.2	105.7	1385.86
41.2	52.7	7.8	0.750	10.4	123.6	1574.22
34.3	54.7	8.2	0.750	10.9	128.5	1702.11
34.3	54.7	8.2	0.750	10.9	128.5	1702.11
27.5	56.8	8.5	0.750	11.4	133.4	1835.00
27.5	56.8	8.5	0.750	11.4	133.4	1835.00
20.6	58.8	8.9	0.750	11.8	138.3	1972.88
20.6	58.8	8.9	0.750	11.8	138.3	1972.88
13.7	60.9	9.2	0.750	12.3	143.2	2115.76
13.7	60.9	9.2	0.750	12.3	143.2	2115.76
6.9	62.9	9.6	0.750	12.8	148.1	2263.63
6.9	62.9	9.6	0.750	12.8	148.1	2263.63
0.0	65.0	10.0	0.750	13.3	152.9	2416.50

Note: w/t values marked with * (asterisk) indicate width to thickness exceeding maximum allowable values by standards.

Customer: MCM HOLDINGS LLC
Project: 130 FT OF 150 FT TSP
Site: WESTBROOK PERMANENT- CT
Engr. File: 231452 R5
Build Code: ANSI/TIA-222-G-2005

Mat Foundation

ver.2.2.14

R5

Design Parameters

	Load Case					
Description	**1**	**2**	**3**	**4**	**5**	**Service**
Total Moment, ft-kips	9,230.36	9,178.26	2,084.96	245.51	243.32	1,436.15
Total Shear, kips	84.84	84.81	19.32	2.12	2.12	13.22
Total Tower Wt, kips	96.23	72.14	140.72	87.05	61.71	70.84
Max. Uplift, kips	N/A	N/A	N/A	N/A	N/A	N/A
Shear, kips	N/A	N/A	N/A	N/A	N/A	N/A
Max Download, kips	N/A	N/A	N/A	N/A	N/A	N/A
Shear	N/A	N/A	N/A	N/A	N/A	N/A
Soil L.F.	1.20	0.90	1.20	1.20	0.90	1.00
Concrete L.F.	1.20	0.90	1.20	1.20	0.90	1.00

Foundation	
Ht. AGL, ft	0.50
Depth, ft.	6.00
Pole	
Butt OD, ft	5.42
Offset, in	.00
Soil	N/A
Blow Count	N/A
Inplace Unit Wt, pcf	110.00
Submerged Unit Wt, pcf	47.60
Friction Angle, ϕ, deg.	30.00
Cohesion, ksf	N/A
Uplift Angle, deg.	30.00
Water Depth, ft	4.00
Ult Bearing Capacity, ksf	12.00

Mat	
Thickness, ft	2.00
Width, ft	32.00
EA, in	23.00
Batter, in/ft	0.00

Anchor Bolts	
Diameter, in	2.2500
No.	22
Length, in	84.00
Bolt Circle, in	71.50
Projection, in	13.00
Concrete	
28 Day Strength, ksi	4.50
Dry Unit Wt, pcf	150.00
Wet Unit Wt, pcf	88.00

Pier	
Height, ft	4.50
Diameter, ft	9.00
No. Piers	1
Shape	Square

Pocket	
Diameter, in	N/A
Thickness, ft	N/A

Rebar Fy	
Vertical, ksi	60.00
Circular, ksi	60.00
Horizontal, ksi	60.00

Results

ϕM_N – Parallel Axis	10,126.51	ft-kips
ϕM_N – Diagonal Axis	11,147.33	ft-kips
Moment – Interaction Ratio	0.961	
ϕV_N – Lateral Load	174.26	kips
Lateral Load – Interaction Ratio	0.487	

Final Mat Dimension : 32.00 x 32.00 x 2.00 ft. thick w/ (1) 9.00 ft. Square Pier

Final Pocket Dimension : Pockets not required

Total Volume of Concrete : 89.4 yd^3

Designed By: AS
Date: 17 Oct,19 @ 10:54 AM

Checked By: HA
Date: 10/17/19

Customer: MCM HOLDINGS LLC
Project: 130 FT OF 150 FT TSP
Site: WESTBROOK PERMANENT- CT
Engr. File: 231452
Build Code: ANSI/TIA-222-G-2005

Mat Foundation

ver.2.2.14

OTM Capacity

Controlling Load Case: 2 [Wind w/Min. Dead Load]
Foundation Width = 32.00 ft
M_U = 9,729.5 ft-kips

	ϕM_N, ft-kips	x, ft	N	σ_{ur}
Parallel	10,126.5	3.200	0.100	8.97
Diagonal	11,147.3	10.119	0.224	8.97

ϕM_N= 10,126.51 ft-kips IRatio = 0.961
ϕV_N = 174.26 kips IRatio = 0.487

Mat Design

γ_e = 102.67 pcf

Exterior Slab	x, ft	N	σ_R, ksf	P_s kips	P_{su} kips	Moment, ft-kips/ft DownLoad Side	Moment, ft-kips/ft Uplift Side	Shear, kips/ft Download Side	Shear, kips/ft Uplift Side
Parallel	4.271	0.133	5.04	25.31	0.00	164.74	57.88	20.41	9.28
Diagonal	13.145	0.290	3.98	25.31	0.00	104.23	34.24	22.54	7.39

Punching Shear	Download Interior	Download Edge	Download Corner	Uplift Interior	Uplift Edge	Uplift Corner	Description
b_{us}, ft	42.33	N/A	N/A	N/A	N/A	N/A	2-Way Shear
Vsu, psi	129.06	N/A	N/A	N/A	N/A	N/A	
ϕVc, psi	199.34	N/A	N/A	N/A	N/A	N/A	
IR	0.65	N/A	N/A	N/A	N/A	N/A	
$0.5*M_{ut}$, ft-kips	2,883.6			N/A			Moment transfer to slab
B_e, ft	15.0			N/A			
M_u, ft-kips/ft	192.2			N/A			
Edge Distances: a = 16.00 ft. b = 16.00 ft. c = 16.00 ft.							

