REVIEWED BY:

PROPERTY OWNER OR REP.	RF
ZONING	NETWORK
CONSTRUCTION	CONTRACTOR
OPERATIONS	SITE ACQUISITION

SCOPE OF WORK

1. INSTALLATION OF NEW ELECTRIC METER AT EXISTING BUILDING METER BANK. INSTALLATION OF POWER CONDUITS FROM NEW METER TO PPC ON EQUIPMENT PLATFORM ON ROOFTOP.
2. INSTALLATION OF NEW FIBER JUNCTION BOX PER FIBER COMPANY RECOMMENDATION. INSTALLATION OF 2"ø FIBER CONDUITS & (2) ROPES INSIDE EACH CONDUITS FROM NEW FIBER JUNCTION BOX TO CIENA BOX ON ROOFTOP PLATFORM. INSTALLATION OF STEEL EQUIPMENT PLATFORM INSIDE ROOFTOP LEASE AREA.
3. INSTALLATION OF STEEL PLATFORM WITH STEEL BEAMS, STEEL POSTS, AND SCREEN WALL AT BETA SECTOR.
4. INSTALLATION OF STEEL REINFORCEMENTS FOR EXISTING ROOF JOISTS BELOW PROPOSED ALPHA & GAMMA SECTOR ANTENNA MOUNT LOCATIONS.
5. INSTALLATION OF BALLASTED NON-PENETRATING ROOFTOP ANGLE FRAMES AT ALPHA SECTOR.
6. INSTALLATION OF BALLASTED NON-PENETRATING ROOFTOP ANGLE FRAMES WITH SCREEN WALLS AT GAMMA SECTOR.
7. INSTALLATION OF (1) SSC-HPL3 AND (1) BBU-LB3 CABINETS ON EQUIPMENT PLATFORM. INSTALLATION OF (2) ROOFTOP JUNCTION BOXES, PPC & CIENA CABINET ON NEW PLATFORM. INSTALLATION OF (1) FYGA GPS ANTENNA ON EQUIPMENT PLATFORM.
8. INSTALLATION OF (3) OCTO ANTENNAS, (3) AEHC MASSIVE MIMO ANTENNAS, (3) AHLOAs & (3) AHFIGS ON ANTENNA SECTORS.
9. INSTALLATION OF JUMPER CABLES FROM ROOFTOP JUNCTION BOX TO ALPHA, BETA & GAMMA SECTOR RRUs. CABLES & CONDUITS TO BE MOUNTED ON CABLE TRAYS.
10. INSTALLATION OF RF JUMPERS FROM RRUs TO OCTO ANTENNAS.
11. INSTALLATION OF NEW ELECTRICAL GROUNDING WIRES.

T-Mobile

SITE NAME

35 S. WASHINGTON ST. RT

SITE NUMBER

CH95063B

SITE ADDRESS

35 S. WASHINGTON ST.,
NAPERVILLE, IL 60540

PROJECT TYPE

NSD (NEW SITE DEVELOPMENT) - NEW ANTENNAS AND EQUIPMENT PLATFORM MOUNTED ON ROOFTOP OF EXISTING BUILDING

GEOGRAPHIC COORDINATES (NAD 83)
(OBTAINED FROM 1A CERTIFICATE DATED 10/10/2018.)

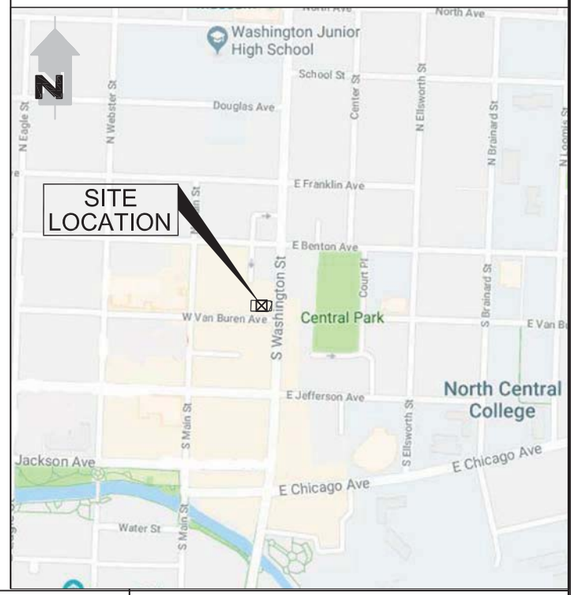
LATITUDE: 41° 46' 27.61" N
LONGITUDE: -88° 08' 53.28" W
GROUND ELEVATION: 686.40 FT (AMSL)

SITE DIRECTIONS

FROM T-MOBILE OFFICE:

- GET ON I-88 E IN LISLE TOWNSHIP FROM E OGDEN AVE
- CONTINUE ON I-88 E TO DOWNERS GROVE. TAKE EXIT 22 FROM I-355 N
- CONTINUE ON IL-56 E/BUTTERFIELD RD TO YOUR DESTINATION

SITE LOCATION



T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/27/20 EXPIRES: 11/30/20

SHEET INDEX

PROJECT SUMMARY

APPLICABLE CODES

- 2018 INTERNATIONAL BUILDING CODE
- 2017 NATIONAL ELECTRICAL CODE (NFPA 70)

APPLICANT

T-MOBILE L.L.C.
1400 OPUS PLACE
DOWNERS GROVE, IL 60515
PHONE:
FAX:

CONSTRUCTION CONTACT: CHRISTOPHER LYTLE
PHONE NO.:

OPERATIONAL CONTACT:
PHONE NO.:

UTILITIES

POWER: COMED

TELEPHONE: AT&T

UNDERGROUND
SERVICE ALERT
CALL TOLL FREE
1-800-892-0123
THREE WORKING DAYS BEFORE YOU DIG

CONTRACTOR

PROFESSIONAL LICENSE

I HEREBY CERTIFY THAT THESE PLANS WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED ENGINEER UNDER THE LAWS OF THE STATE OF ILLINOIS

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURE: _____

SIGNED: 7/24/20 EXPIRES: 11/30/21

NOTES FOR CONTRACTOR

CONTRACTOR SHALL VERIFY ALL PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED IN FIELD. IF SIGNIFICANT DEVIATIONS OR DETERIORATION ARE ENCOUNTERED AT THE TIME OF CONSTRUCTION, A REPAIR PERMIT WILL BE OBTAINED AND CONTRACTOR SHALL NOTIFY STRUCTURAL ENGINEER IMMEDIATELY.

HANDICAP ACCESS REQUIREMENTS

SITE IS UNOCCUPIED AND NOT FOR HUMAN HABITATION. HANDICAP ACCESS NOT REQUIRED.

NOTES

THE DRAWINGS ARE FULL ON 11"x17" SHEET SIZE AND ARE NOT REDUCED IN SIZE U.N.O.

THESE PLANS HAVE BEEN PREPARED FOR THE PURPOSE OF DESIGN AND DETAILING OF ANY AND ALL CIVIL AND ELECTRICAL ENGINEERING ASPECT OF THIS PROJECT,

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
TITLE SHEET

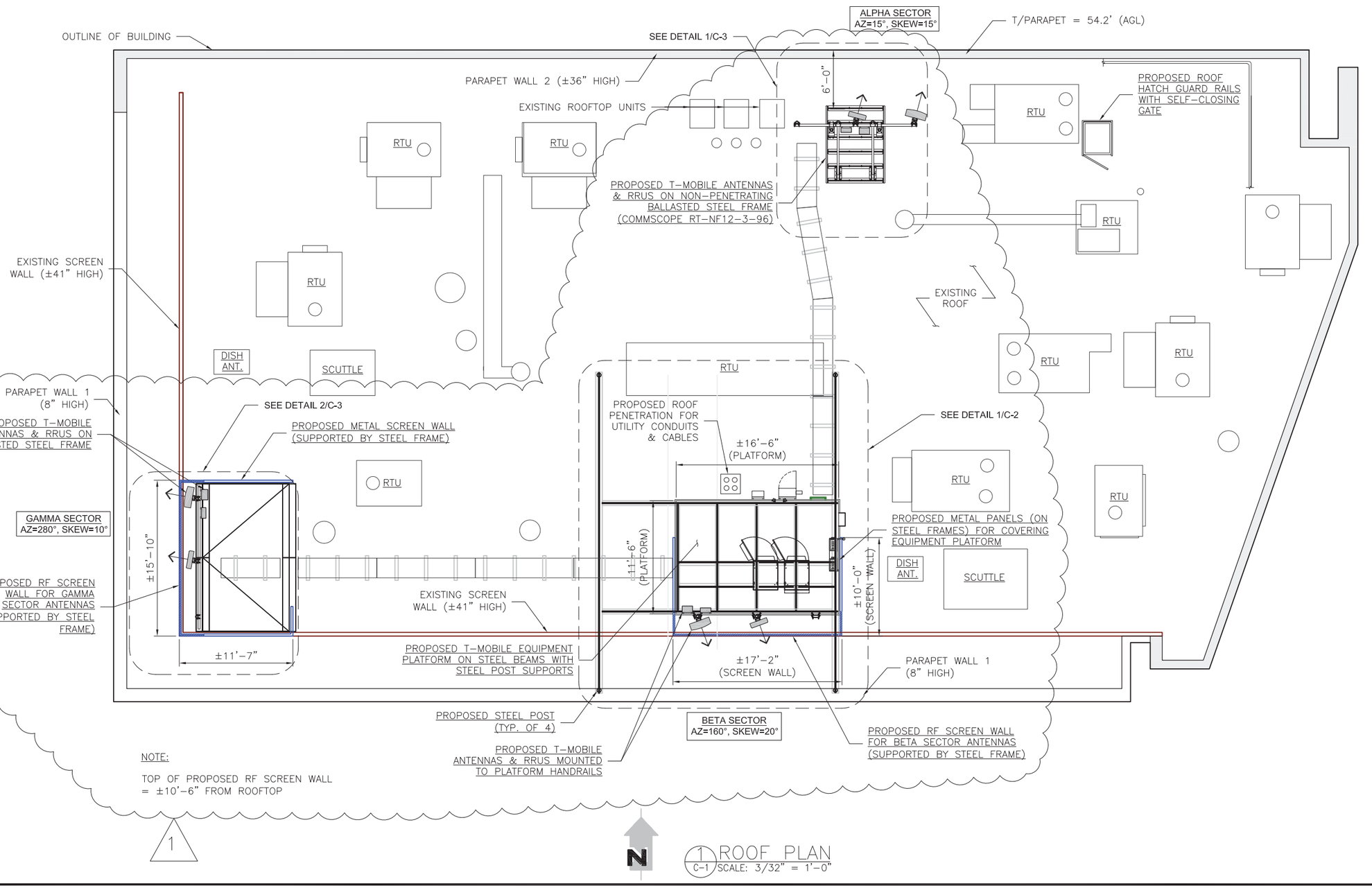
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
T-1

EXHIBIT C

NEW HYBRID JUMPER LENGTHS	TO AHLOA		TO AHFIG		TO AEHC	
	ACTUAL LENGTH	FACTORY LENGTH	ACTUAL LENGTH	FACTORY LENGTH	ACTUAL LENGTH	FACTORY LENGTH
FROM MAIN ROOFTOP JUNCTION BOX LOCATED ON T-MOBILE PROPOSED EQUIPMENT PLATFORM TO ALPHA SECTOR RRUS	(1) 61'-0"	(1) 90'-0"	(1) 58'-0"	(1) 90'-0	(2) 68'-0"	(2) 90'-0
FROM MAIN ROOFTOP JUNCTION BOX LOCATED ON T-MOBILE PROPOSED EQUIPMENT PLATFORM TO BETA SECTOR RRUS	(1) 35'-0"	(1) 60'-0"	(1) 33'-0"	(1) 60'-0"	(2) 28'-0"	(2) 60'-0"
FROM MAIN ROOFTOP JUNCTION BOX LOCATED ON T-MOBILE PROPOSED EQUIPMENT PLATFORM TO GAMMA SECTOR RRUS	(1) 88'-0"	(1) 120'-0"	(1) 86'-0"	(1) 120'-0	(2) 83'-0"	(2) 120'-0

1



1 ROOF PLAN
C-1 SCALE: 3/32" = 1'-0"

EXHIBIT C

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

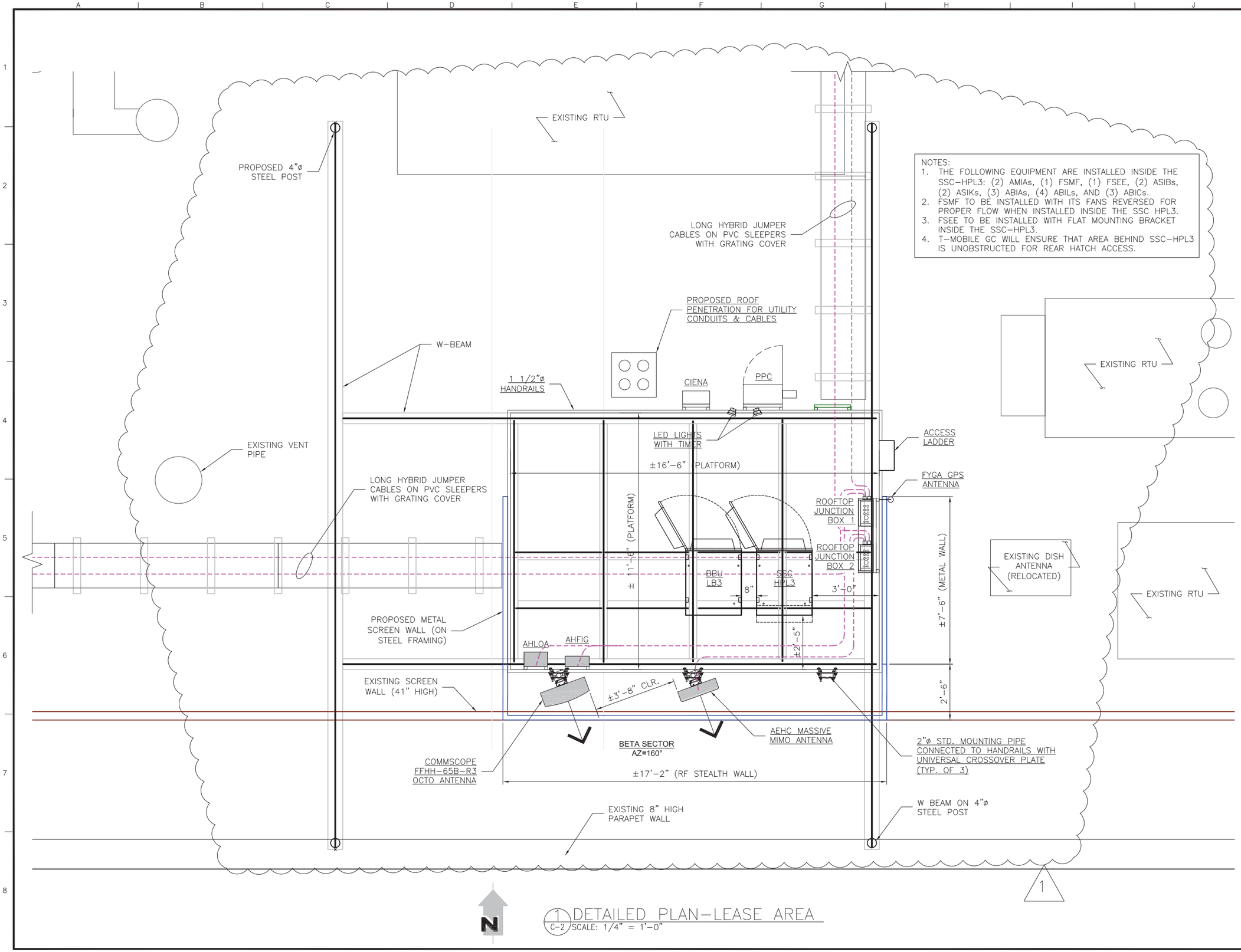
REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
ROOF PLAN

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-1



NOTES:
1. THE FOLLOWING EQUIPMENT ARE INSTALLED INSIDE THE SSC-HPL3: (2) AMIAs, (1) FSMF, (1) FSEE, (2) ASIBs, (2) ASIKs, (3) ABIAs, (4) ABILs, AND (3) ABICs.
2. FSMF TO BE INSTALLED WITH ITS FANS REVERSED FOR PROPER FLOW WHEN INSTALLED INSIDE THE SSC HPL3.
3. FSEE TO BE INSTALLED WITH FLAT MOUNTING BRACKET INSIDE THE SSC-HPL3.
4. T-MOBILE GC WILL ENSURE THAT AREA BEHIND SSC-HPL3 IS UNOBSTRUCTED FOR REAR HATCH ACCESS.

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
DETAILED LEASE AREA PLAN

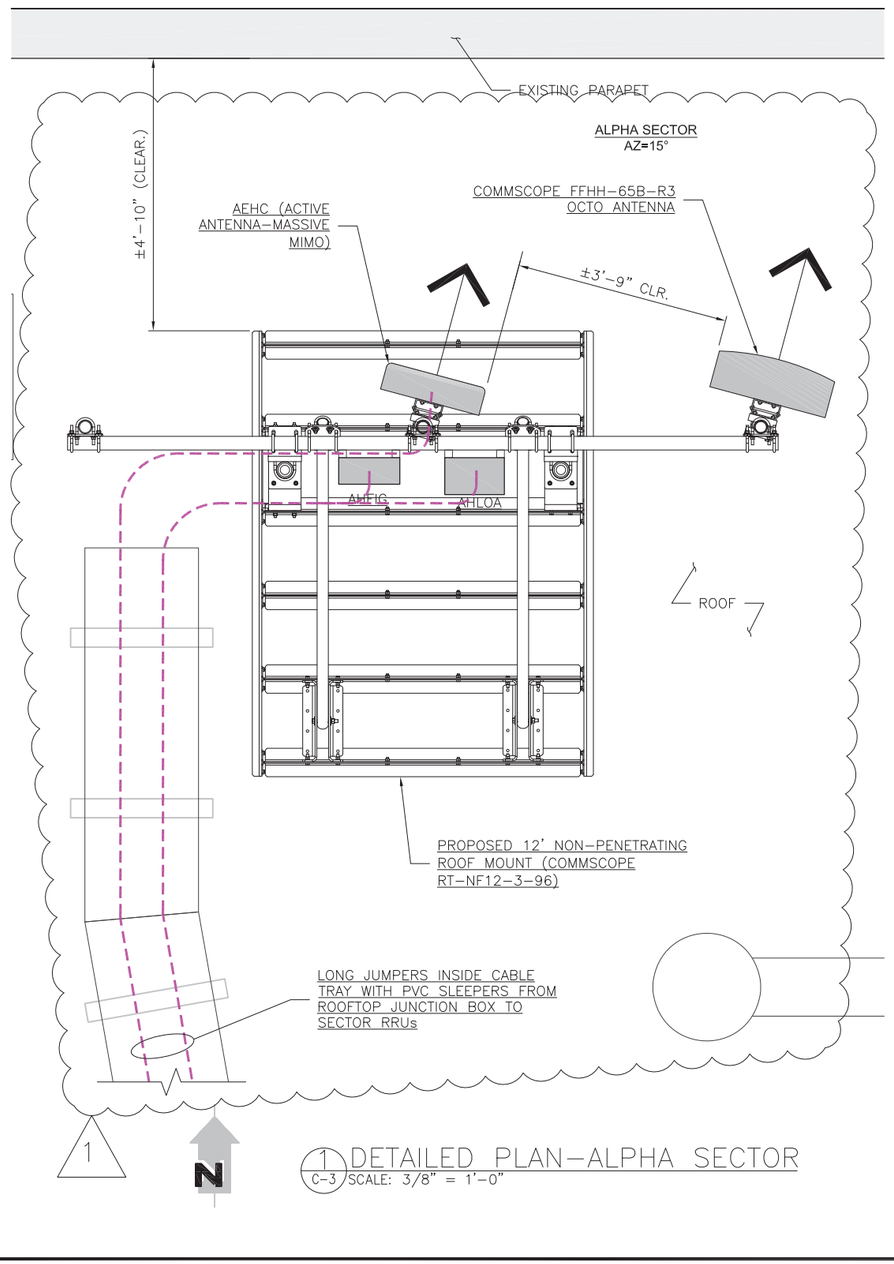
Project Number:	Drawn by: PA
	Date: 8/21/18
Client Project Number:	Checked by: MS
	Date: 8/23/18
Scale:	Approved by:
	Date:

Drawing Number
C-2

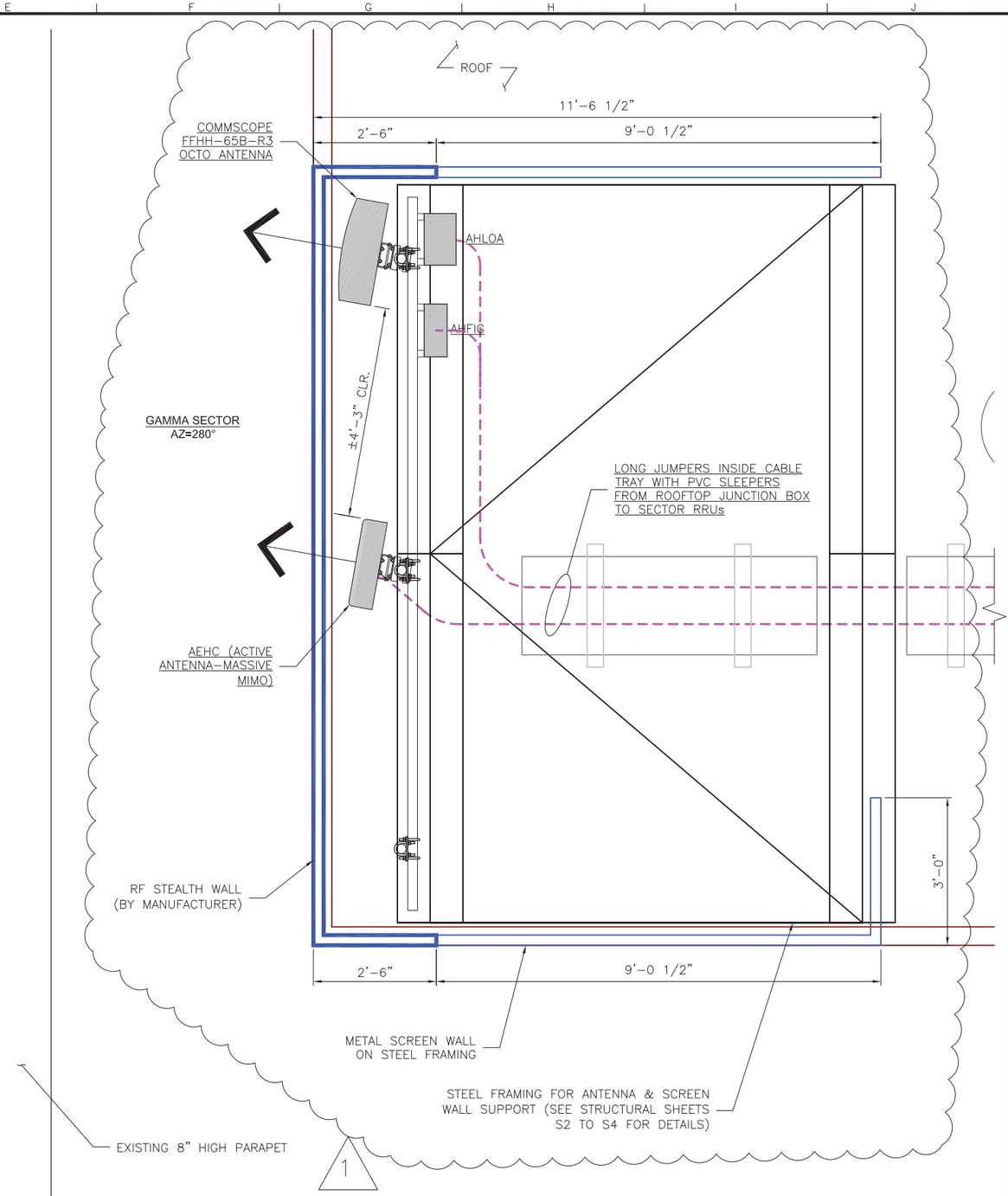
EXHIBIT C

NOTE:

1. ALPHA SECTOR ANTENNAS, MOUNTING PIPES & FRAMES VISIBLE FROM GROUND LEVEL SHALL BE PAINTED TO MATCH THE UPPER WALL COLOR OF THE BUILDING.
2. GENERAL CONTRACTOR WILL COORDINATE WITH BUILDING OWNER FOR COLOR APPROVAL.



1 DETAILED PLAN-ALPHA SECTOR
C-3 SCALE: 3/8" = 1'-0"



2 DETAILED PLAN-GAMMA SECTOR
C-3 SCALE: 3/8" = 1'-0"

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

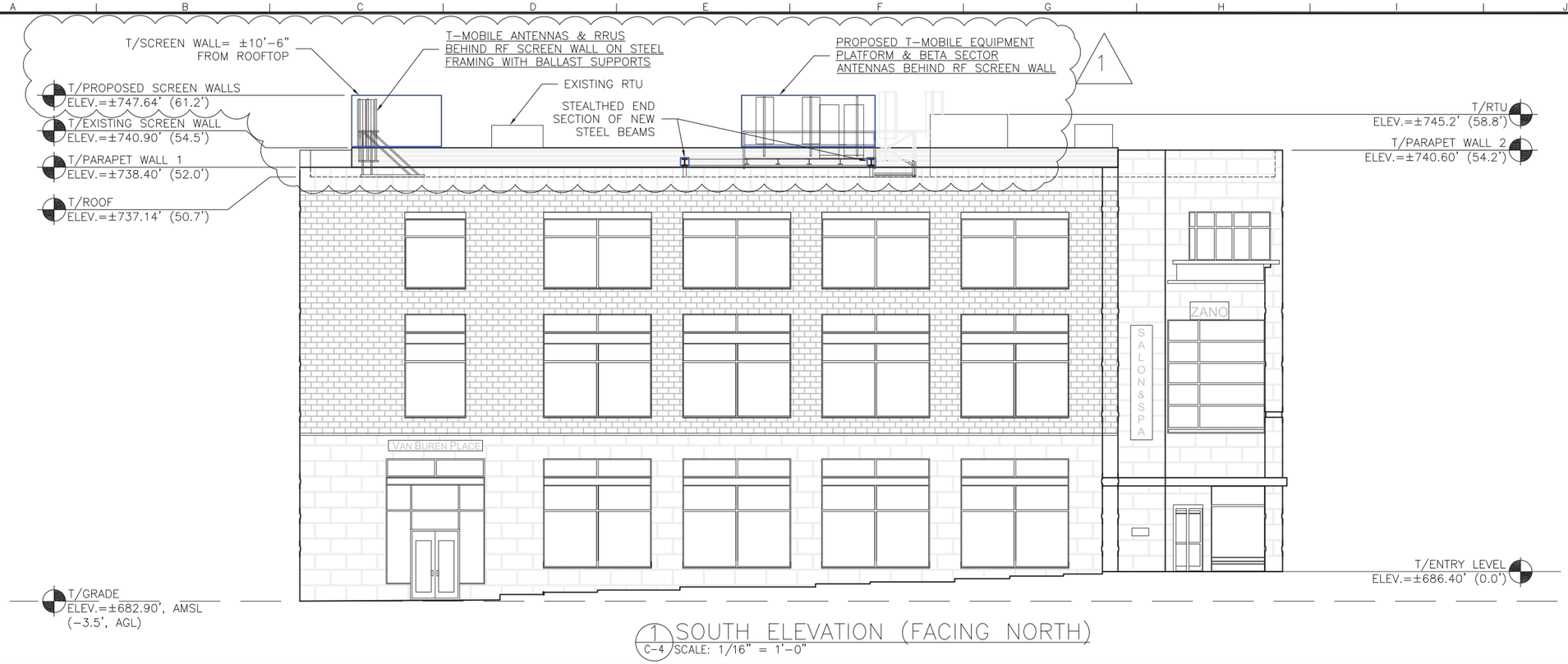
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
SECTORS DETAILED PLANS

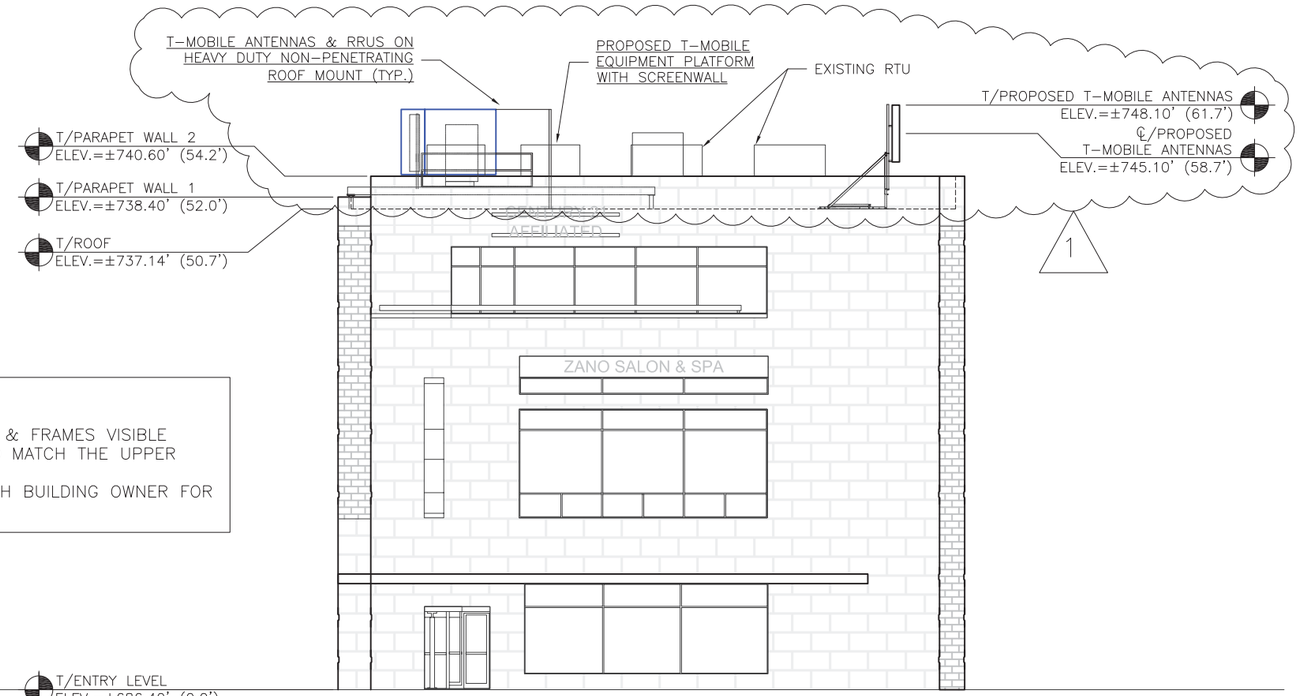
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-3

EXHIBIT C



1 SOUTH ELEVATION (FACING NORTH)
C-4 SCALE: 1/16" = 1'-0"



2 EAST ELEVATION (FACING WEST)
C-4 SCALE: 1/16" = 1'-0"

NOTE:

1. ALPHA SECTOR ANTENNAS, MOUNTING PIPES & FRAMES VISIBLE FROM GROUND LEVEL SHALL BE PAINTED TO MATCH THE UPPER WALL COLOR OF THE BUILDING.
2. GENERAL CONTRACTOR WILL COORDINATE WITH BUILDING OWNER FOR COLOR APPROVAL.

T-Mobile

1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

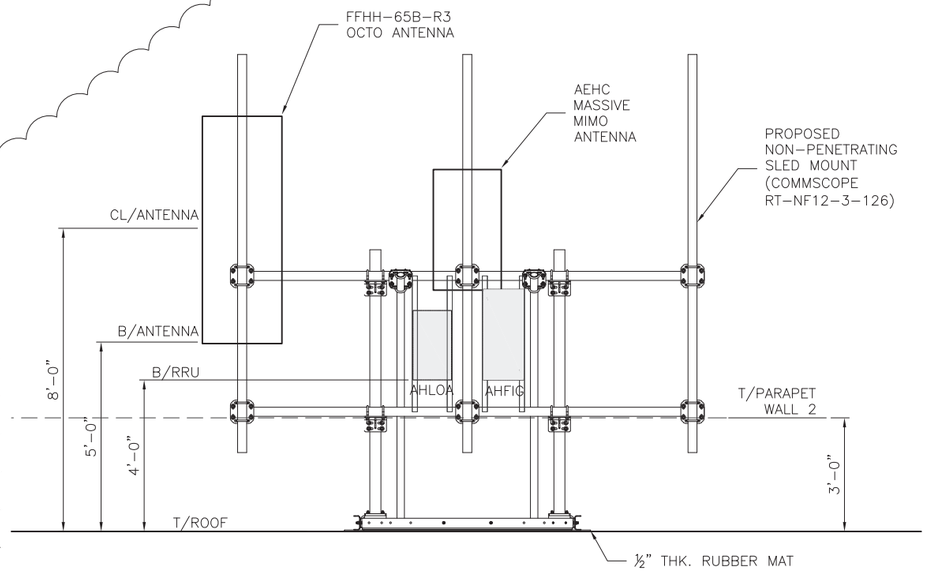
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
BUILDING SOUTH & EAST ELEVATIONS

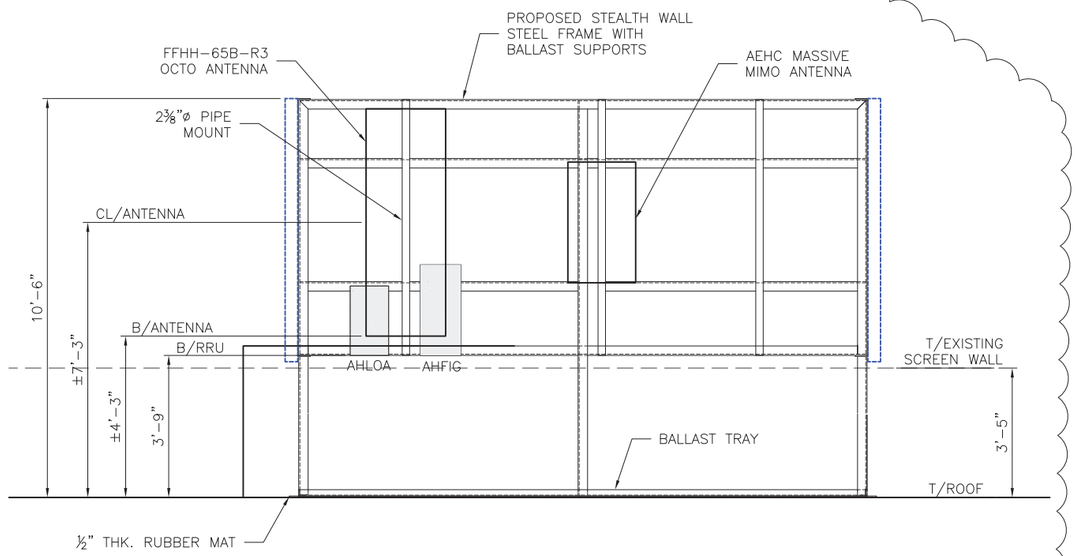
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-4

EXHIBIT C

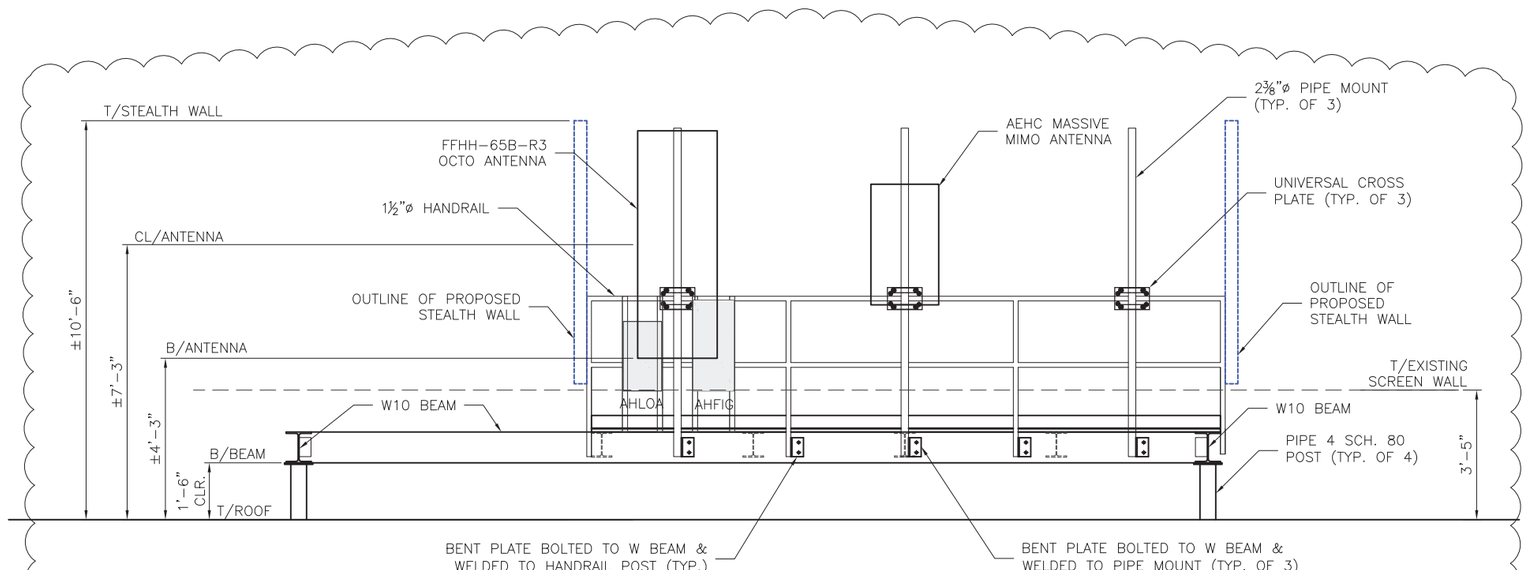


1 C-5 ALPHA SECTOR ANTENNAS & RRUS MOUNTING DETAIL
SCALE: 1/4" = 1'-0"



2 C-5 GAMMA SECTOR ANTENNAS & RRUS MOUNTING DETAIL
SCALE: 1/4" = 1'-0"

1



3 C-5 BETA SECTOR ANTENNAS & RRUS MOUNTING DETAIL
SCALE: 1/4" = 1'-0"

1

EXHIBIT C

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES:
DATE: 7/24/20 EXPIRES: 11/30/21

1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18
REV.	DESCRIPTION	DATE

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
ANTENNA/RRU MOUNTING DETAIL