Summary	Max. Value	Utilization
Slab Moment, ft-kips/ft	192.24	0.987
Slab Shear, kips/ft	22.54	0.867
Punching Shear, psi	129.06	0.647
Soil Bearing Required, σ_{UR}, ksf	6.71	0.559

Mat Reinforcement	
Min. Steel Area (Strength)	2.415 in^2/ft.
Min. Steel Area (Temperature)	.259 in^2/ft.
Steel Strain Actual	0.010
Minimum Steel Strain Required	0.005

62 - #10 Horizontal bars equally spaced @6.20 in., each way, top and bottom, total of 248, A_s = 2.454 in^2/ft

Designed By: AS
Date: 17 Oct,19 @ 10:54 AM

Checked By: HH
Date: 10/17/19

Customer:	MCM HOLDINGS LLC
Project:	130 FT OF 150 FT TSP
Site:	WESTBROOK PERMANENT- CT
Engr. File:	231452
Build Code:	ANSI/TIA-222-G-2005

Mat Foundation

ver.2.2.14

Pier Design

Controlling Load Case: 1 [Wind w/Max. Dead Load]

C = 96.23 kips	Vc = 84.84 kips	Mc = 9,612.14 ft-kips
T = .00 kips	Vt = .00 kips	Mt = .00 ft-kips
Fy = 60.00 ksi	Fyt = 60.00 ksi	L.F. = 1.00
H = 108.00 in.	Ds = 99.00 in.	F'c = 4.50 ksi
U = 1.00	Irs = Square	

*** **NOTE:** Pier cross section is Square ***

SUMMARY OF ANALYSIS

Minimum area of steel required	= 58.320 in^2	(Rhomin = 0.0050)
Area of steel provided.	= 59.335 in^2	(Rhoactual= 0.0051)
Maximum steel area limit	= 732.872 in^2	(Rhomax = 0.0628)

(38) #11 Vertical Bars equally spaced w/ #5 Circular Ties @ 6" on center.

CIRCULAR TIE DATA

Vu < 0.85*Vc/2, shear reinforcement is not required

Use maximum tie spacing specified in ACI 318,
Section 7.10.5 for compression reinforcement.

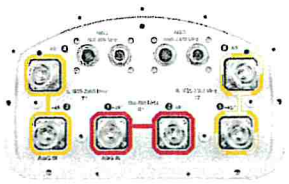
DEVELOPMENT LENGTH MODIFIERS FOR BAR DEVELOPMENT

Modifier for tension development = 0.859
Modifier for compression development = 0.505
REQUIRED Ld = MODIFIER * BASIC Ld * ACI 318 MODIFIERS, (12 in. min.)

Designed By:	AS	Checked By:	
Date:	17 Oct,19 @ 10:54 AM	Date:	10/17/19

4

NHH-65B-R2B



6-port sector antenna, 2x 698–896 and 4x 1695–2360 MHz, 65° HPBW, 2x RET. Both high bands share the same electrical tilt.

- Interleaved dipole technology providing for attractive, low wind load mechanical package
- Internal SBT on low and high band allow remote RET control from the radio over the RF jumper cable
- Separate RS-485 RET input/output for low and high band
- One RET for low band and one RET for both high bands to ensure same tilt level for 4x Rx or 4x MIMO

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain, dBi	14.9	15.0	17.7	17.9	18.4	18.7
Beamwidth, Horizontal, degrees	65	60	71	69	64	57
Beamwidth, Vertical, degrees	12.4	11.2	5.7	5.2	4.9	4.6
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS (First Lobe), dB	13	14	18	18	19	18
Front-to-Back Ratio at 180°, dB	30	29	31	30	29	31
Isolation, Cross Polarization, dB	25	25	25	25	25	25
Isolation, Inter-band, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port at 50°C, maximum, watts	300	300	300	300	300	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

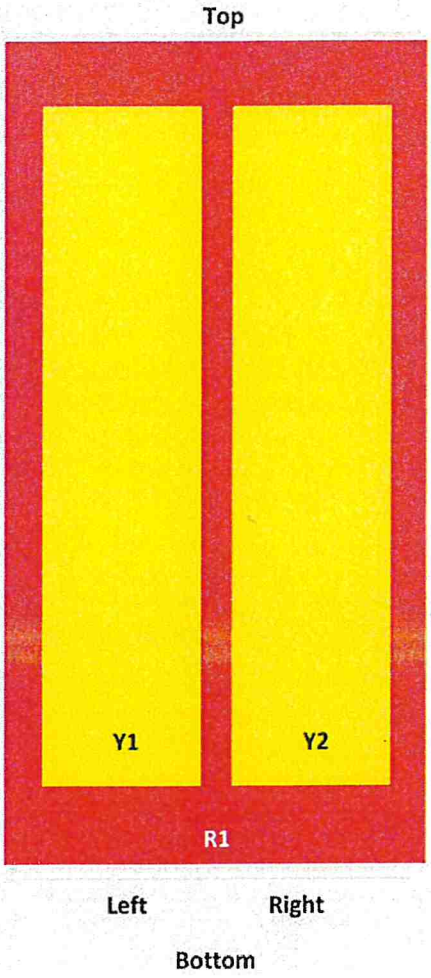
Electrical Specifications, BASTA*

Frequency Band, MHz	**698–806**	**806–896**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain by all Beam Tilts, average, dBi	14.5	14.5	17.3	17.7	18.1	18.5
Gain by all Beam Tilts Tolerance, dB	±0.6	±1.1	±0.4	±0.4	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.4 7 ° | 14.6 14 ° | 14.3	0 ° | 14.7 7 ° | 14.7 14 ° | 14.1	0 ° | 17.2 4 ° | 17.3 7 ° | 17.3	0 ° | 17.6 4 ° | 17.7 7 ° | 17.7	0 ° | 18.0 4 ° | 18.2 7 ° | 18.1	0 ° | 18.3 4 ° | 18.5 7 ° | 18.6
Beamwidth, Horizontal Tolerance, degrees	±2	±2.1	±3	±4.1	±6.5	±2.9
Beamwidth, Vertical Tolerance, degrees	±0.7	±0.7	±0.3	±0.2	±0.3	±0.2
USLS, beampeak to 20° above beampeak, dB	13	14	16	16	17	15
Front-to-Back Total Power at 180° ± 30°, dB	23	22	27	27	25	25
CPR at Boresight, dB	22	21	23	23	22	19
CPR at Sector, dB	10	7	16	13	11	4

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

Array Layout

NHH



Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-896	1-2	1	ANxxxxxxxxxxxxxxx1
Y1	1695-2360	3-4	2	ANxxxxxxxxxxxxxxx2
Y2	1695-2360	5-6		

View from the front of the antenna

(Sizes of colored boxes are not true depictions of array sizes)

General Specifications

Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Antenna Type	Sector

NHH-65B-R2B

Band	Multiband
Performance Note	Outdoor usage | Wind loading figures are validated by wind tunnel measurements described in white paper WP-112534-EN
Total Input Power, maximum	600 W @ 50 °C