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-5

ANTENNA & CABLE SCHEDULE

SECTOR	1					2					3				
SECTOR NAME	ALPHA					BETA					GAMMA				
ANTENNA	1				2	1				2	1				2
MODEL #	COMMSCOPE FFHH-65B-R3 (OCTO)				AEHC (ACTIVE ANTENNA MASSIVE MIMO)	COMMSCOPE FFHH-65B-R3 (OCTO)				AEHC (ACTIVE ANTENNA MASSIVE MIMO)	COMMSCOPE FFHH-65B-R3 (OCTO)				AEHC (ACTIVE ANTENNA MASSIVE MIMO)
AZIMUTH	15°					160°					280°				
RAD CENTER	±59.0'					±59.0'					±59.0'				
MECH. DOWNTILT	0				0	0				0	0				0
PORTS	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P3	P4	P5
ACTIVE TECHNOLOGY	L700 L600 N600	L700 L600 N600	L2100 L1900 G1900	L2100 L1900 G1900	L2500 N2500	L700 L600 N600	L700 L600 N600	L2100 L1900 G1900	L2100 L1900 G1900	L2500 N2500	L700 L600 N600	L700 L600 N600	L2100 L1900 G1900	L2100 L1900 G1900	L2500 N2500
DARK TECHNOLOGY															
ELEC. DOWNTILT	2	2	2	2		2	2	2	2		2	2	2	2	
RRU TYPE	(1) AHLOA		(1) AHFIG		INTEGRATED TO AEHC ANTENNA	(1) AHLOA		(1) AHFIG		INTEGRATED TO AEHC ANTENNA	(1) AHLOA		(1) AHFIG		INTEGRATED TO AEHC ANTENNA
CABLES															
CABLE TYPE FROM ROOFTOP JUNCTION BOXES/OVPS AT EQUIPMENT PLATFORM TO SECTOR RRU	LONG HYBRID JUMPER (HELIAX FIBERFEED HYBRID CABLE)					LONG HYBRID JUMPER (HELIAX FIBERFEED HYBRID CABLE)					LONG HYBRID JUMPER (HELIAX FIBERFEED HYBRID CABLE)				
ACTUAL JUMPER LENGTH	(1) 61'-0"		(1) 58'-0"		(1) 68'-0"	(1) 35'-0"		(1) 33'-0"		(1) 28'-0"	(1) 88'-0"		(1) 86'-0"		(2) 83'-0"
FACTORY JUMPER LENGTH	(1) 90'-0"		(1) 90'-0"		(2) 90'-0"	(1) 60'-0"		(1) 60'-0"		(2) 60'-0"	(1) 120'-0"		(1) 120'-0"		(2) 120'-0"
JUMPER TYPE FROM RRU TO ANTENNA	RF JUMPER	RF JUMPER	RF JUMPER	RF JUMPER		RF JUMPER	RF JUMPER	RF JUMPER	RF JUMPER		RF JUMPER	RF JUMPER	RF JUMPER	RF JUMPER	
JUMPER LENGTH	(2) 9'-0"	(2) 9'-0"	(2) 12'-0"	(2) 12'-0"		(2) 6'-0"	(2) 6'-0"	(2) 6'-0"	(2) 6'-0"		(2) 6'-0"	(2) 6'-0"	(2) 6'-0"	(2) 6'-0"	

1

T-Mobile

1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
ANTENNA & CABLE SCHEDULE, HYBRID JUMPER INFORMATION

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-6

EXHIBIT C

FFHH-65B-R3

8-port sector antenna, 4x 617–806 and 4x 1695–2360 MHz, 65° HPBW, 3x RET, 600 MHz-Ready Antenna Technology

Electrical Specifications

Frequency Band, MHz	617–698	698–806	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.1	14.3	17.6	18.4	19.0	19.7
Beamwidth, Horizontal, degrees	65	60	66	60	60	54
Beamwidth, Vertical, degrees	14.9	13.3	5.7	5.3	4.9	4.4
Beam Tilt, degrees	2–14	2–14	2–12	2–12	2–12	2–12
USLS (First Lobe), dB	19	17	20	19	19	20
Front-to-Back Ratio at 180°, dB	33	29	36	40	40	42
Isolation, dB	28	28	28	28	28	28
Isolation, Intersystem, dB	28	28	28	28	28	28
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
Input Power per Port at 50°C, maximum, watts	250	250	200	200	200	200
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	617–698	698–806	1695–1880	1850–1990	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	13.6	13.9	17.2	18.1	18.5	19.3
Gain by all Beam Tilts Tolerance, dBi	±0.6	±0.6	±0.6	±0.5	±0.5	±0.5
Gain by Beam Tilt, average, dBi	2 ° | 13.4 8 ° | 13.7 14 ° | 13.5	2 ° | 13.8 8 ° | 13.9 14 ° | 13.8	2 ° | 17.1 7 ° | 17.3 12 ° | 17.1	2 ° | 18.0 7 ° | 18.2 12 ° | 17.9	2 ° | 18.3 7 ° | 18.6 12 ° | 18.4	2 ° | 19.0 7 ° | 19.4 12 ° | 19.2
Beamwidth, Horizontal Tolerance, degrees	±3	±4	±4.5	±5.6	±6.5	±7.9
Beamwidth, Vertical Tolerance, degrees	±1.1	±1.1	±0.3	±0.3	±0.4	±0.2
USLS, beampeak to 20° above beampeak, dB	19	17	15	15	16	17
Front-to-Back Total Power at 180° ± 30°, dB	24	21	29	32	32	32
CPR at Boresight, dB	22	24	18	16	18	22
CPR at Sector, dB	8	9	7	7	9	9

* 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

COMMSCOPE®

FFHH-65B-R3

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

Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	617-806	1-2	1	ANxxxxxxxxxxxxxxx1
R2	617-806	3-4		
Y1	1695-2360	5-6	2	ANxxxxxxxxxxxxxxx2
Y2	1695-2360	7-8	3	ANxxxxxxxxxxxxxxx3

Port Configuration

General Specifications

Operating Frequency Band 1695 – 2360 MHz | 617 – 806 MHz

COMMSCOPE®

FFHH-65B-R3

Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage
Total Input Power, maximum	900 W @ 50 °C

Mechanical Specifications

RF Connector Quantity, total	8
RF Connector Quantity, low band	4
RF Connector Quantity, high band	4
RF Connector Interface	4.3-10 Female
Color	Light gray
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	765.0 N @ 150 km/h 172.0 lbf @ 150 km/h
Wind Loading, lateral	251.0 N @ 150 km/h 56.4 lbf @ 150 km/h
Wind Loading, maximum	1041.0 N @ 150 km/h 234.0 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Length	1830.0 mm | 72.0 in
Width	640.0 mm | 25.2 in
Depth	235.0 mm | 9.3 in
Net Weight, without mounting kit	46.0 kg | 101.4 lb

Remote Electrical Tilt (RET) Information

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

COMMSCOPE®

1 OCTO ANTENNA SPECIFICATIONS
SCALE: N.T.S.

5GC000657 Nokia AirScale MAA 64T64R 192AE B41 320W AEHC
LTE4225 Nokia AirScale MAA 64T64R 192AE B41 320W AEHC
5GC002350 NR-LTE concurrent operation for AEHC eCPRI radios
LTE5111 NR-LTE concurrent operation for eCPRI radios

1.1 64T64R Massive MIMO Adaptive Antenna AEHC (B41)

Description

The AEHC is a new Massive MIMO Adaptive Antenna product with an integrated radio for Band 41 (2.5GHz) from Nokia. This antenna/radio unit is LTE and 5G capable and has beamforming for the Massive MIMO function, which provides coverage and capacity gains.

The deployment of Massive MIMO requires HW that supports this functionality. The AEHC has 64T64R and 5 W / TRX (320 W total, 2 W/MHz up to 160 MHz). The AEHC radio can be set up in concurrent mode with 64TRX designated for NR-LTE. Later SW versions will allow for beamforming function, and this requires the use of a TM9 UE for beamforming.

The AEHC will work with SRAN20B/5G20A SW in single mode for LTE/NR. The AEHC will be available in concurrent mode with SRAN20C/5G20B SW for LTE/NR. It deploys in a TDD configuration and is eCPRI based radio and will only work with the AirScale System Module. AEHC has 4 x SFP28 optical ports, and each AEHC requires – 1 fiber for LTE 3X20MHz 8DL4UL layers, 2 fibers for LTE 4X40MHz 16DL8UL layers and 1 fiber for NR 100MHz per fiber 8DL4UL layers, 2 fibers required for NR when utilizing 2nd carrier example 100MHz+60MHz 8DL4UL layers or 2 fibers required for NR 100MHz+ 16DL8UL layers.

BW/Tech	TDD Layers	No of Carriers	No of Fibers	BB Requirements	Software Support
LTE 80MHz	8DL4UL	3X20MHz	1	1 ABIC per AEHC	SRAN20B
NR 100MHz	8DL4UL	1	1	1/2 ABIL per AEHC	5G20B
NR 100+80MHz	8DL4UL	2	2	1 ABIL per AEHC	Dual carrier TBD
NR 100MHz	16DL8UL	1	2	1 ABIL per AEHC	TBD
NR 100+80MHz	16DL8UL	2	2	TBD	TBD

Diagram : AEHC 475124A

There are no RF ports on the AEHC since it is an integrated radio within the antenna.

T··Mobile·

Since it is an antenna/radio integration **it will be mounted as an antenna** tc ensure proper beam coverage. **DO NOT** mount the unit in a way that will have the beam blocked by parapets or so the face of the unit does not point towards the coverage area.

Additional features involved with AEHC are:

- 5GC002350 NR-LTE concurrent operation for AEHC eCPRI radios
- LTE5111 NR-LTE concurrent operation for eCPRI radios

The AEHC has the following main features:

Property	Value
Output power	5 W / TRX (320 W total, 2 WMHz up to 160 MHz)
Modulation Support	(DL) BPSK, QPSK, 16 QAM, 64 QAM, 256 QAM (UL) BPSK, QPSK, 16 QAM, 64 QAM
Number of TX/RX	64TX64RX
MIMO	16
Outdoor installation	Yes
SW supported technology	TD-LTE and 5G
Beamforming	Yes
RF Sharing (WCMDA/GSM/LTE)	No
Frequency Range	2496 MHz – 2690 MHz 3GPP B41
Instantaneous Bandwidth IBW	194 MHz
Occupied Bandwidth OBW	190 MHz
Number of Carriers per Pipe	Up to 3
Supported bandwidths	LTE: 60 MHz 5G: 60, 40/80/100MHz

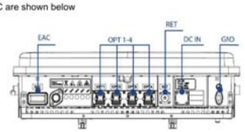
1.2 Antenna Properties

Macro Coverage Usage:

Property	Value
Antenna configuration	12, 8, 2 (±45°X-polarized)
Max. Antenna gain	24 dBi
Horizontal beamwidth	15°(boresight)
Vertical Beamwidth	6°(boresight)
Horizontal coverage angle	±45°(3 dB), ±60°(5 dB)
Vertical steering angle	0°to +12°(+ means down)
Vertical steering pre-tilt	+6°

1.2.1 AEHC Interfaces

The ports of the AEHC are shown below



T··Mobile·

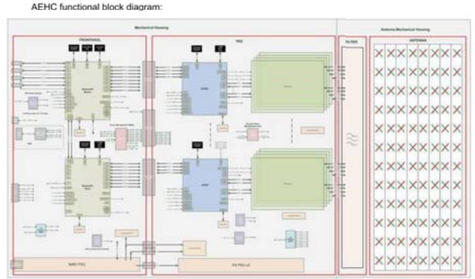
Interface	Label on the HW	Number of interfaces	Connector type	Additional info
Power Connector	DC IN	1	2-Pole screw terminal	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR-26	-
Optical interface	OPT	4	SFP28 (OCTIS)	25 Gbps, eCPRI, OCTIS IP Seal
Local management Interface	LMI	1	HDMI	
Grounding	⏚	1	2 x M5 screws	-

1.2.2 Antenna Line Devices (ALD) Support

ALD support via antenna ports	Value
AISG	RAE: AISG 3.0
Voltage	10-30 V
Power per port	-

1.2.3 Functional Blocks

AEHC functional block diagram:



T··Mobile·

1.2.4 Installation/Mechanical Specifications

The installation and mechanical specifications for the AEHC are below:

Property	Value
Installation options	Pole Installation Wall Installation
IP rating	IP65
Related optional items	Pole Mounting Kit (AMPF) External alarm cable (ASAC EAC cable) Optical connector (AOPE) Power connector (APPG)SFP (AOSC)

1.2.5 Electrical Specifications

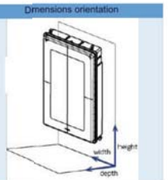
The electrical specifications for the AEHC are below

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

1.2.6 Dimensions and Weight

Property	Value
Height	970 mm (38.2 in.) with front covers
Width	545 mm (21.5 in.) with front covers
Depth	150 mm (5.9 in.) with front covers
Weight	49 kg (108.0 lb) without mounting brackets

Dimensions orientation



1.2.7 Power Consumption

AEHC Power consumption is listed below:

- ≤1330 W typical (75% DL duty cycle, 30% RF load)
- ≤1827 W max (75% DL duty cycle, 100% RF load)

The detailed test results will be available upon AEHC availability for FOA.

2 AEHC MASSIVE MIMO ANTENNA SPECIFICATIONS
SCALE: N.T.S.

EXHIBIT C

T··Mobile·
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
ANTENNA INFORMATION

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-7

HP-Large 3 Power Cabinet

Product Features

Compact design for equipment & power:

- 30RU supports 3 radios and transport equipment
- 600A @ -48V power system
- Slimline high efficiency rectifier
- ORION Touch screen Controller
- Rear Access Hatch

Direct air-cooling solution, 6000W capacity, 5°C delta T

Easy slide-in filter replacement

Connects with:

- SB3, 2-string battery cabinet
- LB3, 4-string battery cabinet
- V2, Expansion equipment and battery cabinet

Designed to GR-487 specifications

www.deltaww.com

DELTA
Smarter. Greener. Together.

DELTA
Smarter. Greener. Together.

Specifications

Model	HPL3 (HP-Large 3 Power Cabinet)	
1. General		
Construction	Aluminum enclosure	
Dimensions (W x H x D)	30 x 72 x 34.6 in. (762 x 1829x 879mm),	
Weight	Depth with Door/Hatch: 44.7 in. (1136mm) ~595 lbs (~270kg) (without customer equipment or batteries)	
Internal rack dimension	Total Equipment space 30RU Horizontal rack: 19" x 27RU Vertical rack: 19" x 3RU Power System space: 23" x 12RU	
Mounting options	Pad-mount, plinth option	
Finish	Polyester Power Paint (Tan)	
Safety	UL Listed, IEC / EN 60950	
2. Environment		
Operating temperature	-40°C to +50°C (-40°F to +122°F) with solar load. IP 55	
Protection class	designed to GR-487	
Acoustics	65dBA @5000W heat load , 70dBA @ 6000W	
Humidity (relative)	95%, non-condensing (Max.)	
3. Thermal Management		
Cooling Equipment:	Direct Air Cooling, 6000W capacity, 5°C delta T	
Heating Equipment:	Forced air heating (2) 1000W AC heaters	
4. Equipment		
Cable entry	Knock-out plate on each upper side wall / Additional knockouts on sides (1) 3" conduit holc with holc plug	
Door latch	3 point latching, 5/16 nut driver tool, pad-locking capability	
Primary ground	10 double-hole ¼"-20 threaded holes on 5/8" center ground bar	
Lifting Ears	4 Lifting Tabs	
Plinth	Optional 6" plinth available	
Standard equipment	AC Load Center: 240V split phase, dual feed / (1) 200A + (1)100A 208V 3-phase, single feed / (1) 200A AC Surge Protection for each breaker feed GFCI Receptacle 120V Temp Probes (6 form-C) Alarm Termination block 605A/ 54V (336kW) redundant Power System with DIN rail distribution: 12 rectifier positions (3x55A DPR3000 rectifiers included) 48 poles for load (2x10A, 3x30A, and 6x100A load breakers included) 16 poles for battery (2) SB350 / (2) SB175 Battery connections (3) SB350 Generator connections	
Front Door:	(6) DC powered centrifugal fans with (3) MERV-13 filters, (GORE option) Clogged Filter alarm pressure switch Door intrusion alarm (2) 1000W AC powered heaters LED interior cabinet light	
Rear Hatch:	Exhaust vent with (3) MERV-13 filters, (GORE option)	
5. Ordering information		
Cabinet	ESOA600-HCU01	HP-Large 3 600A Power / Equipment Cabinet
Rectifier	ESR-48/60A A-T	48V / 56A 3000W, 96.4%, CAN communication
Controller (Spare)	TPS1020028AU17	Orion TOUCH Controller
Plinth, 6"	37993318816900-S	Plinth for V1/V2, HPL2, HPL3, LB2 and LB3

*All specifications are subject to change without prior notice

Delta Group Website:
www.deltaww.com

Product Website:
www.deltapowersolutions.com

United States of America & Canada:
Delta Electronics (USA) Inc.
2925 E. Plano Parkway
Plano, TX (Texas) 75074

Sales and Orders:
DEUSTPS.Sales@deltaww.com
DEUSTPS.Orders@deltaww.com

Field Support:
1-877-DELTA-08 option 3
(877-335-8208 option 3)
DEUSTPS.Support@deltaww.com

Installation Services:
DEUSTPS.Services@deltaww.com

RMA:
DEUSTPS.RMA@deltaww.com

Large Battery 3 Cabinet

LB3 Site Support Enclosure

Product Feature

- Direct air cooling solution with optional Gore filter
- Supports four strings of -48V VRLA batteries up to 210Ah
- 600A bus bar with individual 200A breakers per string
- Bulk Input / Output with ability to daisy chain cabinets
- Connection kit includes cables with disconnects
- Rear hatch access
- Corrosion resistant aluminum construction
- Powder coated high gloss finish
- Designed to meet GR-487

www.deltaww.com

DELTA
Smarter. Greener. Together.

DELTA
Smarter. Greener. Together.

Specifications

Model	Large 3 Battery (LB3) Cabinet	
1. General		
Construction	Aluminum enclosure	
Dimensions (W x H x D)	30 x 72 x 35in. (766 x 1829x 889mm), Depth with door: 41 in. (1045mm)	
Weight	~540lbs (245kg) (without batteries)	
Internal rack dimension	4 battery trays to support up to 210Ah batteries	
Mounting options	Pad-mount, plinth option	
Finish	Polyester Powder Paint (Tan)	
Safety	UL Listed, IEC / EN 60950	
2. Environment		
Operating temperature	-40C to +50C (-40F to +122F) with solar load.	
Protection class	IP55 designed to GR-487	
Acoustics	65 dBA	
Humidity (relative)	95%, non-condensing (Max.)	
3. Thermal management		
Cooling	Direct Air Cooling: (4) Axial Fans. Filters: F6 front and rear	
Heating	Forced air heating (2) 1000W AC heaters	
4. Equipment		
Cable Entry	Knock-out plate on each upper side wall Additional knockouts each side	
Door latch	3 point latching, 5/16 Nut driver tool, pad-locking capability	
Lifting Ears	4 eye bolts	
Standard equipment	AC Load Center with AC Surge protection and GFCI outlet Left or Right side AC entry options (2) 1000W AC powered heater DC Load Center 600A bulk feed bus bar (4) 20050A DIN rail battery breakers (4) 2-hole lug landings (2) Anderson SB350 input connectors to daisy chain 2nd battery cabinet 2AWG battery cables from breakers to trays Configurable trays for (4) strings of up to 210Ah batteries Door intrusion switch LED interior cabinet light Fan Control Board, factory wired alarms via RJ45 output (fan & breaker alarms) Cabinet Connection kit (2) 4/0 cables with SB350 disconnects to connect to power cabinet	
5. Ordering information		
Cabinet	ESOF015-ECV04	Large Battery 3 Cabinet
Plinth, 6"	37993318816900-S	Plinth for V1/V2, HPL2, LB2 cabinets only

*All specifications are subject to change without prior notice.

Delta Group Website:
www.deltaww.com

Product Website:
www.deltapowersolutions.com

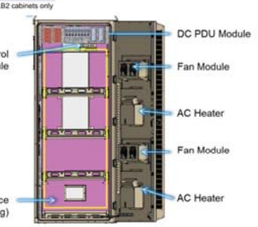
United States of America & Canada:
Delta Electronics U.S. Inc.
2925 E. Plano Parkway
Plano, TX (Texas) 75074

Sales and Support:
Sales: DEUSTPS.Sales@deltaww.com
Orders: DEUSTPS.Orders@deltaww.com

Field Support:
1-877-DELTA-08 option 3
(877-335-8208 option 3)
DEUSTPS.Support@deltaww.com

Installation Services:
DEUSTPS.Services@deltaww.com

RMA:
DEUSTPS.RMA@deltaww.com



1 DETAIL—HP LARGE SITE SUPPORT CABINET & BBU
SCALE: N.T.S.

Nokia AirScale SM Indoor Technical Datasheet

AirScale SM Indoor general specification	
Capacity Multi-RAT capable platform	Per Capacity plug-in unit in LTE16A: 8 LTE cells (FDD)
Minimum configuration	1 Common PIU (transport and control), 1 Capacity PIU (baseband processing)
Maximum configuration	2 Common PIU , 6 Capacity PIU
Installation options	19 inch standard rack, pole and wall (wth mounting plinth), inside Outdoor Enclosure

AirScale SM Indoor mechanical specifications	
Dimensions	(3U) H 128 mm x W 447 mm x D 400 mm H 5.04" x W 17.60" x D 15.75"
Installation Depth	400mm + cooling air space 50mm
Weight	Minimum (Common PIU + Capacity PIU): 10.1kg 22.27 LBS. Maximum (2 Common PIU + 6 Capacity PIU): 23.5kg 51.81 LBS.
Ingress protection	IP20
Operational Temperature Range	-5°C to 55°C

AirScale SM Indoor electrical specifications	
Supply Voltage / Voltage Range	Nominal: -48V DC / -40.5V to -57V
Power consumption	1 Common PIU & 1 Capacity PIU: typ 210W *1 Common PIU & 3 Capacity PIU: typ 420W* 2 Common PIU & 6 Capacity PIU: typ 840W

Minimum configuration (1x BTS)

Minimum configuration (2x BTS, 1 BTS per half subrack

Maximum AirScale SM Indoor configuration (FL16A: 1 BTS per half subrack)

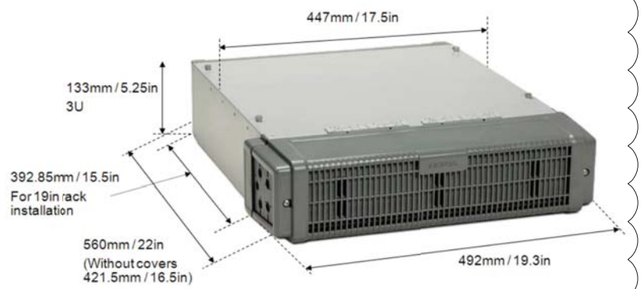
One logical BTS in full subrack (Future releases)

NOKIA

2 DETAIL—AMIA
SCALE: N.T.S.

Flexi Multiradio BTS System Module FSMF

- < 15 liters
- < 15 kg
- 3 height units
- IP65
- -35 to +55 °C



NOTE:
FSMF TO BE INSTALLED WITH ITS FANS REVERSED FOR PROPER AIR FLOW WHEN PLACED INSIDE THE SSC—HPL3.

3 DETAIL—FSMF
SCALE: N.T.S.

1

EXHIBIT C

T-Mobile

1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:

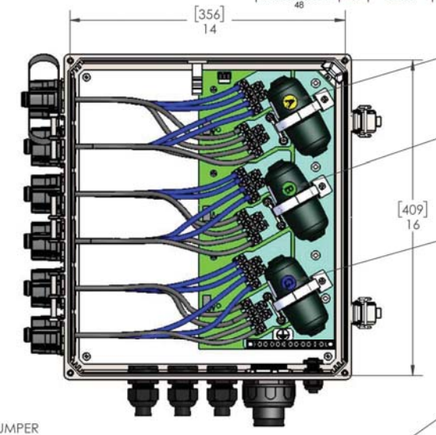
EQUIPMENT INFORMATION

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

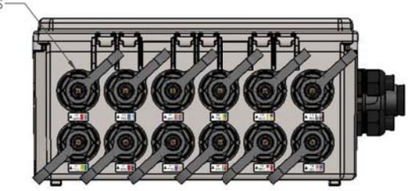
Drawing Number

C-8

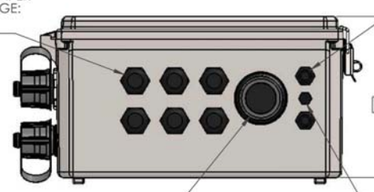
DWG NO.	REV	PROJECT	DESCRIPTION OF CHANGE
RTMDC-5895-PF-48	09	ESR-607	Added model number to title block



12X Senko HYBRID PORT CONNECTORS WITH COVERS



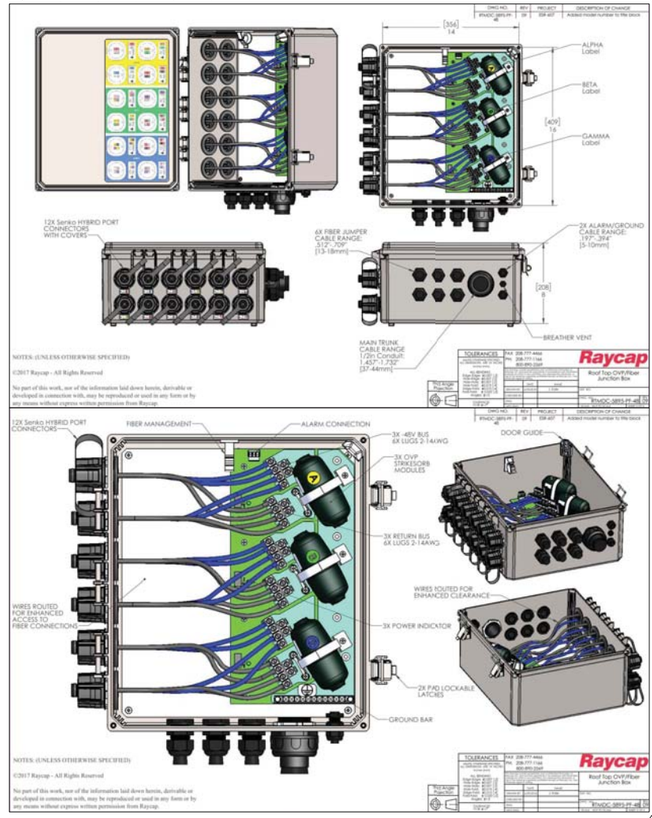
6X FIBER JUMPER CABLE RANGE: .512"-.709" [13-18mm]



MAIN TRUNK CABLE RANGE 1/2in Conduit: 1.457"-1.732" [37-44mm]

TOLERANCES		Raycap
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES [mm]	FAX 208-777-4466 PH: 208-777-1166 800-890-2569	Roof Top OVP/Fiber Junction Box
ALL BENDING Edge-Edge: ±0.007 [.2] Hole-Edge: ±0.007 [.2] Hole-Hole: ±0.007 [.2] Hole-Fold: ±0.015 [.4] Edge-Fold: ±0.015 [.4] Fold-Fold: ± 0.030 [.8] Angles: ± 1.0	The drawing contains proprietary and confidential information of Raycap. It is loaned subject to the agreement that it will not be copied for which it was supplied. Any reproduction disclosure, or use in whole or in part without permission except as Raycap, Inc. has otherwise agreed in writing.	SAP NO.
TOLERANCES TO BE ±1/64"	DRAWN BY: 6/29/2018 J. Kolar CHECKED BY: ENG: MFG ENG:	DWG. NO. RTMDC-5895-PF-48 REV 09 SCALE: NOT TO SCALE SHEET 2 OF 3

Third Angle Projection



1 DETAIL—ROOFTOP OVP/FIBER JUNCTION BOX
SCALE: N.T.S.

Product Specifications

COMMSCOPE®

HFT410-4SNOK2-150

HELIAX® FiberFeed® Hybrid Cable Assembly, HQLC. End 1: 4 fibers terminated DLC for Nokia RRUs with flush cut power cord (red / black conductors). End 2: 4 fibers terminated LC and 4 X 10 AWG conductors terminated at hybrid trunk connector. 150 ft

Construction Materials

Fiber Type	Bend insensitive singlemode fiber (G.657.A2)
Total Fibers, quantity	4
Armor Type	Corrugated aluminum
Jacket Color	Black

Dimensions

Cord Length	45.72 m | 150.00 ft
Breakout Length, Fiber, end 1	815 mm | 32 in
Breakout Length, Power, end 1	895 mm | 35 in
Breakout Length, Fiber, end 2	600 mm | 24 in

Environmental Specifications

Environmental Space	Wireless installation
Operating Temperature	-40 °C to +75 °C (-40 °F to +167 °F)

General Specifications

Conductors, quantity	4
Construction Type	Hybrid standard tail
Center Conductor Gauge	10 AWG
Interface Body Style, connector A	Flex angle
Interface Body Style, connector B	Straight
Interface Feature, connector A	Nokia boot
Interface Feature, connector B	Outdoor
Interface, connector A	DLC
Interface, connector B	HQLC

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

RoHS Compliant

Included Products

760234195 | HTC-4SM-410-APVA (Product Component—not orderable) — HELIAX® FiberFeed® Hybrid Cable, UL Type TC-OF-ER

- CS-8G-MP (Product Component—not orderable) — Enhanced Low Macrobending, Zero Water Peak, Dispersion-Unshifted Singlemode Fiber (ITU-T G.657.A2, B2)

760234195 | HTC-4SM-410-APVA

HELIAX® FiberFeed® Hybrid Cable, UL Type TC-OF-ER

Representative Image

General Specifications

Conductor Gauge	10 AWG
Conductors, quantity	4
Construction Type	Shielded
Application	Remote radio head
Brand	HELIAX® FiberFeed®
Cable Type	Wireless feeder
Inner Shield (Tape) Material	Corrugated aluminum
Outer Shield (Tape) Material	PVC
Ripcord Material	Para-aramid synthetic fiber
Strength Member	Glass reinforced plastic rod
Water Blocking Method	Water blocking tape(s) | Water blocking threads

Construction Materials

Fiber Type Solution	Bend insensitive singlemode fiber (G.657.A2/B2)
Total Fiber Count	4
Fiber Type	Bend insensitive singlemode fiber (G.657.A2/B2)
Fiber Type, quantity	4
Fibers per Subunit, quantity	2
Jacket Color	Black

Electrical Specifications

dc Resistance, maximum	1.039 ohms/kft | 5.430 ohms/km
dc Resistance Note	Maximum value based on a standard condition of 20 °C (68 °F)

Dimensions

Buffer Tube/Subunit Diameter	3.60 mm | 0.14 in
Cable Weight	456.1 kg/km | 306.5 lb/kft
Diameter Over Jacket	18.31 mm | 0.72 in
Subunit, quantity	2

Physical Specifications

Minimum Bend Radius, multiple bends, loaded	365.8 mm | 14.4 in
Minimum Bend Radius, multiple bends, unloaded	221.0 mm | 8.7 in
Minimum Bend Radius, single bend, unloaded	127.0 mm | 5.0 in
Tensile Load, long term, maximum	801 N | 180 lbf
Tensile Load, short term, maximum	2669 N | 600 lbf

Environmental Specifications

Environmental Space	Wireless installation
Installation Temperature	-30 °C to +70 °C (-22 °F to +158 °F)
Operating Temperature	-40 °C to +70 °C (-40 °F to +158 °F)
Storage Temperature	-40 °C to +70 °C (-40 °F to +158 °F)

Mechanical Test Specifications

Compression	22 N/mm | 126 lb/in
Compression Test Method	FOTP-41
Flex	25 cycles
Flex Test Method	FOTP-104
Impact	2.94 N-m | 2.17 ft lb
Impact Test Method	FOTP-25
Twist	10 cycles
Twist Test Method	FOTP-85

Qualification Specifications

Cable Qualification Standards	ANSI/ICEA S-87-640 | Telcordia GR-20 | Telcordia GR-409

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

CS-8G-MP (Product Component—not orderable) — Enhanced Low Macrobending, Zero Water Peak, Dispersion-Unshifted Singlemode Fiber (ITU-T G.657.A2, B2)

* Footnotes

Operating Temperature Specification applicable to non-terminated bulk fiber cable

CS-8G-MP

Enhanced Low Macrobending, Zero Water Peak, Dispersion-Unshifted Singlemode Fiber (ITU-T G.657.A2,B2)

Optical Specifications, Wavelength Specific

Standards Compliance	ITU-T G.657.A2 | ITU-T G.657.B2
Attenuation, maximum	0.50 dB/km @ 1310 nm 0.50 dB/km @ 1385 nm 0.50 dB/km @ 1550 nm
Dispersion, maximum	18 ps/(nm-km) at 1550 nm | 3.5 ps(nm-km) from 1285 nm to 1330 nm at 1310 nm
Mode Field Diameter	8.8 µm @ 1310 nm
Mode Field Diameter Tolerance	±0.4 µm @ 1310 nm
Index of Refraction	1.467 @ 1310 nm 1.467 @ 1385 nm 1.468 @ 1550 nm
Polarization Mode Dispersion Link Design Value, maximum	0.06 ps/sqrt(km)

Physical Specifications

Cladding Diameter	125.0 µm
Cladding Diameter Tolerance	±0.7 µm
Cladding Non-Circularity, maximum	0.7 %
Coating Diameter (Colored)	254 µm
Coating Diameter (Uncolored)	240 µm
Coating Diameter Tolerance (Colored)	±7 µm
Coating Diameter Tolerance (Uncolored)	±5 µm
Coating/Cladding Concentricity Error, maximum	12 µm
Core/Clad Offset, maximum	0.5 µm

Optical Specifications, General

Cabled Cutoff Wavelength, maximum	1260 nm
Point Defects, maximum	0.10 dB
Zero Dispersion Slope, maximum	0.092 ps/[km-nm-nm]
Zero Dispersion Wavelength, maximum	1322 nm
Zero Dispersion Wavelength, minimum	1302 nm

Mechanical Specifications

Coating Strip Force, maximum	8.9 N | 2.0 lbf
Coating Strip Force, minimum	1.3 N | 0.3 lbf
Dynamic Fatigue Parameter, minimum	20
Fiber Curl, minimum	4.0 m | 13.1 ft
Macrobending, 15 mm mandrel, 1 turn	0.50 dB @ 1550 nm 1.00 dB @ 1625 nm
Macrobending, 20 mm mandrel, 1 turn	0.10 dB @ 1550 nm 0.20 dB @ 1625 nm
Macrobending, 30 mm mandrel, 10 turns	0.03 dB @ 1550 nm 0.10 dB @ 1625 nm
Proof Test	689.48 N/mm² | 100000.00 psi

Environmental Specifications

Heat Aging, maximum	0.05 dB/km @ 85 °C
Temperature Dependence, maximum	0.05 dB/km
Temperature Humidity Cycling, maximum	0.05 dB/km
Water Immersion, maximum	0.05 dB/km @ 23 °C

2 DETAIL—HYBRID JUMPER CABLE
SCALE: N.T.S.

EXHIBIT C

T-Mobile

1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:

EQUIPMENT INFORMATION

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number

C-9

AirScale Dual RRH 4T4R B12/71 240W AHLOA (Draft)

Product Code: 474331A	
Supported Frequency bands	3GPP Band 12/71
Frequencies	Band 12 adjusted: Rx 698 – 715 MHz, TX 728 – 745 MHz Band 71: RX 663 MHz – 698 MHz, TX 617 MHz – 652 MHz
Number of TX/RX paths/pipes	4 pipes; 2T2R, 2T4R, 4T4R for both bands
Instantaneous Bandwidth IBW	16 MHz for B12 and 35MHz for B71 1 MHz below B12 NB IoT future use
Occupied Bandwidth OBW	52 MHz total across bands
Output Power	60W per TXshared between bands
Supply Voltage / Range	DC-48 V / -36 V to -60 V
Typical Power Consumption	664W [ETSI Busy Hour Load at 4TX@60W (Both Bands Active)]
	395W [ETSI Busy Hour Load at 4TX@30W (One Band Active)]
Antenna Ports	4 ports, 4.3-10+
Optical Ports	2 x CPRI 9.8 Gbps
ALD Control Interfaces	AISG3.0 from ANT1, 2, 3, 4 and RET (DC on ANT1 & ANT3)
Other Interfaces	External Alarm MDR-26 Serial connector (4 inputs, 1 Output) DC Circular Power Connector
Physical	560 mm x 308 mm x 189 mm (22.05" x 12.13" x 7.44") Approximately 38kg with no covers or brackets (83.78 lbs)
Operating Temperature Range	-40°C to 55°C (with no solar load)
Surge Protection	Class II 5A
Installation Options	Vertical & Horizontal Book Mount, Pole & Wall Mount

1 DETAIL – AHLOA
SCALE: N.T.S.

LTE5213/SR002411: Nokia Airscale Dual RRH 4T4R B25/B66 Module AHFIG

Description

LTE5213/SR002411: Nokia AirScale Dual RRH 4T4R B25/66 480 W AHFIG feature in release LTE19A/SRAN19A introduces the new Nokia AirScale Multiband Remote Radio Head with four transmitters and four receivers for 3GPP Band 25 and Band 66 enabling it to support one sector and two bands simultaneously with up to 4x40 W for B66 and 4x80 W for B25 at the antenna connector.

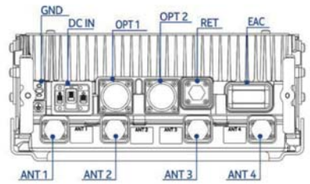
AHFIG is an updated version of the AHFIB with an improvement in the output PA power for B25 to 4x80 W as compared to 4x40 W in AHFIB. Output PA power for B66 is same as AHFIB (4x40 W).

This radio can be used in LTE only or LTE/WCDMA/GSM using the SRAN functionality. Classical RF sharing with WCDMA or GSM is not supported with this radio. The AHFIG radio will work only with AirScale system module. The AHFIG is a 5G capable radio.

The AHFIG is a 4TX/4RX RRH for Band 25 and Band 66. There are four ports on the RRH. It is a one sector radio optimized for macro BTS installations.

AHFIG Interfaces

The ports of the AHFIG are shown below



Dimensions and Weight

Property	Value
Height	Core RRH: 695 mm (27.4 in.) With upper and lower mounting brackets: 730 mm (28.7 in.)
Width	Core RRH: 308 mm (12.1 in.) With mounting cover: 327 mm (12.9 in.)
Depth	Core RRH: 131 mm (5.2 in.) With mounting cover: 142 mm (5.6 in.)
Weight	Core RRH: 32 kg (70.5 lb)

2 DETAIL – AHFIG
SCALE: N.T.S.

1

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:

EQUIPMENT INFORMATION

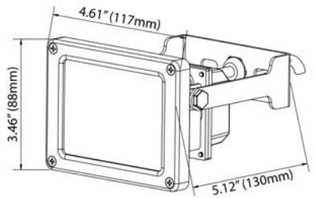
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number

C-10

EXHIBIT C

INPUT WATTAGE	14.0	BEAM ANGLE	14.0
INPUT VOLTAGE RANGE	120–277	BEAM TYPE	WIDE
DELIVERED LUMENS	1260.0	POWER FACTOR	0.90
EFFICACY (lm/W)	95.0	MAX THD (%)	14
COLOR RENDERING INDEX (CRI)	82	MINIMUM AMBIENT TEMP (°F)	–31
COLOR TEMPERATURE (CCT)	5000	MAXIMUM AMBIENT TEMP (°F)	115
EQUIVALENT WATTAGE	100W QH	PRODUCT WEIGHT (LBS.)	1.50

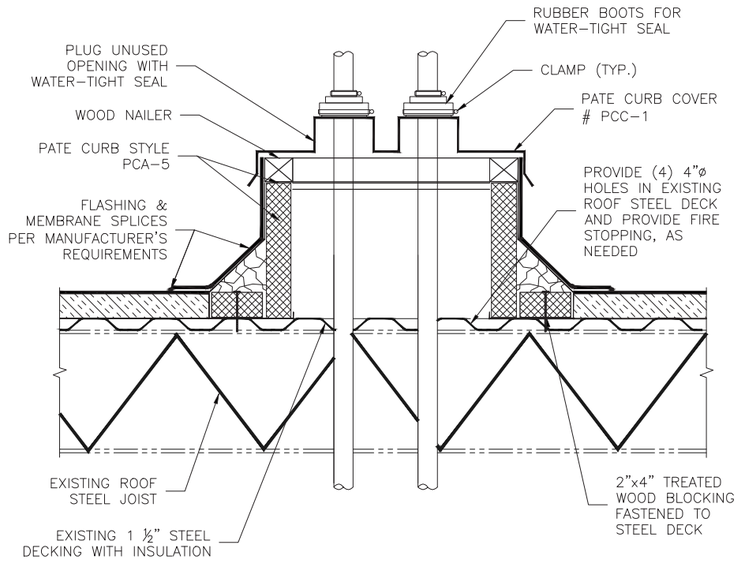


MAXLITE FLS15U50B-MAX
ORDER # 77088

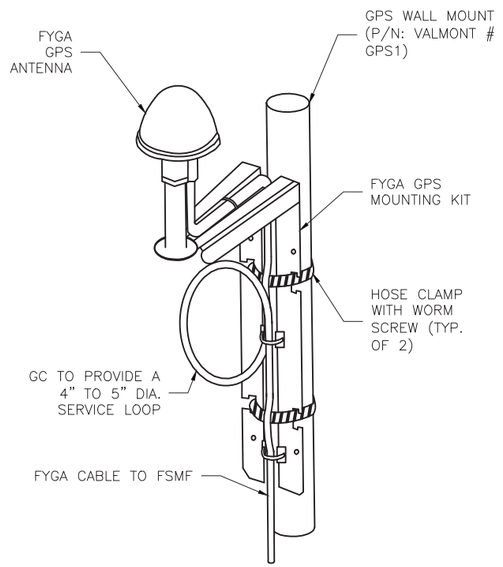
ADDITIONAL LIGHTING ACCESSORIES SPECIFICATIONS:

1. TWO GANG CLEAR COVER, EXTRA DUTY WITH LOCKABLE ENCLOSURE: SIGMA # 14425 OR EQUIVALENT.
2. MECHANICAL COUNTDOWN TIMER: INTERMATIC # FF60MC, OR EQUIVALENT.
3. CAST ALUMINUM 2 GANG WEATHER PROOF FS BOX, NO LUGS, DEEP BOXI APPLETON, HUBBELL–KILLARK, OR EQUIVALENT. USE BACK OF GANG BOX FOR ENTRY INTO PPC, SEAL FLUSH AGAINST PPC WITH GASKETING MATERIAL, AND/OR SEAL EXTERIOR PERIMETER WITH SILICONE BEAD TO PREVENT WATER INTRUSION.
4. GFCI, 15 AMP: LEVITON MT759–T OR EQUIVALENT.