Mechanical Specifications

RF Connector Quantity, total	6
RF Connector Quantity, low band	2
RF Connector Quantity, high band	4
RF Connector Interface	7-16 DIN Female
Color	Light gray
Grounding Type	RF connector body grounded to reflector and mounting bracket
Radiator Material	Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	278.0 N @ 150 km/h | 63.6 lbf @ 150 km/h
Wind Loading, lateral	230.0 N @ 150 km/h | 51.7 lbf @ 150 km/h
Wind Loading, maximum	120.7 lbf @ 150 km/h | 537.0 N @ 150 km/h
Effective Projected Area (EPA), frontal	0.26 m^2 | 2.80 ft^2
Effective Projected Area (EPA), lateral	0.22 m^2 | 2.37 ft^2
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Length	1828.0 mm | 72.0 in
Width	301.0 mm | 11.9 in
Depth	180.0 mm | 7.1 in
Net Weight, without mounting kit	19.8 kg | 43.7 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 3
Internal RET	High band (1) | Low band (1)
Power Consumption, idle state, maximum	2 W
Power Consumption, normal conditions, maximum	13 W
Protocol	3GPP/AISG 2.0 (Single RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male

NHH-65B-R2B

Packed Dimensions

Length	1952.0 mm | 76.9 in
Width	409.0 mm | 16.1 in
Depth	299.0 mm | 11.8 in
Shipping Weight	32.3 kg | 71.2 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
China RoHS SJ/T 11364-2014	Above Maximum Concentration Value (MCV)

Included Products

BSAMNT-3 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

5

Simply Intelligent

KMW COMMUNICATIONS

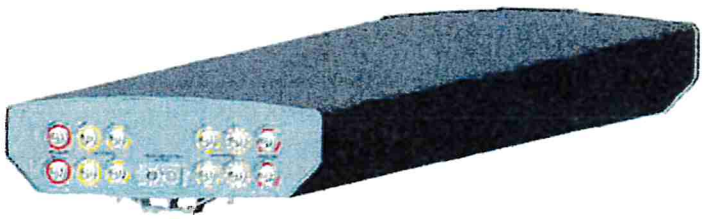
EPBQ-654L8H8-L2

12-Port Multi-Band Antenna / 8' / 65°

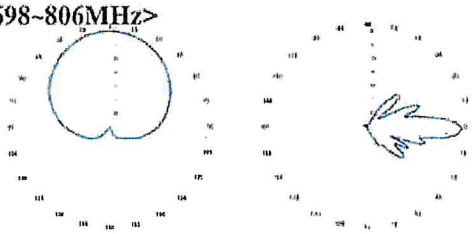
698 ~ 894MHz XX-pol., H67 V9.3 , ET:2~12'
1695 ~ 2400MHz, XXXX-pol., H61 / V8.1 , ET: 2~12

Electrical Specification

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

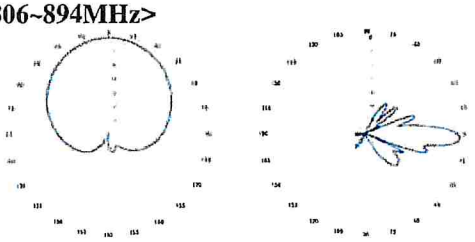


<698~806MHz>



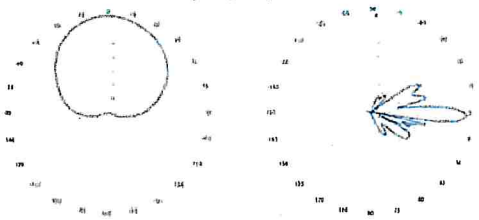
Horizontal Pattern Vertical Pattern (2°)

<806~894MHz>



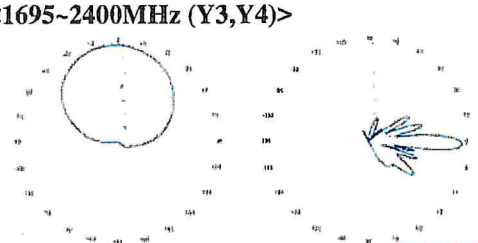
Horizontal Pattern Vertical Pattern (2°)

<1695~2400MHz (Y1,Y2)>



Horizontal Pattern Vertical Pattern (2°)

<1695~2400MHz (Y3,Y4)>



Horizontal Pattern Vertical Pattern (2°)

Simply Intelligent

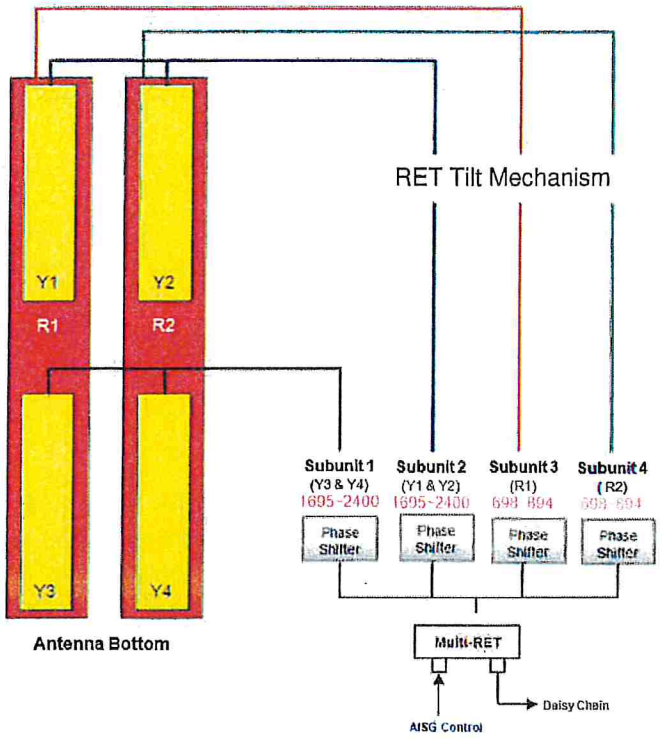
KMW COMMUNICATIONS

EPBQ-654L8H8-L2

12-Port Multi-Band Antenna / 8' / 65°

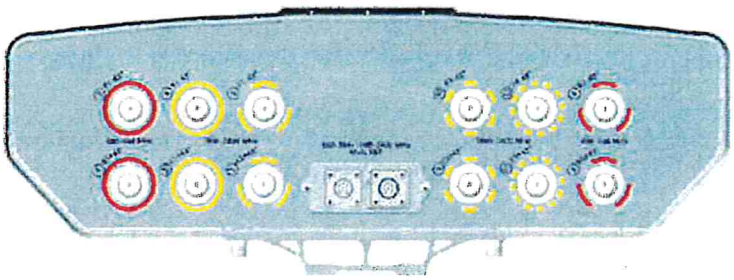
698 ~ 894MHz, XX-pol., H67 / V9.3 , ET:2~12

1695 ~ 2400MHz, XXXX-pol , H61 / V8.1', ET: 2~12



Mechanical Specification

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



Correlation Table

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

***Note**

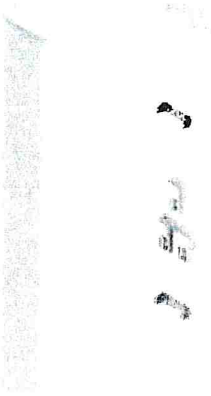
- Gain can vary and the values stated are typical
- Environmental Compliance: IP 65 for Radome & IP 67 for Connectors
- RET Motor Configuration: Field Replaceable RET Electronic Control Module RET Motor is internal to antenna & not field replaceable
- Compliant with AISG: AISG2.0
- Accessory: Standard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