1 – DETAIL–LED LIGHTS
SCALE: N.T.S.



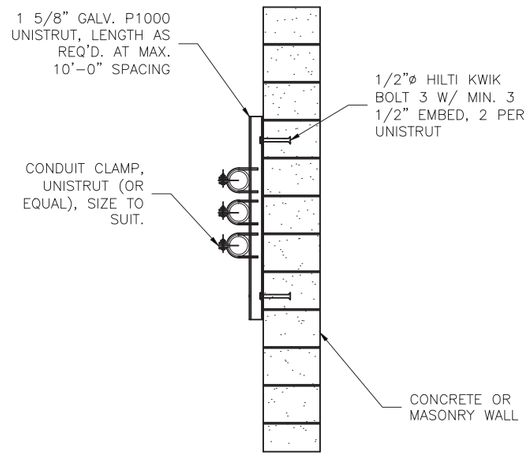
3 – CONCRETE ROOFTOP PENETRATION
SCALE: N.T.S.



NOTES

1. THE GPS ANTENNA MOUNT IS DESIGNED TO FASTEN TO A STANDARD 1–1/4" DIA. SCH. 40 GALVANIZED OR STAINLESS STEEL PIPE. THE PIPE MUST BE THREADED AT THE ANTENNA MOUNT END. THE PIPE SHALL BE CUT TO THE REQUIRED LENGTH (MIN. OF 18") USING A WAND OR ROTARY PIPE CUTTER TO ASSURE A SMOOTH PERPENDICULAR CUT. THE CUT PIPE END SHALL BE DEBURRED AND SMOOTH IN ORDER TO SEAL AGAINST THE NEOPRENE GASKET ATTACHED TO THE ANTENNA MOUNT.
2. THE MOUNTING PLATE SHALL BE FABRICATED AS SHOWN AND ATTACHED TO THE APPROPRIATE SUPPORT STRUCTURE USING U–BOLTS. THE SUPPORT PIPE FOR THE GPS SHALL BE MOUNTED USING OVERSIZED U–BOLTS TO ALLOW ADJUSTMENT. IT IS CRITICAL THAT THE GPS ANTENNA IS MOUNTED WITHIN 2" OF VERTICAL AND THE BASE OF THE ANTENNA IS WITHIN 2" LEVEL.
3. INSTALL GPS ANTENNA AS SPECIFIED ON SITE PLAN. IF INSTALLING ON ICE/CABLE BRIDGE ENSURE THAT GPS IS A MINIMUM OF 10' ABOVE GRADE.
4. GENERAL CONTRACTOR SHALL ENSURE THE GPS ANTENNA HAS THE REQUIRED FULL EXPOSURE TO THE SOUTHERN HEMISPHERE/HORIZON.

2 – FYGA GPS ANTENNA DETAIL
SCALE: N.T.S.



4 – CONDUIT SUPPORT AT WALL/CEILING
SCALE: N.T.S.

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES:
DATE: 3/13/19 EXPIRES: 11/30/19

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
MISCELLANEOUS DETAILS

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-11

EXHIBIT C

RT-NF

GENERAL SPECIFICATIONS

Single Ballast Roof Top Sector Frame
Modular frame with various configurations
Includes: Frame | Pipe Mounts | Brackets
Material Type: Hot Dip Galvanized Steel

MECHANICAL SPECIFICATIONS

Pipe Diameter - Horizontal	73 mm | 2.875 in.
Antenna Pipe Diameter	73 mm | 2.875 in

RT-DNF

GENERAL SPECIFICATIONS

Double Ballast Roof Top Sector Frame
Modular frame with various configurations
Includes: Frame | Pipe Mounts | Brackets
Material Type: Hot Dip Galvanized Steel

MECHANICAL SPECIFICATIONS

Pipe Diameter - Horizontal	73 mm | 2.875 in.
Antenna Pipe Diameter	73 mm | 2.875 in

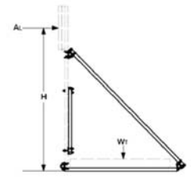
MOUNT CLASSIFICATION CRITERIA

MOUNT MODEL	TIA-5053 MOUNT CLASSIFICATION	AT&T Mount Classification
RT-NF7-2-126	M1500R(1000)-2[12]	Heavy-WLL (2 Mount Pipes)
RT-NF10-3-126	M1500R(1000)-3[6]	Heavy-WLL (3 Mount Pipes)
RT-NF12-4-126	M1100R(1000)-4[6]	Heavy-5 (4 Mount Pipes)
RT-DF12-4-126	M1500R(1000)-4[18]	Heavy-WLL (4 Mount Pipes)
RT-DF14-4-126	M1500R(1000)-4[15]	Heavy-WLL (4 Mount Pipes)

Notes:
1. For more details please refer mount classification letter, RT-NF, RT-DF Mount Classification 60400-01-STR-LET document

RT-NF CONFIGURATION

PART NO.	DESCRIPTION	WEIGHT (LBS.)
RT-NF-BAL	BALLAST TRAY	420
RT-NF7-B	MOUNT, 7' BALLAST W/O PIPES	811
RT-NF7-2-96	MOUNT, 7' BALLAST W/2 96" PIPES	936
RT-NF7-2-126	MOUNT, 7' BALLAST W/2 126" PIPES	966
RT-NF7-3-96	MOUNT, 7' BALLAST W/3 96" PIPES	998
RT-NF7-3-126	MOUNT, 7' BALLAST W3 126" PIPES	1043
RT-NF10-B	MOUNT, 10' BALLAST W/O PIPES	853
RT-NF10-3-96	MOUNT, 10' BALLAST W/3 96" PIPES	1039
RT-NF10-3-126	MOUNT, 10' BALLAST W/3 126" PIPES	1084
RT-NF10-4-96	MOUNT, 10' BALLAST W/4, 96" PIPES	1102
RT-NF10-4-126	MOUNT, 10' BALLAST W/4, 126" PIPES	1161
RT-NF12-B	MOUNT, 12' BALLAST W/O PIPES	877
RT-NF12-3-96	MOUNT, 12' BALLAST W/3 96" PIPES	1064
RT-NF12-3-126	MOUNT, 12' BALLAST W/4 126" PIPES	1109
RT-NF12-4-96	MOUNT, 12' BALLAST W/4 96" PIPES	1126
RT-NF12-4-126	MOUNT, 12' BALLAST W/4 126" PIPES	1186



BALLAST EQUATION WITH 1.5 SAFETY FACTOR:

$$WT = \frac{[(AL * H * N) + (FL * HF)] * (1.5)}{3.375}$$

$$\text{FOR 4 TRAYS, } W = \frac{WT}{4}$$

BALLAST EQUATION WITH REV. G LOADING

$$WT = \frac{[(AL * H * N) + (FL * HF)] * (1.6)}{3.375 * (0.9)}$$

$$\text{FOR 4 TRAYS, } W = \frac{WT}{4}$$

BALLAST EQUATION WITH REV. H LOADING

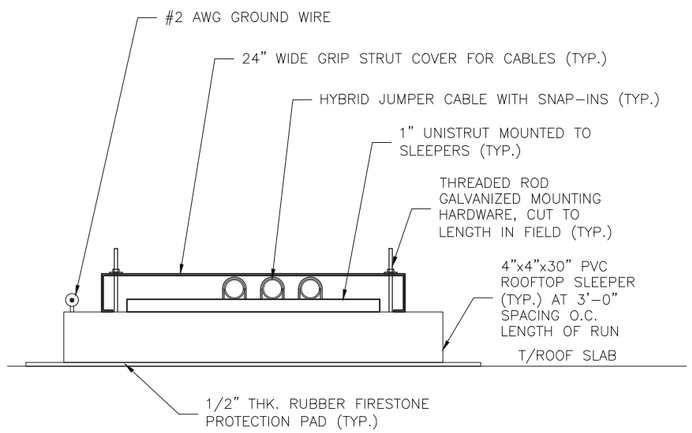
$$WT = \frac{[(AL * H * N) + (FL * HF)] * (1.0)}{3.375 * (0.9)}$$

$$\text{FOR 4 TRAYS, } W = \frac{WT}{4}$$

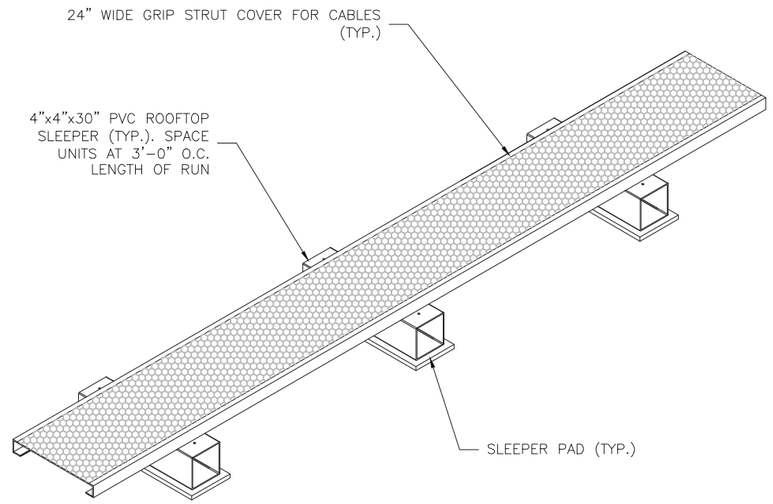
AL=Antenna Wind Load (Non-Factored), lbs.
FL=Mount Frame Wind Load (Non-Factored), lbs.
H=Height from rooftop, ft
HF= Centerline of Mount frame from rooftop, ft
N=Number of Antennas
WT= Total Ballast Weight, lbs.
W= Ballast Weight per Tray, lbs.

Note:
Formula includes wind load seen by mount frame which will vary based on individual engineering judgement as well as shielding factor

1 ANTENNA & RRU MOUNTING FRAME DETAILS
SCALE: N.T.S.



2 ROOFTOP CABLE SUPPORT DETAIL
SCALE: N.T.S.



3 ROOFTOP CABLE SUPPORT DETAIL
SCALE: N.T.S.

EXHIBIT C

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/24/20 EXPIRES: 11/30/21

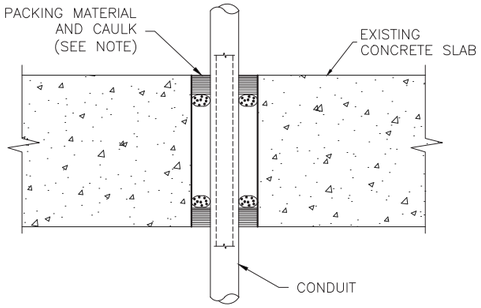
REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
ANTENNA MOUNT & ROOFTOP CABLE MOUNTING DETAILS

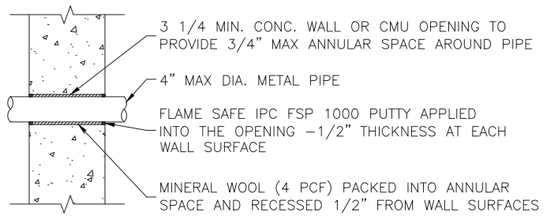
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-12



THE CONTRACTOR SHALL DO ALL CUTTING, CHASING OR CHANNELING AND PATCHING REQUIRED FOR ANY WORK. ALL SLEEVE OPENINGS, ETC. THROUGH WALLS AND FLOORS SHALL BE SEALED AFTER INSTALLATION. USE "RTV" OR T & B "FLAME SAFE", NELSON FLAME SEAL OR 3M FIRE BARRIER MOLDABLE PUTTY. CARE SHALL BE TAKEN NOT TO CUT EXISTING REINFORCING BARS.

1 – DETAIL–CONDUIT THROUGH CONCRETE SLAB
SCALE: N.T.S.



NOTES:
1. CONTRACTOR TO X–RAY PRIOR TO DRILLING OR CORING TO LOCATE EXISTING RE–BAR. DO NOT CUT RE–BAR.
2. CONTRACTOR TO INSURE WATER–TIGHTNESS AT ALL WALL PENETRATIONS.

2 – CONCRETE WALL PENETRATION
SCALE: N.T.S.

DB Series

Base with Galv. Channel - 1" (25mm) high
Dimensions - 5" (127mm) High x 6" (152mm) Wide x Length (overall length)
Ultimate Load Capacity - (uniform load) *

DB5 = 200 lbs. (0.89kN)
DB10 = 500 lbs. (2.22kN)
DB20 = 1,000 lbs. (4.45kN)
DB30 = 1,500 lbs. (6.67kN)
DB40 = 2,000 lbs. (8.89kN)
DB48 = 2,500 lbs. (11.12kN)

UPC/Part #	Cat. #	Height	Width	Overall Length	Weight Each
782051 50035	**DB5**	5" (127mm)	6" (152mm)	4.8" (122mm)	2.75 (1.25kg)
782051 49972	**DB10**	5" (127mm)	6" (152mm)	9.6" (244mm)	5.28 (2.39kg)
782051 49974	**DB20**	5" (127mm)	6" (152mm)	20.2" (513mm)	10.63 (4.82kg)
782051 50021	**DB30**	5" (127mm)	6" (152mm)	30.8" (782mm)	15.99 (7.25kg)
782051 50022	**DB40**	5" (127mm)	6" (152mm)	41.4" (1052mm)	21.34 (9.68kg)
782051 50023	**DB48**	5" (127mm)	6" (152mm)	52.0" (1321mm)	26.70 (12.4kg)

Specifications

PART 1 GENERAL

1.01 SECTION INCLUDES
A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required for the correct installation of recycled rubber pipe [conduit] supports for mechanical piping [electrical conduit] systems.

1.02 REFERENCES
A. ASTM A653 G90 SS Gr. 33 - Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dipped Process
B. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel
C. ASTM C531 – Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, Monolithic Surfaces, and Polymer Concretes
D. ASTM C642 – Test Method for Specific Gravity, Absorption, and Voids in Hardened Concrete
E. ASTM C672 – Test Methods for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
F. ASTM D412 – Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
G. ASTM D395 – Standard Test Methods for Rubber Property – Compression Set
H. ASTM D573 – Test Method for Rubber – Deterioration in an Air Oven
I. ASTM D746 – Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
J. ASTM D2240 – Test Method for Rubber Property – Durometer Hardness
K. NFPA 70 – National Electrical Code

1.03 QUALITY ASSURANCE
A. Rubber / steel pipe supports shall be manufactured under a strict quality control program assuring quality product delivered to the jobsite. Pipe supports that are damaged shall not be installed.
B. Workmanship: All pipe [conduit] supports to be installed by a qualified piping [electrical] contractor and installed in accordance with manufacturer's recommendations.
1. All work shall comply with all applicable federal, state, and local codes and laws having jurisdiction.
2. All work shall conform to accepted industry and trade standards for pipe support [conduit] installations.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS
A. Manufacturer: Subject to compliance with these specifications, pipe support systems shall be DURA-BLOK® design as supplied by Eaton [or engineer approved equal].

2.02 MATERIALS
A. Curb base must be made of 100% recycled rubber and polyurethane prepolymer with a uniform load capacity of 500 pounds per linear foot of support.* In addition, each base to have a reflective red stripe. (*See 3.01(C))
B. Dimensions: 6-inches wide by [4] [5.0] [6.75] inches tall by [9.6] [20.2] [30.8] [41.4] [52.0] inches long.
C. Steel frame: Steel, strut galvanized per ASTM A653 or strut galvanized per ASTM A653 for bridge series.
D. Attaching hardware: Zinc-plated threaded rod, nuts and attaching hardware per ASTM B633.
E. Any products claiming to be a similar, like, or equal must demonstrate (meet or exceed) the same physical and performance characteristics as specified below:
1. Density: 0.52 oz/cu in ASTM D575
2. Durometer Hardness: 67.2A ± 1 AS˜M D575
3. Tensile Strength: 231 psi minimum ASTM D575
4. Compression Deformation: 5% at 70psi and 72°F ASTM D575
5. Brittleness at Low Temp: -50°F ASTM D746
6. Weathering: 70 hours at 120°F ASTM D573
a. Hardness retained: 100% (±5%)
b. Compressive strength: 100% (±5%)
c. Tensile strength: 100% (±5%)
d. Elongation retained: 100% (±5%)

2.03 TYPE OF ROOFTOP SUPPORTS
A. Rubber block supports – DURA-BLOK® model # [DBP] [DMB] base dimensions: 6-inch wide by 4-inch tall by [9.6] [4.8]-inch length. Accessories are fastened directly into rubber material with weather resistant type 12 lag screws.
B. Continuous block channel supports – DURA-BLOK DB Series or DBE Series: Dimensions 6-inch wide bt [5.0] [6.5]-inch tall bt [9.6] [20.2] [30.8] [41.4] [52.0]-inch length. Assembly has 1" gaps between blocks for free flow of water. Standard strut accessories can be used for attachment.
C. Bridge channel supports – DURA-BLOK DBG Series: Dimensions 6-inch wide by 5¾ -inch tall by [28.0] [36.0] [42.0] [50.0] [60.0]-inch length. Standard strut accessories can be used for attachment.
D. Extendible height support – DURA-BLOK model DBE 10-[8][12][16], height to suit application: 8-inch, 12-inch or 16-inch Ø00 pound maximum load). Base to be 9.6 inches in length or otherwise specified sizes available. Heavier loads, may require CLDP load distribution plate.
E. Roller supports– DURA-BLOK DBR10 Series & DBR Series: DBR10 Series is sized for pipe up to 2½ inches, with vertical adjustment up to 12 inches. DBR Series is sized for [2-3½] [4-6] [8-10] [12-14] [16-20]-inch pipe sizes.
F. Elevated single pipe supports– DURA-BLOK DBM Series: [Copper] or [Steel] pipe sizes [½] [¾] [1] [1¼] [1½] [2]-inch.

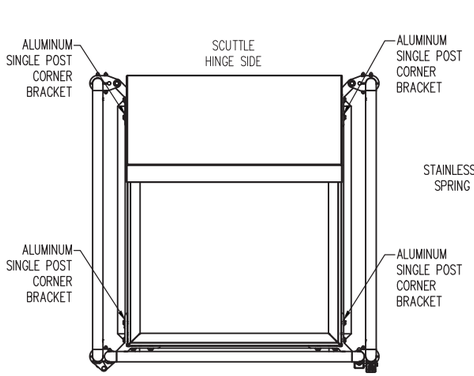
PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions and recommendations.
B. If gravel top roof, gravel must be removed around and under pipe support.
C. Always consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (rubber pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.
D. Gas pipe spacing subject to local gas authorities.
E. Use properly sized clamps to suit pipe [conduit] sizes.

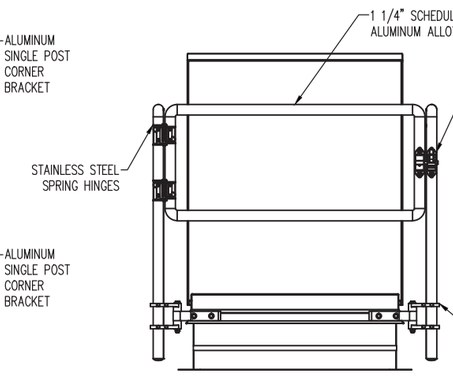
NOTE:

USE BUTTERFLY CLAMPS FOR MOUNTING ELECTRICAL POWER, FIBER AND GROUNDING CONDUITS TO PRE-INSTALLED 1" UNISTRUT.

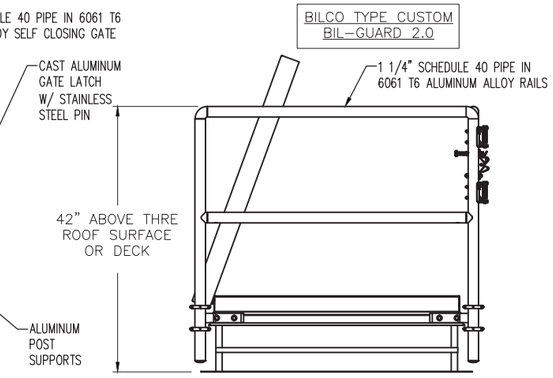
3 – DURA–BLOK ROOFTOP CONDUIT SUPPORTS
SCALE: N.T.S.



PLAN



FRONT VIEW



SIDE VIEW

NOTE:
INSIDE OPENING OF EXISTING ROOF HATCH IS 30"x36".

4 – DETAIL–ACCESS HATCH RAILING WITH GATE
SCALE: 3/4" = 1'–0"

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847–490–8200; FAX: 847–490–8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 3/13/19 EXPIRES: 11/30/19

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

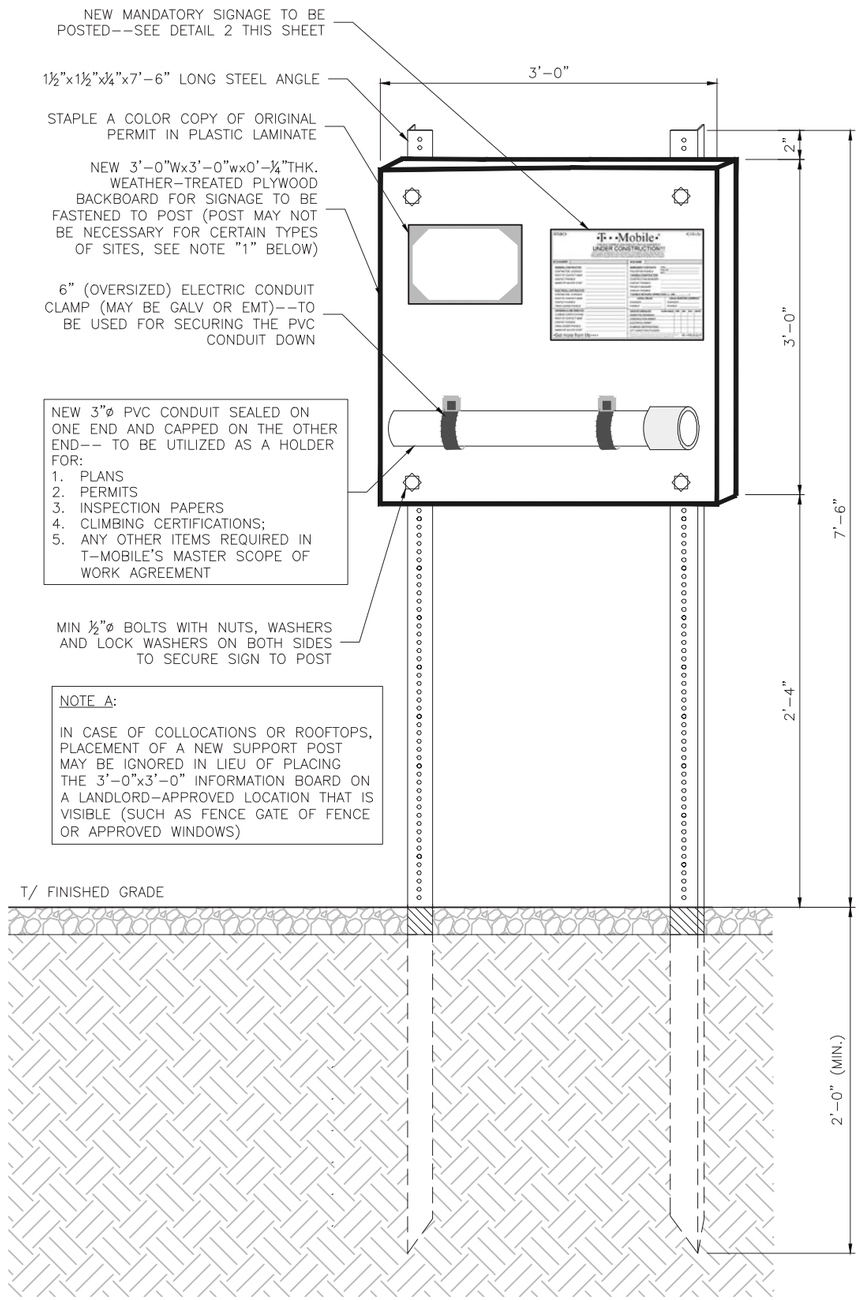
CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
MISCELLANEOUS DETAILS

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-13

EXHIBIT C



1 SITE INFORMATION POST & BOARD ELEVATION
SCALE: N.T.S.

·T·M·O· ·T··Mobile· ·U·S·A·

THIS IS A T-MOBILE USA FACILITY THAT IS CURRENTLY

UNDER CONSTRUCTION!!!

THE FOLLOWING INFORMATION IS SHALL BE POSTED BY THE GENERAL CONTRACTING FIRM THAT HAS BEEN AWARDED THE CONSTRUCTION OF THIS SITE FAILURE TO POST THIS INFORMATION CONSTITUTES A VIOLATION OF THE MASTER SCOPE OF WORK AGREEMENT BETWEEN THE CONTRACTOR & T-MOBILE

SITE NUMBER:	SITE NAME
GENERAL CONTRACTOR:	EMERGENCY CONTACTS FIRE POLICE BOU
CONTRACTOR LICENSE #	POLICE/FIRE PHONE #
POINT OF CONTACT NAME	T-MOBILE CONSTRUCTION
CONTACT PHONE #	CONSTRUCTION MANAGER
NAMES OF ON-SITE STAFF	CONTACT PHONE #
	PROJECT MANAGER
ELECTRICAL CONTRACTOR:	CONTACT PHONE #
CONTRACTOR LICENSE #	T-MOBILE NETWORK OPERATIONS (1 - 800 - -)
POINT OF CONTACT NAME	LOCAL TELCO / LOCAL ELECTRIC COMPANY
CONTACT PHONE #	ENGINEER: / ENGINEER:
CREW LEADER PHONE #	PHONE # / PHONE #
ANTENNA & LINE CREW CO:	ON-SITE CHECKLIST AVAILABLE: YES NO N/A DATE
CLIMBING CERTIFICATION#	PERMITTED DRAWINGS
POINT OF CONTACT NAME	CONSTRUCTION PERMIT
CONTACT PHONE #	ELECTRICAL PERMIT
CREW LEADER PHONE #	CLIMBING CERTIFICATIONS
NAMES OF ON-SITE STAFF	CITY INSPECTION STICKERS

·Get more from life····

IMPORTANT!!! GC Shall Post this Mandatory Sign on the SITE INFORMATION BOARD along with the materials from the above noted checklist in a Visible Area On-Site

·T··Mobile·

1

2 ON-SITE MANDATORY INFORMATION SIGN/BOARD
SCALE: N.T.S.

¡ATTENTION GC!
THIS IS A TEMPORARY INSTALLATION THAT MAY REQUIRED USE OF A HOLE AUGER-AT NO CIRCUMSTANCE WHATSOEVER WILL THE GC BE ALLOWED TO POUR/PLACE CONCRETE AROUND THE POST--THIS IS A TEMPORARY INSTALLATION AND WILL BE REMOVED AT THE END OF THE PROJECT LIFE AT THE CONCLUSION OF THE QA WALK.

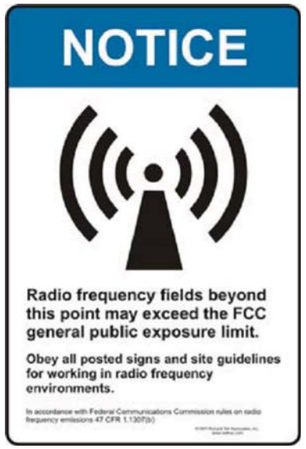
¡ATTENTION GC!
1-APPROVE LOCATION OF SIGN WITH T-MOBILE PROJECT MAAGER AND LANDLORD REP. SIGN SHALL NOT POSE A TRIPPING HAZARD. GC SHALL BE RESPONSIBLE FOR PLACEMENT AND MAINTENANCE OF THE SIGN BOARD UNTIL THE CONCLUSION OF THE QA WALK.
2-MATERIAL SAFETY DATA SHEETS FOR ALL MATERIALS THAT ARE FURNISHED BY GC SHALL BE PLACED ON SITE.

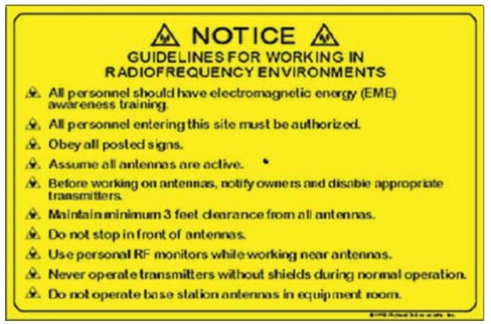
UTILITY NOTES:

1) CONTRACTOR TO VERIFY LOCAL UTILITY REQUIREMENTS FOR DEPTH, SIZE & SEPARATION OF CONDUITS PRIOR TO INSTALLATION. NOTIFY CONSTRUCTION MANAGER IMMEDIATELY OF ANY DISCREPANCIES.
2) CONTRACTOR TO CALL UTILITY LOCATES 48 HOURS PRIOR TO EXCAVATING FOR UNDERGROUND UTILITY LOCATIONS. LOCATION SURROUNDING EXCAVATED AREA MUST BE PRIVATELY LOCATED FOR NON-PUBLIC UTILITIES.

OSHA CFR 1910 SPECIFIES THAT IF YOU HAVE EMPLOYEES OR CONTRACTORS WHO CLIMB HIGHER THAN SIX FEET, THEY MUST BE TRAINED AND CERTIFIED IN FALL PROTECTION. IF THEY ARE NOT CERTIFIED, THEY MUST BE UNDER DIRECT SUPERVISION OF A CERTIFIED INDIVIDUAL, AND CLIMB 100% ATTACHED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONSULT WITH ALL APPLICABLE OSHA RULES AND GUIDELINES PRIOR TO CONSTRUCTION START.

3 ADDITIONAL NOTES AND GUIDELINES
SCALE: N.T.S.





NOTE:

RF SIGNAGES ARE TO BE MOUNTED ON THE PROPOSED SECTOR STEEL FRAMES, EQUIPMENT PLATFORM HANDRAILS AND ON THE PROPOSED ACCESS HATCH RAILING ON THE MAIN ROOFTOP.

4 RADIO FREQUENCY NOTICE & CAUTION SIGNAGES
SCALE: N.T.S.

·T··Mobile·
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES:

DATE: 5/24/18 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	12/21/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
MANDATORY SIGNAGES & POSTINGS

Project Number:	Drawn by: PA
	Date: 8/21/18
Client Project Number:	Checked by: MS
	Date: 8/23/18
Scale:	Approved by:
	Date:

Drawing Number
C-14

EXHIBIT C

RAN Template:	A&L Template:
56792EZ_SR	56792EZ_SR

CH95063B_Anchor_1_draft

Print Name: Standard (1)
PORs: Cell Split_CMP4

Section 1 - Site Information

Site ID: CH95063B
Status: Draft
Version: 1
Project Type: Anchor
Approved: Not Approved
Approved By: Not Approved
Last Modified: 5/29/2020 8:49:36 AM
Last Modified By: Ahmaad.Brunson@T-Mobile.com

Site Name: 35 S. Washington
Site Class: Roof Top Mount
Site Type: Building
Plan Year: 2020
Market: CHICAGO IL
Vendor: Nokia
Landlord: K2 development LLC

Latitude: 41.77433600
Longitude: -88.14813300
Address: 35 S. Washington St.
City, State: Naperville, IL
Region: CENTRAL

RAN Template: 56792EZ_SR		AL Template: 56792EZ_SR		
Sector Count: 3	**Antenna Count:** 6	**Coax Line Count:** 0	**TMA Count:** 0	**RRU Count:** 6

Section 2 - Existing Template Images

----- This section is intentionally blank. -----

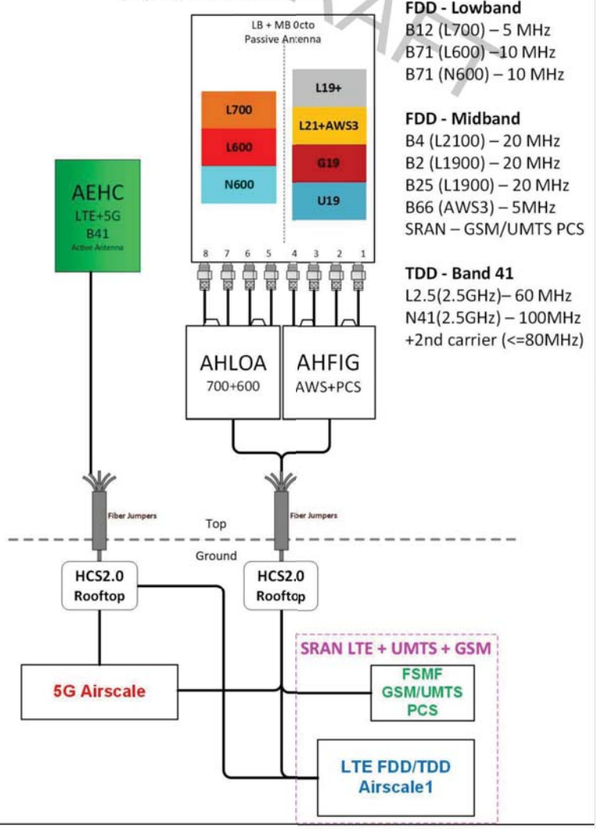
Section 3 - Proposed Template Images

56792EZ_SR.jpg

Configuration 56792EZ_SR

* For 5G and LTE Airscale BB dimensioning refer to Fiber Port matrices.

(Alpha, Beta & Gamma)



FDD - Lowband
B12 (L700) – 5 MHz
B71 (L600) –10 MHz
B71 (N600) – 10 MHz

FDD - Midband
B4 (L2100) – 20 MHz
B2 (L1900) – 20 MHz
B25 (L1900) – 20 MHz
B66 (AWS3) – 5MHz
SRAN – GSM/UMTS PCS

TDD - Band 41
L2.5(2.5GHz)– 60 MHz
N41(2.5GHz) – 100MHz
+2nd carrier (<=80MHz)

Notes:

Section 4 - Siteplan Images

----- This section is intentionally blank. -----

Section 5 - RAN Equipment

Existing RAN Equipment

----- This section is intentionally blank. -----

Proposed RAN Equipment

Template: 56792EZ_SR

Enclosure	1	2	3	4
Enclosure Type	Generic 600A Site Support Cabinet	Tower Top Mount (Nokia)	Ancillary Equipment (Nokia)	Generic Battery Cabinet for 600A SSC
Baseband	ASIB (L2100, L1900, L700, L600); ASIK (N2500); FSMF (G1900); ASIK (N600); ASIB (L2500)			
Baseband Submodule	ABIA (x 2) (L2100, L1900); ABIA (L700, L600); ABIL (x 3) (N2500); ABIL (N600); ABIC (x 3) (L2500)			
Baseband Subrack	AMIA (x 2)			
Junction Box			Nokia NCS 2.0 Roof-Top Junction Box (x 2)	
Power subsystem	Rectifier Shelf *Select size*; Breakers *Select size*			Batteries *Select size*
Radio		AHLOA (x 3) (L700, L600, N600); AHFIG (x 3) (L2100, L1900, G1900)		
Transport System	CSR IXRe			

RAN Scope of Work:

Ashutosh 09012018 Rad updated to 58.5 feet.
11/7/2018: HCS length computation based on the PCD REV B actual length.
Alpha = 105+10 = 115 with Close multiple of 30 = 120
Beta = 78+10 = 88 with close multiple of 30 = 90
Gamma = 95+10 =105 with close multiple of 30 = 120
12/4/2018: The azimuth is changed from 0/120/240 to 40/160/280 to accommodate the new proposed antenna location on roof which will be less visible from the adjacent streets.
This is a request from the City of Naperville.
01/02/2019: The AZ of Alpha sector has been changed to 15 degrees other all remain the same this is done to avoid blocking of existing RTU ,
03062019 HCS length updated per Cons , the RFDS was already final.

Section 6 - A&L Equipment

Existing Template: Custom
Proposed Template: 56792EZ_SR

Sector 1 (Proposed) view from front (Note: the images show view from behind)

Coverage Type	A - Outdoor Macro				
Antenna	1				2
Antenna Model	Commscope - FFHH-65B-R3 (Octo)				AEHC (Active Antenna - Massive MIMO)
Azimuth	15				15
M. Tilt	0				0
Height	59				59
Ports	P1	P2	P3	P4	P5
Active Tech.	L700, L600, N600	L700, L600, N600	L2100, L1900, G1900	L2100, L1900, G1900	L2500, N2500
Dark Tech.					
Restricted Tech.					
Decomm. Tech.					
E. Tilt	2	2	2	2	
Cables					
TMAs					
Diplexers / Combiners					
Radio					
Sector Equipment					

Unconnected Equipment:

Scope of Work:

Sector 2 (Proposed) view from front (Note: the images show view from behind)

Coverage Type	A - Outdoor Macro				
Antenna	1				2
Antenna Model	Commscope - FFHH-65B-R3 (Octo)				AEHC (Active Antenna - Massive MIMO)
Azimuth	160				160
M. Tilt	0				0
Height	59				59
Ports	P1	P2	P3	P4	P5
Active Tech.	L700, L600, N600	L700, L600, N600	L2100, L1900, G1900	L2100, L1900, G1900	L2500, N2500
Dark Tech.					
Restricted Tech.					
Decomm. Tech.					
E. Tilt	2	2	2	2	
Cables					
TMAs					
Diplexers / Combiners					
Radio					
Sector Equipment					

Unconnected Equipment:

Scope of Work:

Sector 3 (Proposed) view from front (Note: the images show view from behind)

Coverage Type	A - Outdoor Macro				
Antenna	1				2
Antenna Model	Commscope - FFHH-65B-R3 (Octo)				AEHC (Active Antenna - Massive MIMO)
Azimuth	280				280
M. Tilt	0				0
Height	59				59
Ports	P1	P2	P3	P4	P5
Active Tech.	L700, L600, N600	L700, L600, N600	L2100, L1900, G1900	L2100, L1900, G1900	L2500, N2500
Dark Tech.					
Restricted Tech.					
Decomm. Tech.					
E. Tilt	2	2	2	2	
Cables					
TMAs					
Diplexers / Combiners					
Radio					
Sector Equipment					

Unconnected Equipment:

Scope of Work:

Section 7 - Power Systems Equipment

Existing Power Systems Equipment

----- This section is intentionally blank. -----

Proposed Power Systems Equipment

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
RF DATA CONFIGURATION SHEET

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
C-15

EXHIBIT C

STRUCTURAL NOTES

CODES & STANDARDS:

1. INTERNATIONAL BUILDING CODE, LATEST EDITION
2. AMERICAN WELDING SOCIETY WELDING CODE, LATEST EDITION
3. AISC MANUAL OF STEEL CONSTRUCTION, FOURTEENTH EDITION

GENERAL:

1. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO BEGINNING WORK, AND NOTIFY THE ENGINEER OF ANY CONDITIONS DIFFERENT THAN THOSE SHOWN IN THE CONTRACT DOCUMENTS.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERIFICATION AND COORDINATION OF DIMENSIONS AND FOR THE PROPER FIT-UP OF THE ANTENNA SUPPORT STRUCTURE AND EQUIPMENT.