DATA SHEET

HexPort Multi-Band Antenna

HPA-65R-BUU-H8

MultiPort



- Eight foot (2.4 m), six port antenna with a 65° azimuth beamwidth covering 698-894 MHz and 1710-2360 MHz
- Four high band and two low band ports including the WCS band in a single antenna
- Sharp elevation beamwidth aides in network planning
- Optimal elevation sidelobe performance
- Enhanced array spacing ensures optimal MIMO performance
- Exceeds minimum PIM performance requirements
- Multi-network solution in one radome with six ports
- Reduces tower load and increases space for tower mounted remote radio heads
- Multi-band design improves site radio resource management
- Field replaceable, integrated AISG 2.0 compliant Remote Electrical Tilt (RET) system with independent tilt control for each paired port

Overview

The CCI HexPort multi-band array is a six port antenna with full Wireless Communication Service (WCS) band coverage. With four high band ports covering 1710-2360 MHz and two low band ports covering 698-894 MHz, this eight foot (2.4 m) CCI HexPort provides the capability to deploy 4x4 Multiple-input Multiple-output (MIMO) in the high band. The HexPort allows separate tilt control for each pair of ports enabling maximum flexibility in network deployment.

CCI has engineered its antennas using new and innovative design techniques to provide optimal sidelobe performance, sharp elevation beams, and high front to back ratio.

Multiple technologies can now be connected to a single antenna, reducing tower load, lease expense, deployment time and installation cost.

CCI antennas are designed and produced to ISO 9001:2008 certification standards for reliability and quality in our state-of-the-art manufacturing facilities.

Applications

- 4x4 MIMO for the high band and 2x2 MIMO for the low band
- Increase capacity without adding antennas
- Deploy WCS band without increasing antenna count
- Cosite current, and next-generation basestation technologies on the same antenna

MultiPort

SPECIFICATIONS

HexPort Multi-Band Antenna

HPA-65R-BUU-H8

Electrical

Ports	2 x Low Band Ports for 698-894 MHz		4 x High Band Ports for 1710-2360 MHz			
Frequency Range	698-806 MHz	824-894 MHz	1850-1990 MHz	1710-1780/2110-2180 MHz		2305-2360 MHz
Gain	15.3 dBi	16.2 dBi	17.1 dBi	16.3 dBi	17.4 dBi	17.7 dBi
Azimuth Beamwidth (-3dB)	65°	61°	62°	68°	64°	60°
Elevation Beamwidth (-3dB)	10.1°	8.4°	5.6°	6.2°	5.0°	4.5°
Electrical Downtilt	2° to 10°	2° to 10°	0° to 8°	0° to 8°	0° to 8°	0° to 8°
Elevation Sidelobes (1st Upper)	< -17 dB	< -17 dB	< -19 dB	< -18 dB	< -18 dB	< -17 dB
Front-to-Back Ratio @180°	> 29 dB	> 28 dB	> 35 dB	> 35 dB	> 35 dB	> 35 dB
Front-to-Back Ratio over ± 20°	> 28 dB	> 27 dB	> 28 dB	> 27 dB	> 28 dB	> 28 dB
Cross-Polar Discrimination (at Peak)	> 24 dB	> 20 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Cross-Polar Discrimination (at ± 60°)	> 16 dB	> 14 dB	> 18 dB	> 18 dB	> 18 dB	> 18 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB	> 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	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc
Input Power Continuous Wave (CW)	500 watts	500 watts	300 watts	300 watts	300 watts	300 watts
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

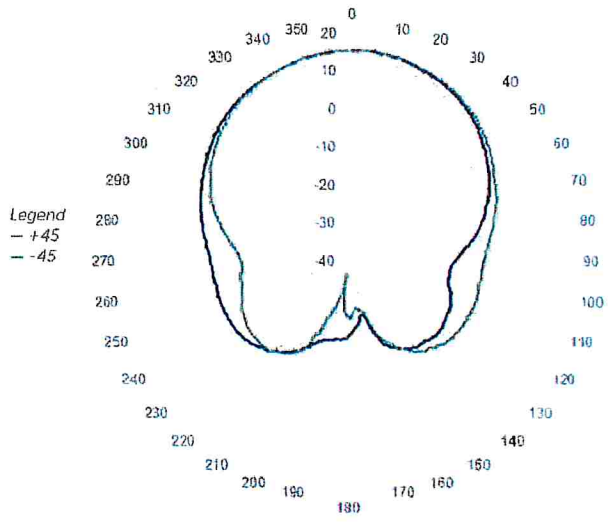
Mechanical

Dimensions (LxWxD)	92.8x14.4x7.3 in (2358x366x185 mm)
Survival Wind Speed	> 150 mph (> 241 kph)
Front Wind Load	327 lbs (1455 N) @ 100 mph (161 kph)
Side Wind Load	191 lbs (849 N) @ 100 mph (161 kph)
Equivalent Flat Plate Area	12.8 ft^2 (1.2 m^2)
Weight *	53.0 lbs (24.1 kg)
RET System Weight	5.0 lbs (2.3 kg)
Connector	6 x 7-16 DIN female long neck
Mounting Pole	2 to 5 in (5 to 12 cm)

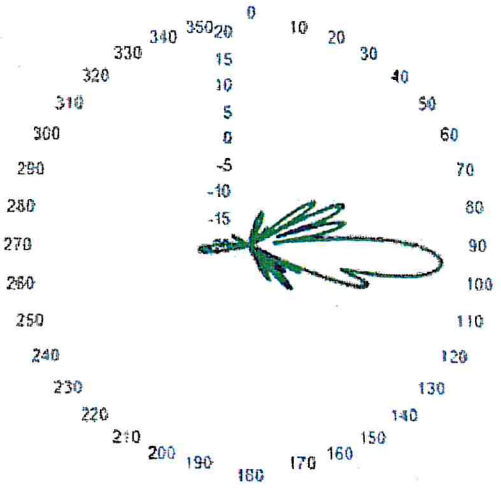
** Weight excludes mounting and RET*

Typical Antenna Patterns

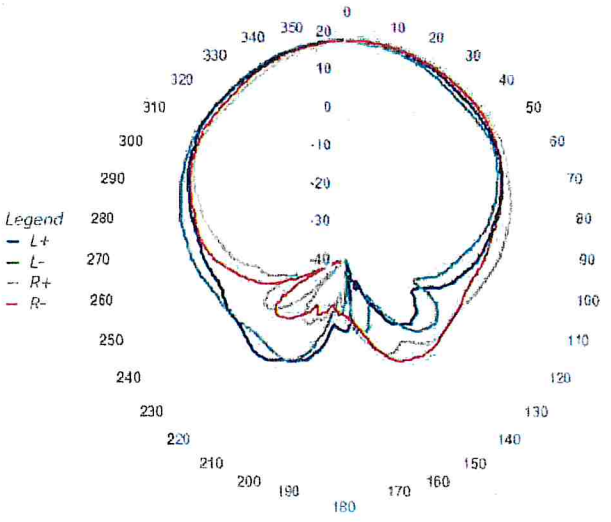
For detailed information on additional antenna patterns, contact customer support at support@cciproducts.com



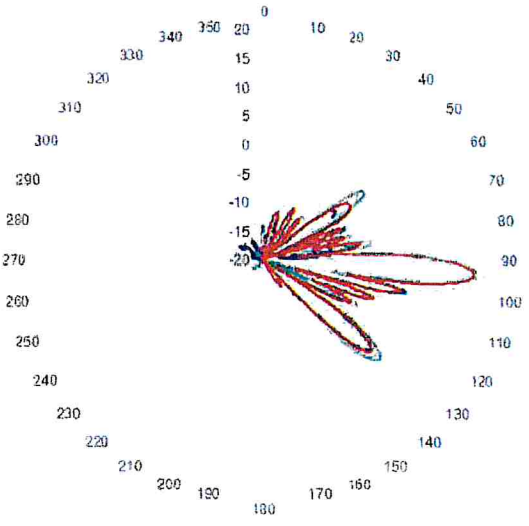
894 MHz Azimuth



894 MHz Elevation 5°



1920 MHz Azimuth



1920 MHz Elevation 4°

Parts & Accessories

HPA-65R-BUU-H8	Eight foot (2.4 m) HexPort antenna with 65° azimuth beamwidth and 3 factory installed BSA-RET200 RET actuators
HPA-65R-BUU-H8-K	Antenna kit with 3 factory installed RET actuators and MBK-01 mounting bracket
MBK-01	Mounting bracket kit (top and bottom) with 0° to 10° mechanical tilt adjustment
TM-01	Optional triple mount mast bracket for mounting up to three 65° antennas on a pole (or mast).
BSA-RET200	Remote electrical tilt actuator
HPA-CBK-AG-RRU	HexPort antenna to RRU AISG cable kit
HPA-CBK-RA-AG-RRU	HexPort antenna to RRU AISG right angle cable kit

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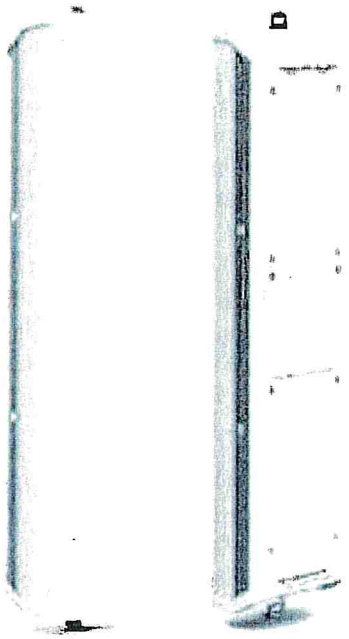
AIR-32 B4A/B2P & B2A/B66AA

ERICSSON ANTENNA INTEGRATED RADIO AIR-32



Radio		
	Single Band (B4a/B2p)	**Dual Band (B2a/B66Aa)**
Band 2 (1850-1910 / 1930-1990 MHz)	Passive frequency band	Active frequency band
Band 4 (1710-1755 / 2110-2155 MHz)	Active frequency band	Subset of Band 66A (AWS 1+3)
Band 66A (1710-1780 / 2110-2180 MHz)	N/A	Active frequency band
PA Output Power	4 x 30W	2 x (4 x 30) W
Downlink EIRP in bore-sight direction for each active band	4 x 62.5 dBmi	4 x 62.5 dBmi
Instantaneous bandwidth	45 MHz (W, L)	B2: 40 MHz (W, L) B2: 20 MHz (G) B66A: 70 MHz (W, L)
Capacity (single standard per unit)	6 GSM 6 WCDMA 2 x 20 MHz LTE	6 GSM (B2 only) 6 WCDMA per Active frequency band 2 x 20 MHz LTE per band
Multi-RAT capability	WCDMA and LTE on both PAs	WCDMA and GSM on both PAs (B2 only) WCDMA and LTE on both PAs (B2 and B4) GSM and LTE (B2 only)

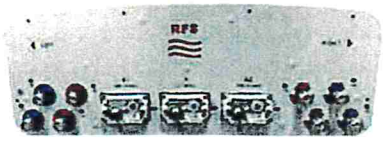
Interfaces		
Optical CPRI	2 x 10 Gbps	2 x 10 Gbps per Active frequency band
DC Power	-48 VDC 3-wire or 2-wire	-48 VDC 3-wire or 2-wire (separate input for both radios)
AC power (Optional)	PSU-AC 08	PSU-AC 08
Passive antenna	4 RF connectors (7/16 female)	N/A
Environmental		
Operating Temperature Range	-40 to +55 °C	-40 to +55 °C
Solar Radiation	≤ 1,120 W/m²	≤ 1,120 W/m²
Relative Humidity	5 to 100%	5 to 100%
Absolute Humidity	0.26 to 40 g/m^3	0.26 to 40 g/m^3
Maximum temperature change	1.0°C/min	1.0°C/min
Antenna		
Electrical Tilt	2° – 12° (B4) 2° – 12° (B2)	2° – 12° (B66A) 2° – 12° (B2)
Bore-sight antenna gain	18 dBi (B4) 17.5 dBi (B2)	18 dBi (B66A) 17.5 dBi (B2)
Nominal beam-width, azimuth	65° (B4) 63° (B2)	65° (B66A) 63° (B2)
Nominal beam-width, elevation	6° (B4) 6° (B2)	6° (B66A) 6° (B2)
Mechanical		
Weight	48 Kg (105.8 lbs)	60 Kg (132.2 lbs)
Dimensions (H x W x D)	1439 x 327 x 220 mm (56.6" x 12.9" x 8.7")	1439 x 327 x 220 mm (56.6" x 12.9" x 8.7")
Wind load at 42 m/s (150 km/h) Front / Lateral / Rear	640N / 300N / 660N	640N / 300N / 660N

PRODUCT DATASHEET

APXVAARR24_43-U-NA20

RADIO FREQUENCY SYSTEMS
The Clear Choice

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 15/15/18/18dBi, 2.4m (8ft), VET, RET, 0-12°/0-12°/2-12°/2-12°



FEATURES / BENEFITS

This antenna provides a 8 Port multi-band flexible platform for advanced use for flexible use in deployment scenarios for encompassing 600MHz, 700MHz, AWS & PCS applications.