STRUCTURAL STEEL:

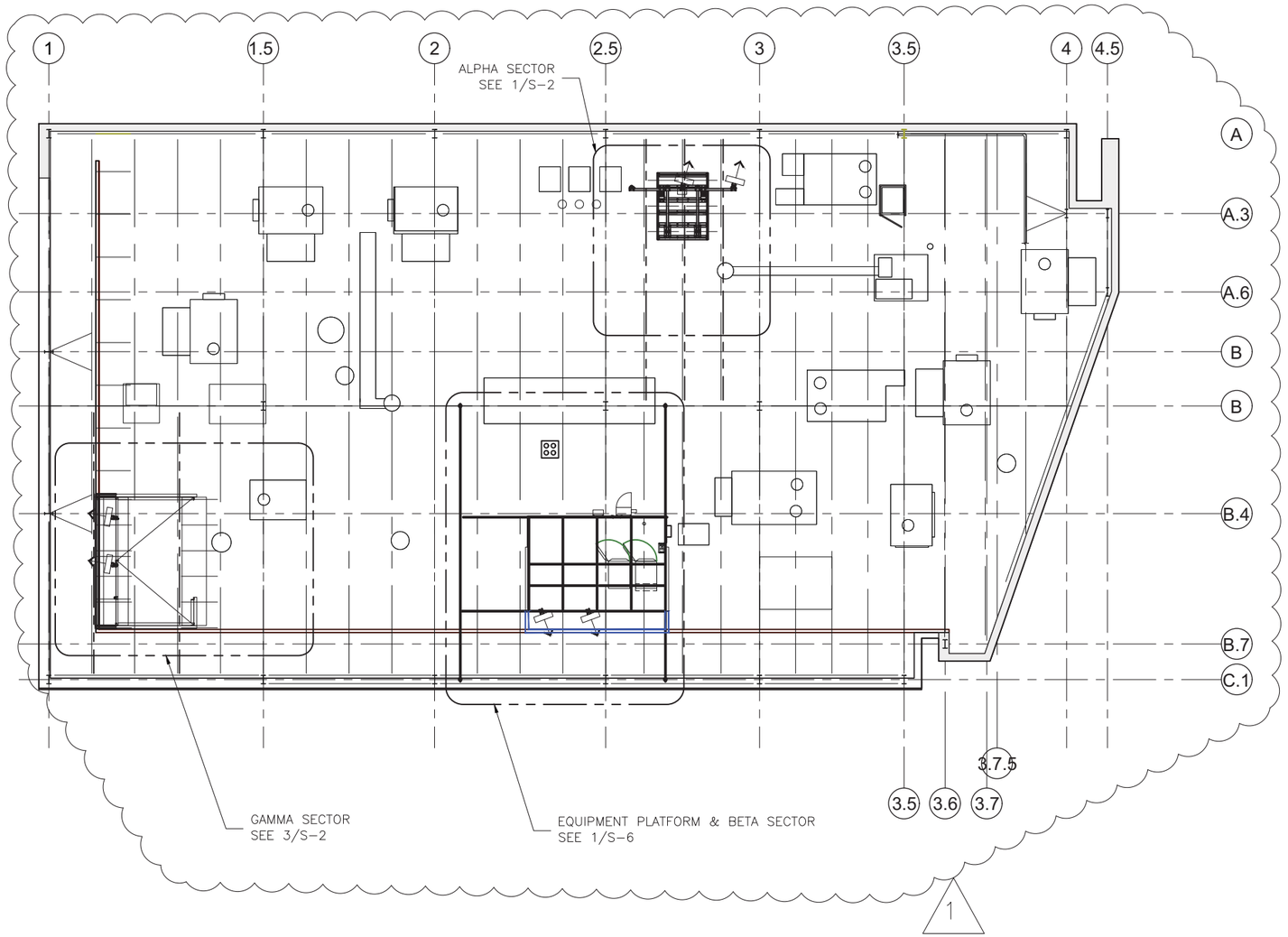
1. PLATFORM DESIGN IS BASED ON OWNER-SUPPLIED EQUIPMENT LOADS AND DESIGN LOADS SHOWN ON THIS DRAWING AND EIA/TIA 222.-E-91 REQUIREMENTS. IN CASE OF CONFLICT BETWEEN ABOVE CODES AND LOCAL BUILDING CODE, THE CONSTRUCTION MANAGER SHALL BRING THIS TO THE ENGINEER'S ATTENTION FOR SOLUTION.
2. STRUCTURAL STEEL DESIGN AND FABRICATION SHALL CONFORM TO THE LATEST EDITION OF AISC MANUAL FOR STEEL CONSTRUCTION, ALLOWABLE STRESS DESIGN. CONTRACTOR SHALL FURNISH SHOP DRAWINGS FOR ENGINEER'S REVIEW. UNLESS NOTED OR DETAILED HEREIN, FIELD CONNECTIONS SHALL BE WELDED. FIELD BOLTING ON EXISTING MEMBERS SHALL BE PRE-APPROVED BY E.O.R. PRIOR TO USE. USE MIN. 2 BOLTS PER CONN., MIN. ANGLE LEG THICKNESS OF 5/16" AND MIN. GUSSET PL. THICKNESS OF 3/8.
3. EXCEPTION IS TAKEN TO AISC CODE OF STANDARD PRACTICE PARAGRAPH 4.2.1 REGARDING OWNER'S AND FABRICATOR'S RESPONSIBILITY FOR CONNECTION DESIGN AND ADEQUACY OF SHOP DRAWINGS. COMPLIANCE WITH THE REQUIREMENTS SHOWN ON DRAWINGS AND/OR SPECIFICATIONS, CONNECTION DESIGN AND DETAILING IS THE CONTRACTOR'S RESPONSIBILITY. ENGINEER'S REVIEW OF SHOP DRAWINGS IS FOR GENERAL CONSIDERATIONS ONLY AND DOES NOT CONSTITUTE AN ACCEPTANCE OF THESE RESPONSIBILITIES BY THE OWNER AND/OR ENGINEER.
4. STRUCTURAL STEEL PLATES AND SHAPES SHALL CONFORM TO ASTM A36. ALL STRUCTURAL TUBING SHALL CONFORM TO ASTM A53, GRADE B. ALL STRUCTURAL BOLTS SHALL BE WITH 3/4"ø ASTM A325. HIGH STRENGTH, BEARING TYPE, WITH THREADS EXCLUDED FROM SHEAR PLANE AND HARDENED WASHER PER ASTM F436.
5. ALL MATERIALS SHALL BE HOT DIP GALVANIZED AFTER FABRICATION, PER ASTM A123 AND A153. TOUCH UP DAMAGED GALVANIZING DURING CONSTRUCTION WITH ZINC RICH PAINT.
6. WELDING SHALL BE IN ACCORDANCE WITH THE AMERICAN WELDING SOCIETY (AWS) D1.1. STRUCTURAL WELDING CODE, LATEST EDITION. WELDING ELECTRODE SHALL BE E70XX.
7. USE ¾"ø A325N H.S. BOLTS FOR ALL CONNECTIONS.
8. GRATING SHALL BE MIN. 1"x3/16" WELDED STEEL, GALVANIZED. PROVIDE BANDING AT CUT EDGE OF BEARING BARS. GRATING SHALL BE SECURED TO STRUCTURAL STEEL WITH TYPE C SADDLE CLIPS, MIN. 14 GA. AND SELF TAPPING SCREWS. PROVIDE MIN. 4 SADDLE CLIPS PER GRATING PANEL.
9. DESIGN LOADS:
   SNOW ROOF LOAD: 25 PSF
   DEAD LOAD (EQUIPMENT CABINETS): 8,000 LBS.
   WIND LOAD: 20 PSF
   LIVE LOAD: 60 PSF

BUILT-UP ROOFING:

1. CONTRACTOR SHALL USE ACCREDITED ROOFING CONTRACTOR TO FURNISH AND INSTALL ALL NECESSARY MEMBRANE AND FLASHING MATERIALS FOR ALL PENETRATIONS TO THE EXISTING ROOFING SYSTEM. ALL WARRANTIES SHALL BE MAINTAINED BY ACCREDITED ROOFING CONTRACTOR.
2. CONTRACTOR TO MEET OR EXCEED SYSTEM REQUIREMENTS FOR ROOF PENETRATION.

REPAIR & RESTORATION WORKS:

THE CONTRACTOR SHALL REPAIR, RESTORE AND RE-PAINT ALL WALLS DAMAGED DURING CONSTRUCTION. THE CONTRACTOR SHALL COORDINATE ALL REPAIR WORKS WITH THE BUILDING OWNER.



1 S-1 ROOF FRAMING PLAN
SCALE: 1/16" = 1'-0"

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/27/20 EXPIRES: 11/30/20

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

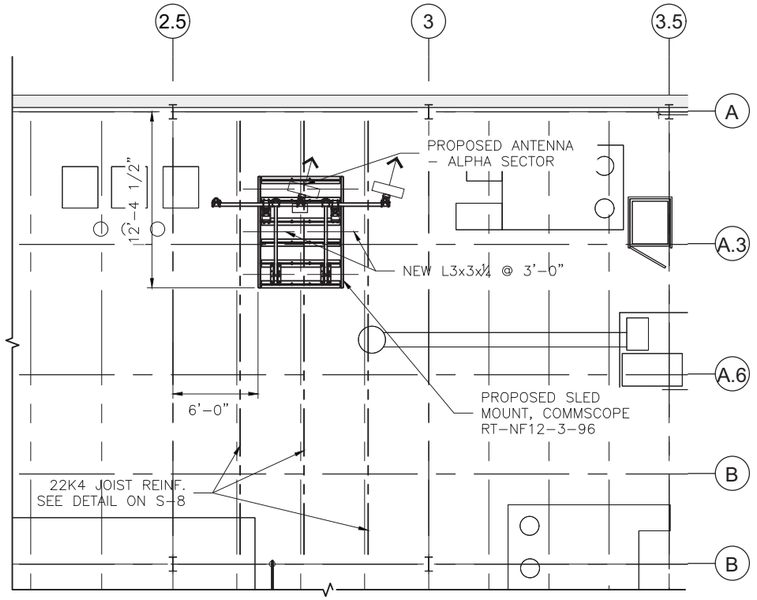
CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
STRUCTURAL NOTES AND OVERALL PLAN

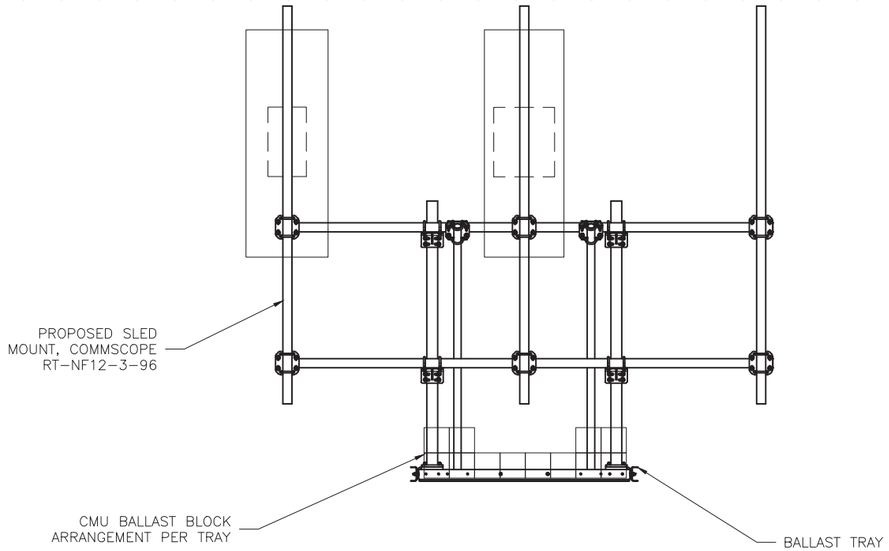
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
S-1

EXHIBIT C



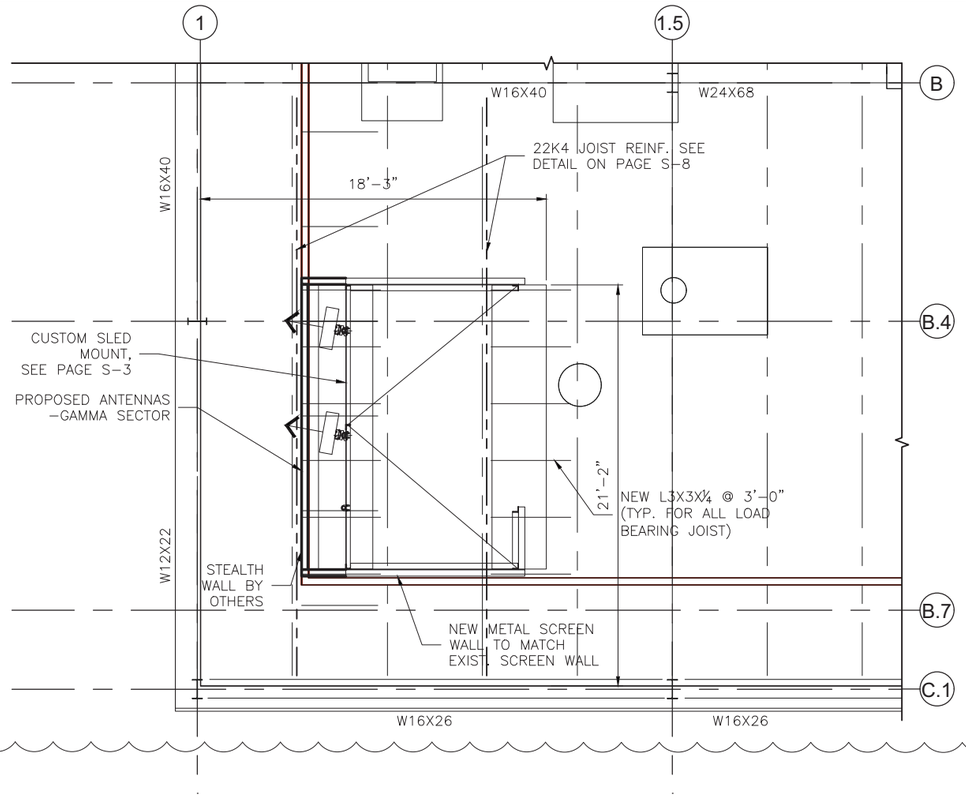
1 DETAILED PLAN–ALPHA SECTOR
S-2 SCALE: 3/32" = 1'-0"



NOTES:

1. ARRANGE BALLAST AS SHOWN ON DETAIL.
2. TOTAL NO. OF BALLAST PER TRAY = 10 BLOCKS
3. TOTAL WT OF BALLAST PER TRAY = 10 BLOCKS * 74 LBS/BLOCK = 740 LBS
4. TOTAL WT OF BALLAST = 4 TRAYS * 740 LBS = 2960 LBS

2 BALLAST ARRANGEMENT
S-2 SCALE: 1/4" = 1'-0"



3 DETAILED PLAN–GAMMA SECTOR
S-2 SCALE: 1/8" = 1'-0"

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/27/20 EXPIRES: 11/30/20

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

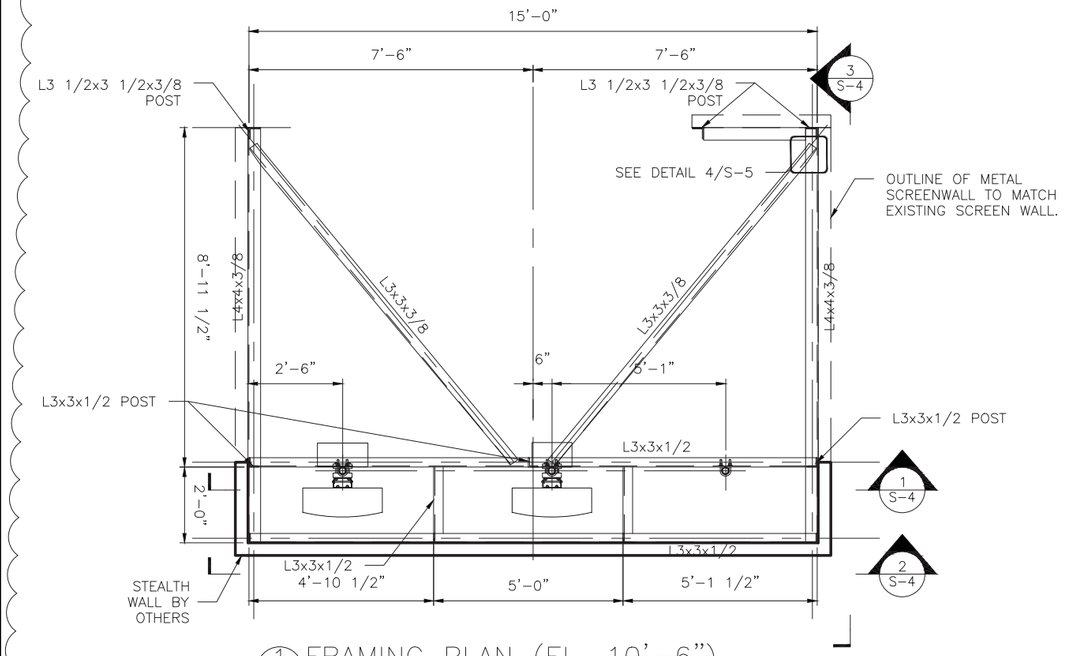
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
ALPHA & GAMMA SECTORS FRAMING DETAILS

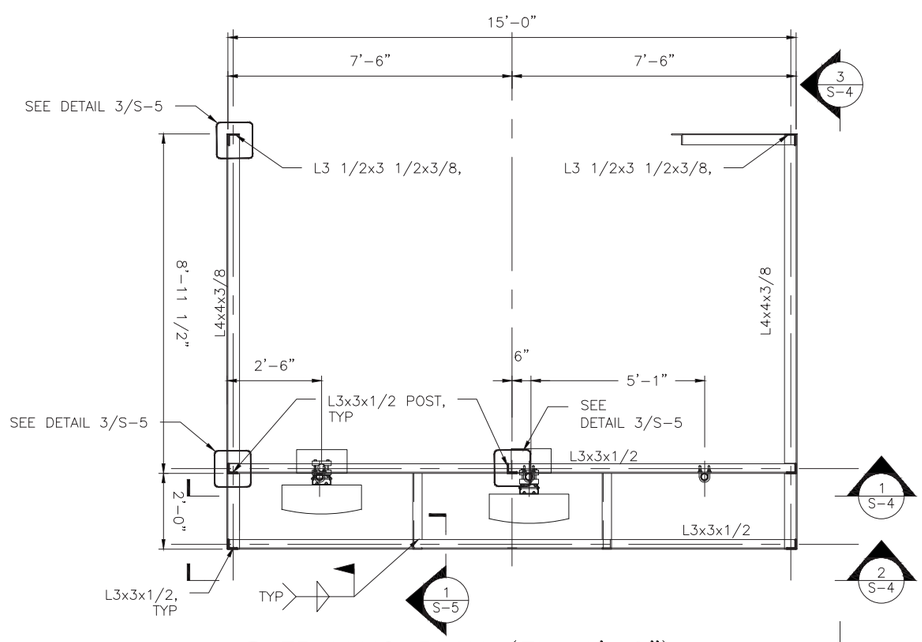
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
S-2