- 24 Inch Width For Easier Zoning
- Field Replaceable (Integrated) AISG RET platform for reduced environmental exposure and long lasting quality
- Superior elevation pattern performance across the entire electrical down tilt range
- Includes three AISG RET motors - Includes 0.5m AISG jumper for optional daisy chain of two high band RET motors for one single AISG point of high band tilt control.
- Low band arrays driven by a single RET motor

Technical Features

LOW BAND LEFT ARRAY (617-746 MHZ) [R1]

Frequency Band	MHz	617-698	698-746
Gain Over All Tilts	dBi	15.1 +/- .3	15.5 +/- .3
Horizontal Beamwidth @3dB	Deg	65 +/- 4	62 +/- 2
Vertical Beamwidth @3dB	Deg	11.4 +/- .7	10.4 +/- .5
Electrical Downtilt Range	Deg	0-12	0-12
Upper Side Lobe Suppression 0 to +20	dB	19	20
Front-to-Back, at +/-30°, Copolar	dB	25	24
Cross Polar Discrimination (XPD) @ Boresight	dB	19	19
Cross Polar Discrimination (XPD) @ +/-60	dB	5	3
3rd Order PIM 2 x 43dBm	dBc		-153
VSWR	-	1.5:1	1.5:1
Cross Polar Isolation	dB	25	25
Maximum Effective Power per Port	Watt	250	250

LOW BAND RIGHT ARRAY (617-746 MHZ) [R2]

Frequency Band	MHz	617-698	698-746
Gain Over All Tilts	dBi	14.8 +/- .2	15.1 +/- .2
Horizontal Beamwidth @3dB	Deg	65 +/- 4	62 +/- 2
Vertical Beamwidth @3dB	Deg	11.4 +/- .8	10.3 +/- .5
Electrical Downtilt Range	Deg	0-12	0-12
Upper Side Lobe Suppression 0 to +20	dB	19	20
Front-to-Back, at +/-30°, Copolar	dB	25	23
Cross Polar Discrimination (XPD) @ Boresight	dB	19	19
Cross Polar Discrimination (XPD) @ +/-60	dB	5	3
3rd Order PIM 2 x 43dBm	dBc		-153
VSWR	-	1.5:1	1.5:1
Cross Polar Isolation	dB	25	25
Maximum Effective Power per Port	Watt	250	250

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 15/15/18/18dBi, 2.4m (8ft), VET, RET, 0-12°/0-12°/2-12°/2-12°

HIGH BAND LEFT ARRAY (1695-2200 MHZ) [B1]

Frequency Band	MHz	1695-1880	1850-1990	1920-2200
Gain Over All Tilts	dBi	17.3 +/- .7	17.8 +/- .4	18.5 +/- 1
Horizontal Beamwidth @3dB	Deg	66 +/- 7	59 +/- 4	59 +/- 6
Vertical Beamwidth @3dB	Deg	5.3 +/- .4	4.7 +/- .4	4.3 +/- .3
Electrical Downtilt Range	Deg	2-12	2-12	2-12
Upper Side Lobe Suppression 0 to +20	dB	15	15	15
Front-to-Back, at +/-30°, Copolar	dB	25	25	25
Cross Polar Discrimination (XPD) @ Boresight	dB	19	17	16
Cross Polar Discrimination (XPD) @ +/-60	dB	4	6	4
3rd Order PIM 2 x 43dBm	dBc	-153	-153	-153
VSWR	-	1.5:1	1.5:1	1.5:1
Cross Polar Isolation	dB	25	25	25
Maximum Effective Power per Port	Watt	250	250	250

HIGH BAND RIGHT ARRAY (1695-2200 MHZ) [B2]

Frequency Band	MHz	1695-1880	1850-1990	1920-2200
Gain Over All Tilts	dBi	17.1 +/- .7	17.8 +/- .4	18.5 +/- 1
Horizontal Beamwidth @3dB	Deg	66 +/- 7	59 +/- 4	59 +/- 5
Vertical Beamwidth @3dB	Deg	5.2 +/- .4	4.7 +/- .4	4.3 +/- .3
Electrical Downtilt Range	Deg	2-12	2-12	2-12
Upper Side Lobe Suppression 0 to +20	dB	15	15	15
Front-to-Back, at +/-30°, Copolar	dB	25	24	25
Cross Polar Discrimination (XPD) @ Boresight	dB	20	17	16
Cross Polar Discrimination (XPD) @ +/-60	dB	4	6	5
3rd Order PIM 2 x 43dBm	dBc	-153	-153	-153
VSWR	-	1.5:1	1.5:1	1.5:1
Cross Polar Isolation	dB	25	25	25
Maximum Effective Power per Port	Watt	250	250	250

RADIO FREQUENCY SYSTEMS
The Clear Choice

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 15/15/18/18dBi, 2.4m (8ft), VET, RET, 0-12°/0-12°/2-12°/2-12°

ELECTRICAL SPECIFICATIONS

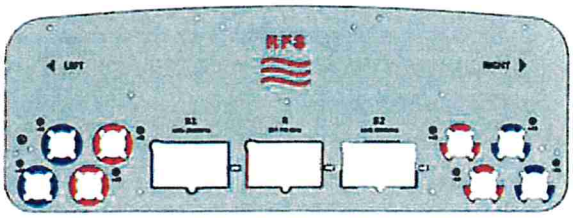
Impedance	Ohm	50.0
Polarization	Deg	±45°

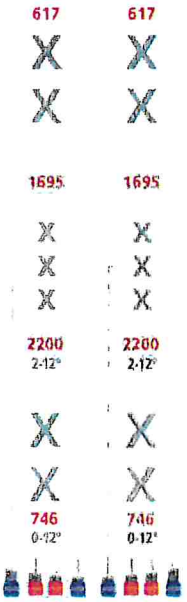
MECHANICAL SPECIFICATIONS

Dimensions - H x W x D	mm (in)	2436 x 609 x 222 (95.9 x 24 x 8.7)
Weight (Antenna Only)	kg (lb)	58 (128)
Weight (Mounting Hardware only)	kg (lb)	11.5 (25.3)
Shipping Weight	kg (lb)	80 (176)
Connector type		8 x 4.3-10 female at bottom + 6 AISG connectors (3 male, 3 female)
Adjustment mechanism		Integrated RET solution AISG compliant (Field Replaceable) + Manual Override + External Tilt Indicator
Mounting Hardware Material		Galvanized steel
Radome Material / Color		Fiber Glass / Light Grey RAL7035

TESTING AND ENVIRONMENTAL

Temperature Range	°C (°F)	-40 to 60 (-40 to 140)
Lightning protection		IEC 61000-4-5
Survival/Rated Wind Velocity	km/h	241 (150)
Environmental		ETSI 300-019-2-4 Class 4.1E





ORDERING INFORMATION

Order No.	Configuration	Mounting Hardware	Mounting pipe Diameter	Shipping Weight
APXVAARR24_43-U-NA20	Field Replace RET included (3)	APM40-5E Beam tilt kit (included)	60-120mm	80 Kg

Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 15/15/18/18dBi, 2.4m (8ft), VET, RET, 0-12°/0-12°/2-12°/2-12°

External Document Links

APM40_Series_Installation_Instructions
Manual_Overdrive_Instructions
Global RFS Website

Notes

All electrical parameters are compliant with BASTA NGMN 9.6 requirements.

Available Configurations
APXVAARR24_43-U-NA20 -- External ACU is included -- shipping weight 80kg.

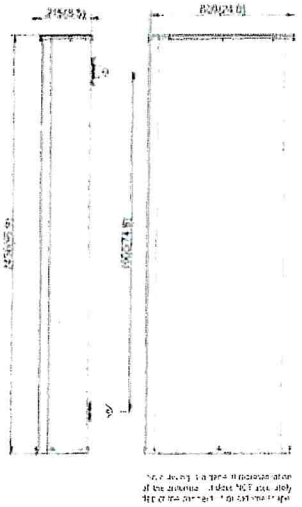
For additional mounting information please click "External Document Links".

This data is provisional and subject to changes

External Link Reference

Global RFS Website — http://www.rfsworld.com

Dimensions: mm (in)



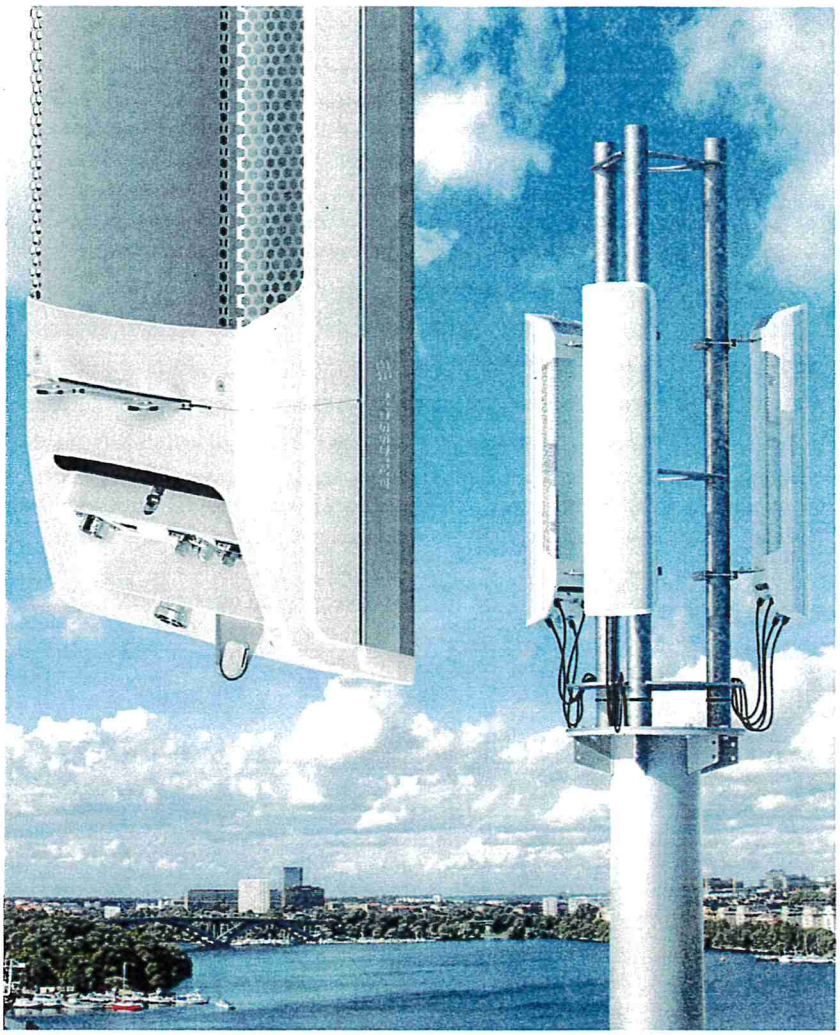
ERICSSON

AIR 21, 1.3 M
B4A B2P

The Antenna-Integrated Radio (AIR) is a single tower-mounted unit that can replace the antenna/s and radio for one sector. There is no need for additional electronics such as ASC and a RET Actuator and control. A passive antenna function for an extra band is optional. (The option has to be specified when ordering, retrofit is not possible).

The height and width are the same as for a passive antenna with similar characteristics. The depth is increased to house the radios' electronics. Digital Units (DUs) from Ericsson's RBS 6000 family provide the baseband function and support GSM, WCDMA and LTE.

One or two DUs, depending on capacity and the standards to be supported, are needed for a three-sector site with AIR units.



The AIR is especially suited for state of the art mobile broadband base stations utilizing advanced MIMO techniques. Less tower-mounted equipment is required and the unit's attractive appearance enables it to blend in well with other existing equipment. The same applies to sites with multiple access technologies on different frequency bands.

With AIR, it is only necessary to swap antennas in order to add new 3G/4G technology on-site or at a new site. The AIR also saves power compared to traditional RBSs.

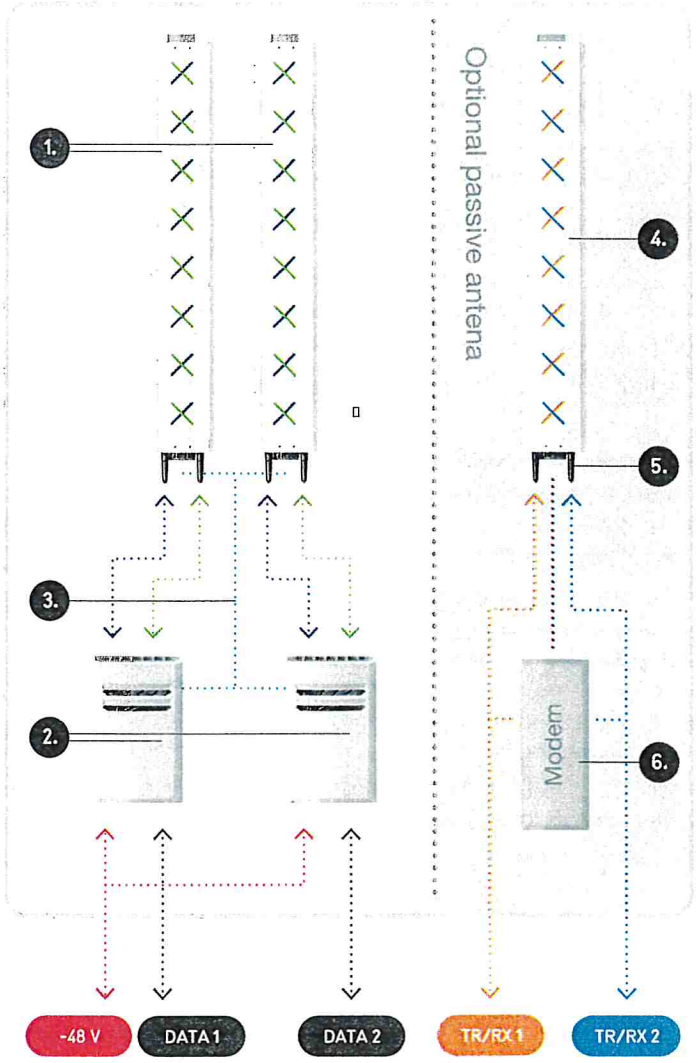
Functionality for the AIR unit

The figure to the right shows an example of the hardware that a single AIR unit can replace. The function of the AIR unit is the same, but the implementation is different.

The AIR unit's active band has two radios (2) connected to a pair of cross-polarized antenna arrays (1). Remote electrical tilt (3) is included. Air supports 2 TX for the down-link and 4 RX for the up-link.

The passive antenna function on the frequency band not used by the AIR unit's active part is optional. The passive function includes an antenna array (4) and a RET motor (5) with a modem to control it (6).

The tilts for the active part and the passive part are controlled independently, but each band has the same tilt for both arrays and for both polarizations.



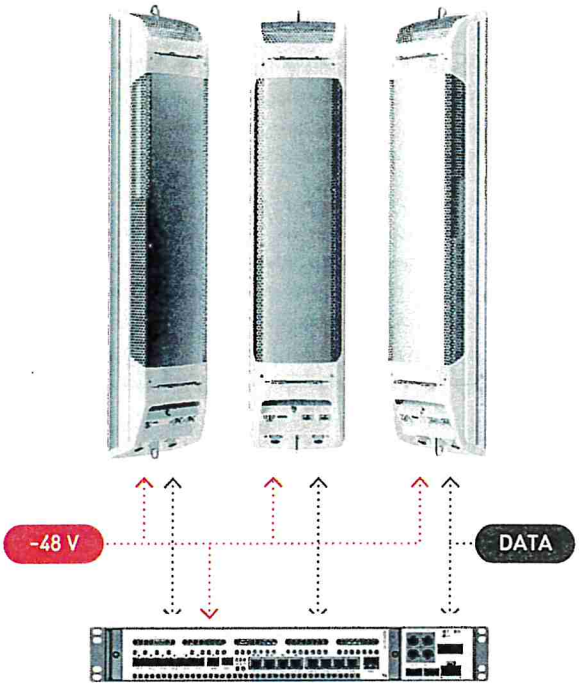
Example of hardware that a single AIR unit can replace

Configuration Example
Figure below shows a typical configuration with WCDMA with 2 × 2 MIMO for Band 4.

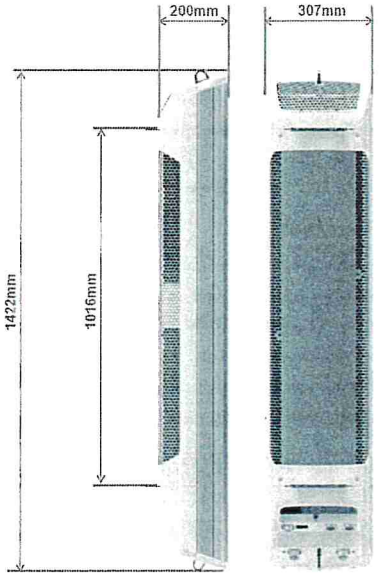
One AIR unit is deployed in each sector.

A common base band unit with a DUW inside provides base band processing and back-haul.

The AIR units can be specified with passive antennas for Band 2.

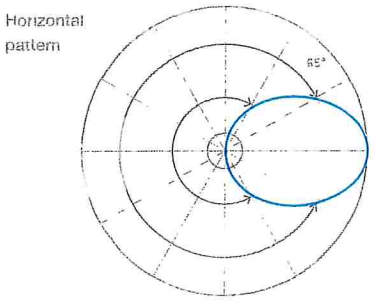


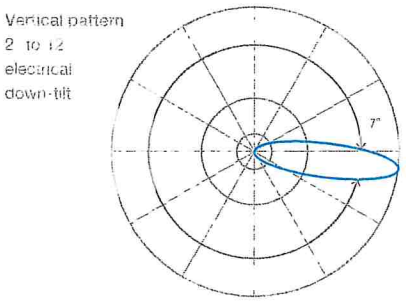
Three sector configuration example: RBS 6601 with three AIR units



Dimensions

Antenna Characteristics.





TECHNICAL SPECIFICATIONS AIR 21, 1.3M, B4A B2P

RADIO	
Active frequency band:	Band 4 (1710-1755 / 2110-2155 MHz)
Passive frequency band (optional):	Band 2 (1850-1910 / 1930-1990 MHz)
Downlink EIRP in bore-sight direction for the active band:	2 x 62,5 dBm
Uplink sensitivity:	TBD*
Remote electrical tilt:	-2° to -12°, independently controlled per frequency band
MIMO:	2 x 2 for DL 4 RX branches to be used for diversity/ beam-steering /MIMO
Instantaneous bandwidth:	20 MHz
Capacity (single standard per sector):	Up to 4 carriers WCDMA with 2 x 2 DL MIMO Up to 20 MHz LTE with 2 x 2 DL MIMO
Multi-RAT capability:	Single standard or two simultaneous standards (Capacity above is reduced for multi-RAT)
Bore-sight antenna gain for passive antenna option:	17.5 dBi
Nominal beam-width, azimuth:	65°
Nominal beam-width, elevation:	7°
Additional antenna parameters:	See Antenna characteristics, page 3
MECHANICAL SPECIFICATION	
Weight (excl. mounting brackets):	37, kg for active only 41 kg for active and passive
Size (H x W x D)	1422 mm x 307 mm x 200 mm
Wind load:	580 N / 300 N / 720 N (frontal/lateral/rear-side) @ 42 m/s wind speed
INTERFACES	
AIR – DU:	DATA 1, Data 2: CPRI links (SFP modules with LC socket + flanges that match protective cover TYCO C20611458)
Power:	- 48 V DC (TYCO/Ericsson RPT 447 04)
Passive antenna (option).	TX/RX 1, TX/RX 2: RF connectors (7-16 female)
SUPPORTING BASE-BAND	
RBS 6601:	One or two units depending on configuration.

* 1 dB better than best-in-class RRU connected to same size best-in-class antenna

** Other base-band configurations are available

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