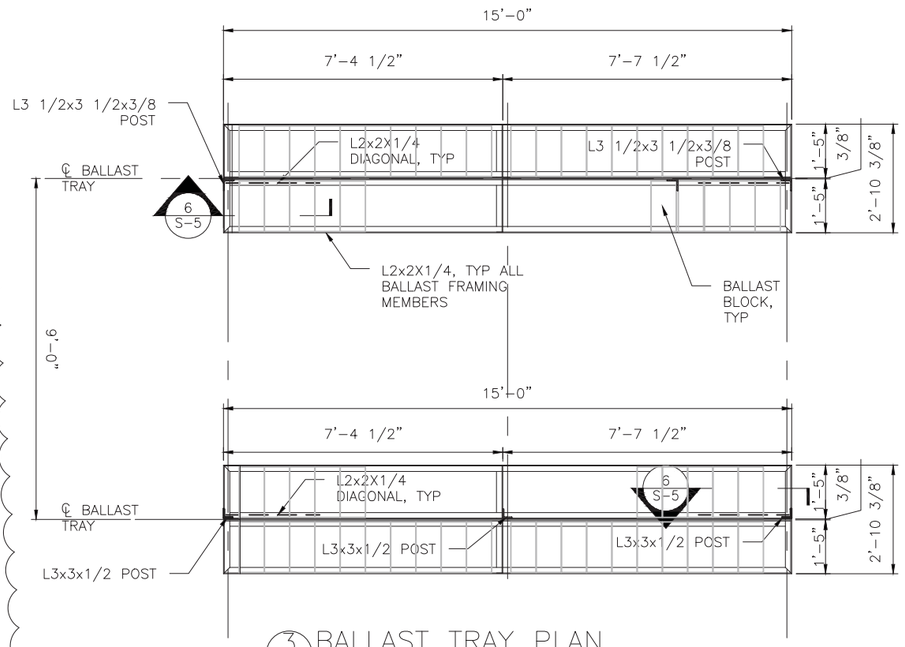
EXHIBIT C



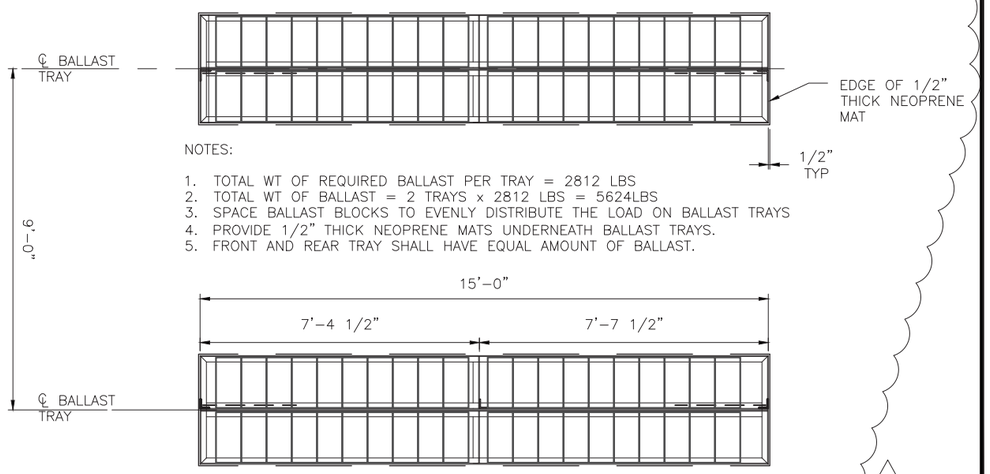
1 S-3 FRAMING PLAN (EL. 10'-6")
SCALE: 1/4" = 1'-0"



2 S-3 FRAMING PLAN (EL. 1'-0")
SCALE: 1/4" = 1'-0"



3 S-3 BALLAST TRAY PLAN
SCALE: 1/4" = 1'-0"



NOTES:

1. TOTAL WT OF REQUIRED BALLAST PER TRAY = 2812 LBS
2. TOTAL WT OF BALLAST = 2 TRAYS x 2812 LBS = 5624LBS
3. SPACE BALLAST BLOCKS TO EVENLY DISTRIBUTE THE LOAD ON BALLAST TRAYS
4. PROVIDE 1/2" THICK NEOPRENE MATS UNDERNEATH BALLAST TRAYS.
5. FRONT AND REAR TRAY SHALL HAVE EQUAL AMOUNT OF BALLAST.

4 S-3 BALLAST ARRANGEMENT PLAN
SCALE: 1/4" = 1'-0"

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/27/20 EXPIRES: 11/30/20

1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18
REV.	DESCRIPTION	DATE

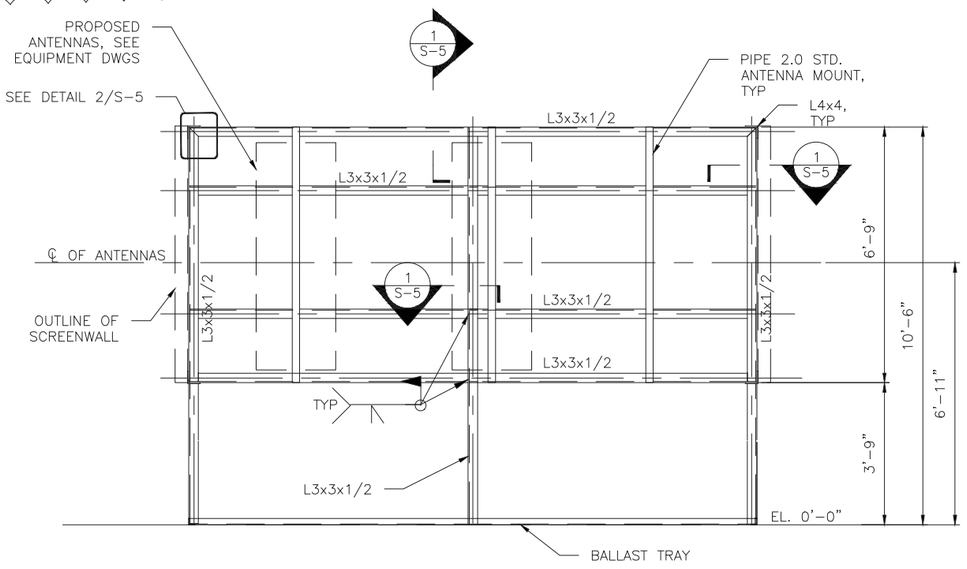
CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
GAMMA SECTOR FRAMING DETAILS

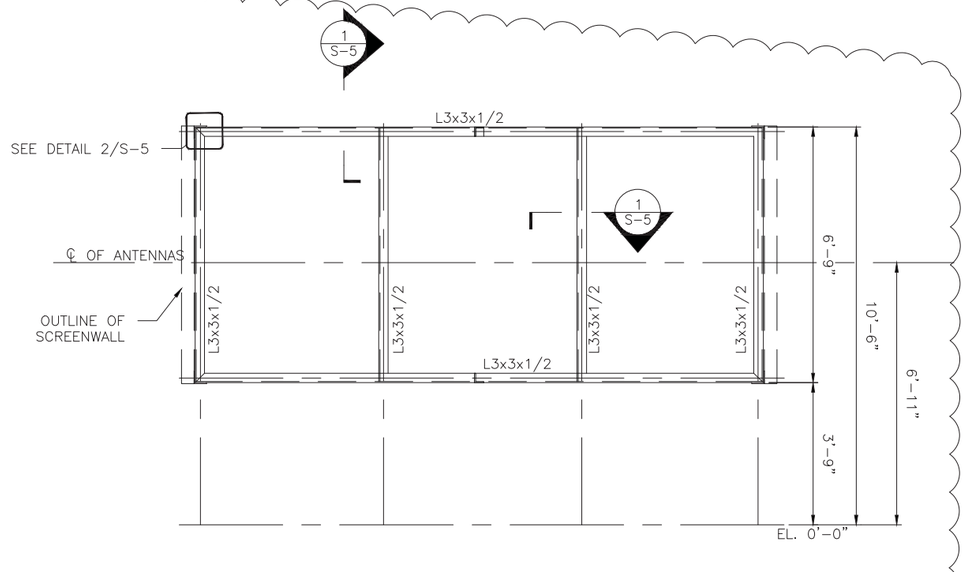
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
S-3

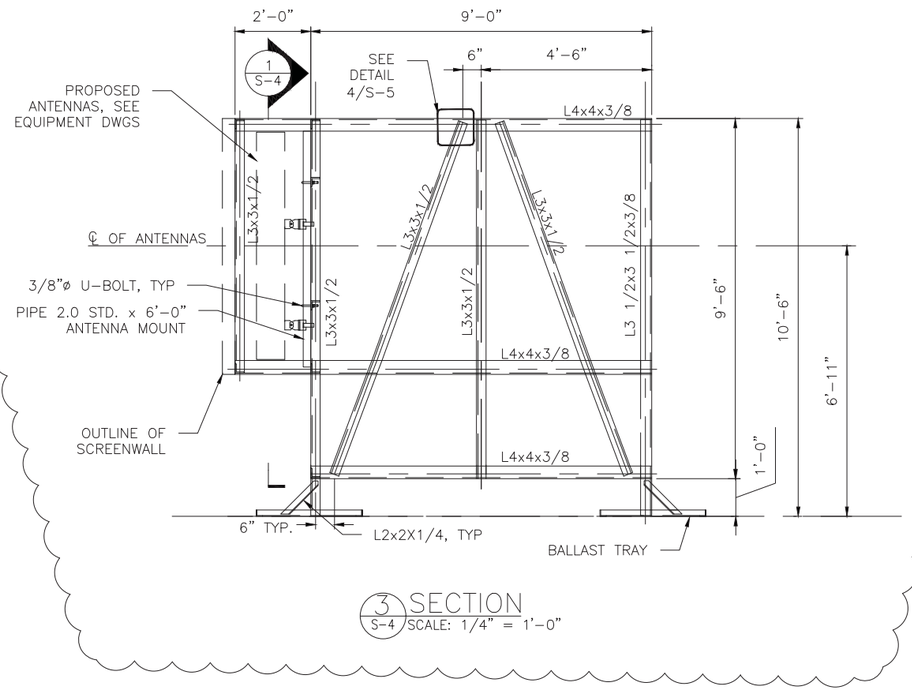
EXHIBIT C



1 SECTION
S-4 SCALE: 1/4" = 1'-0"



2 SECTION
S-4 SCALE: 1/4" = 1'-0"



3 SECTION
S-4 SCALE: 1/4" = 1'-0"

EXHIBIT C

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/27/20 EXPIRES: 11/30/20

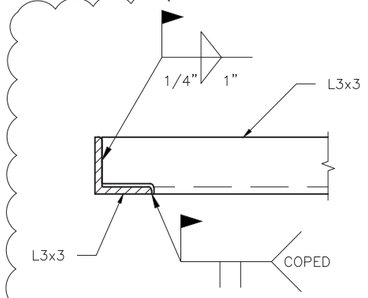
REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

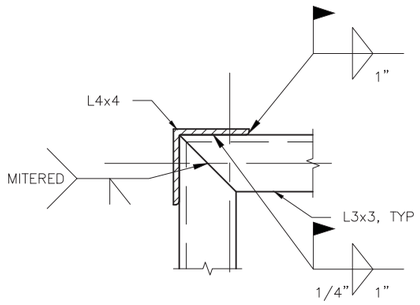
Drawing Title:
GAMMA SECTOR FRAMING DETAILS

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

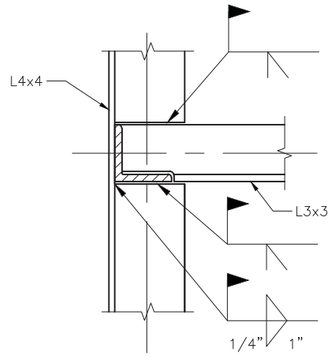
Drawing Number
S-4



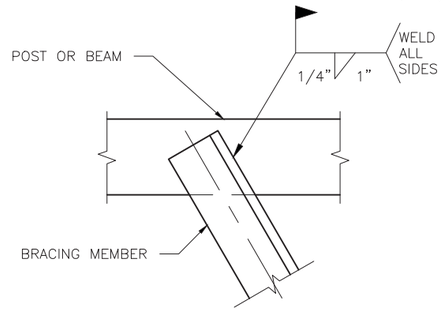
1 SECTION
SCALE: 1 1/2" = 1'-0"



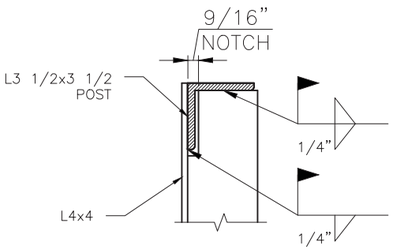
2 SECTION
SCALE: 1 1/2" = 1'-0"



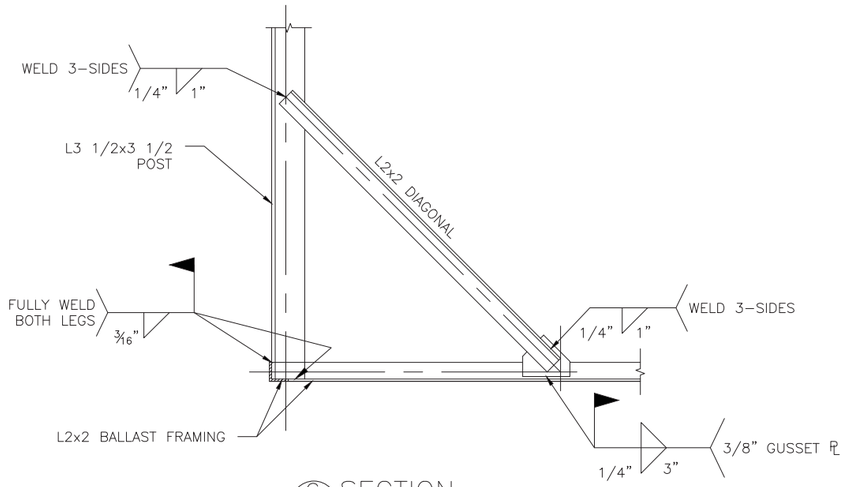
3 SECTION
SCALE: 1 1/2" = 1'-0"



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



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



6 SECTION
SCALE: 3/4" = 1'-0"

1

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/20

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

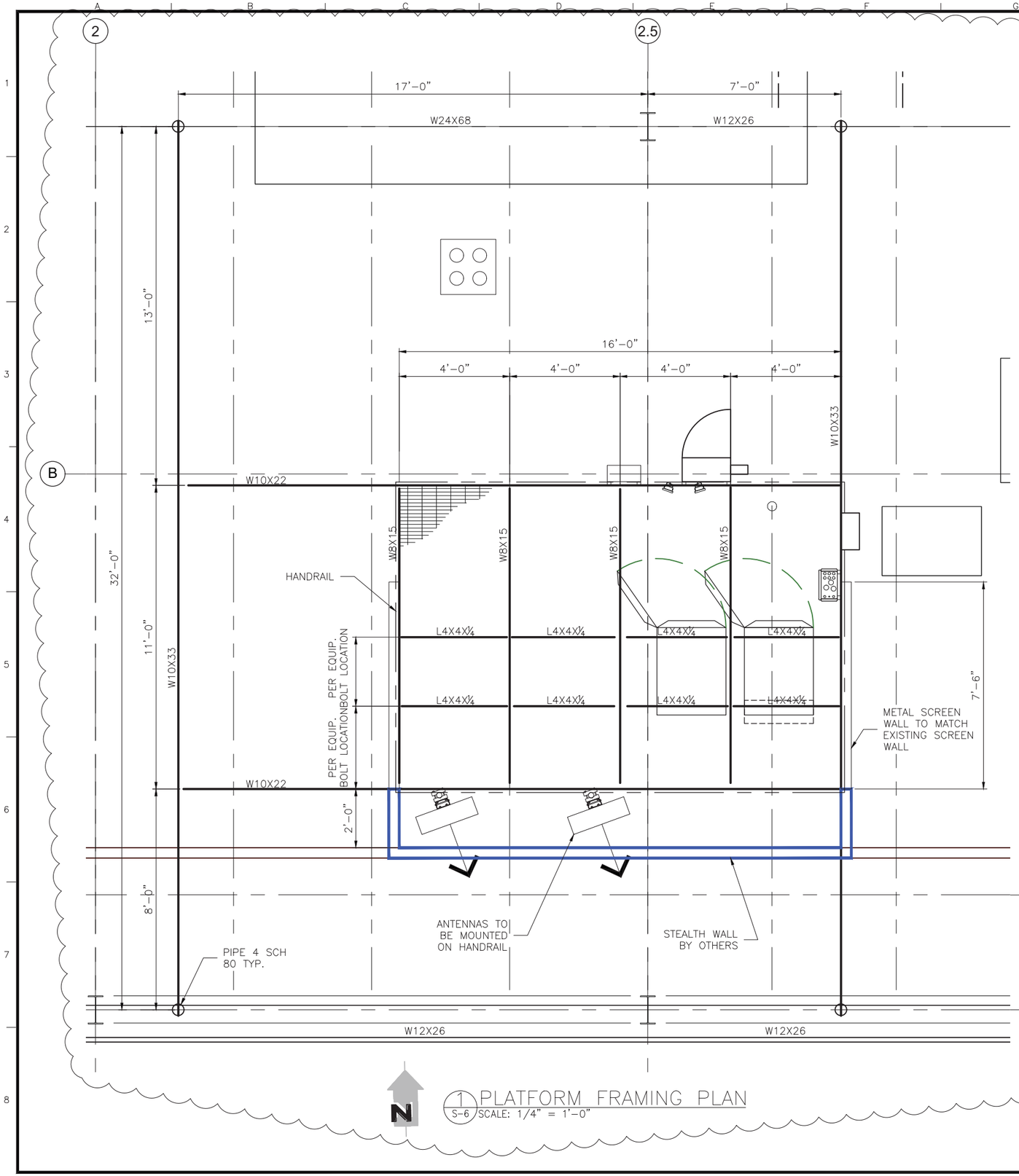
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
GAMMA SECTOR FRAMING DETAILS

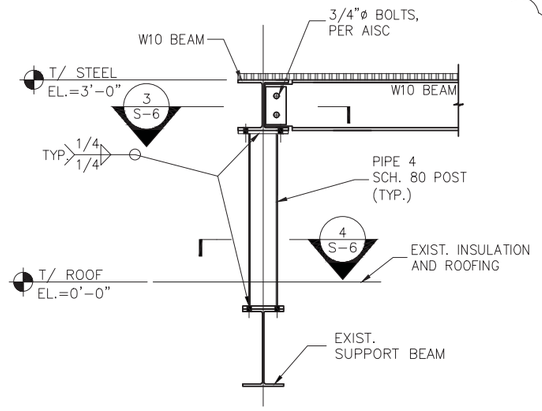
Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
S-5

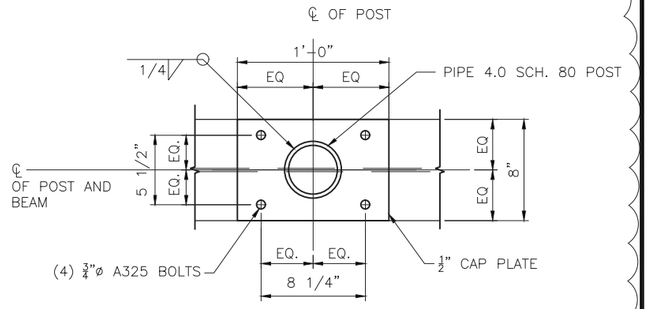
EXHIBIT C



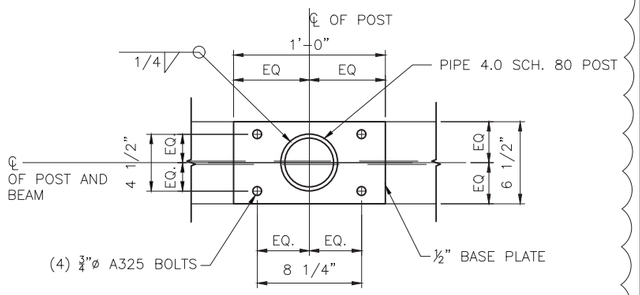
1 PLATFORM FRAMING PLAN
S-6 SCALE: 1/4" = 1'-0"



2 SECTION
S-6 SCALE: 1/2" = 1'-0"



3 SECTION
S-6 SCALE: 1" = 1'-0"



4 SECTION
S-6 SCALE: 1" = 1'-0"

1

EXHIBIT C

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/27/20 EXPIRES: 11/30/20

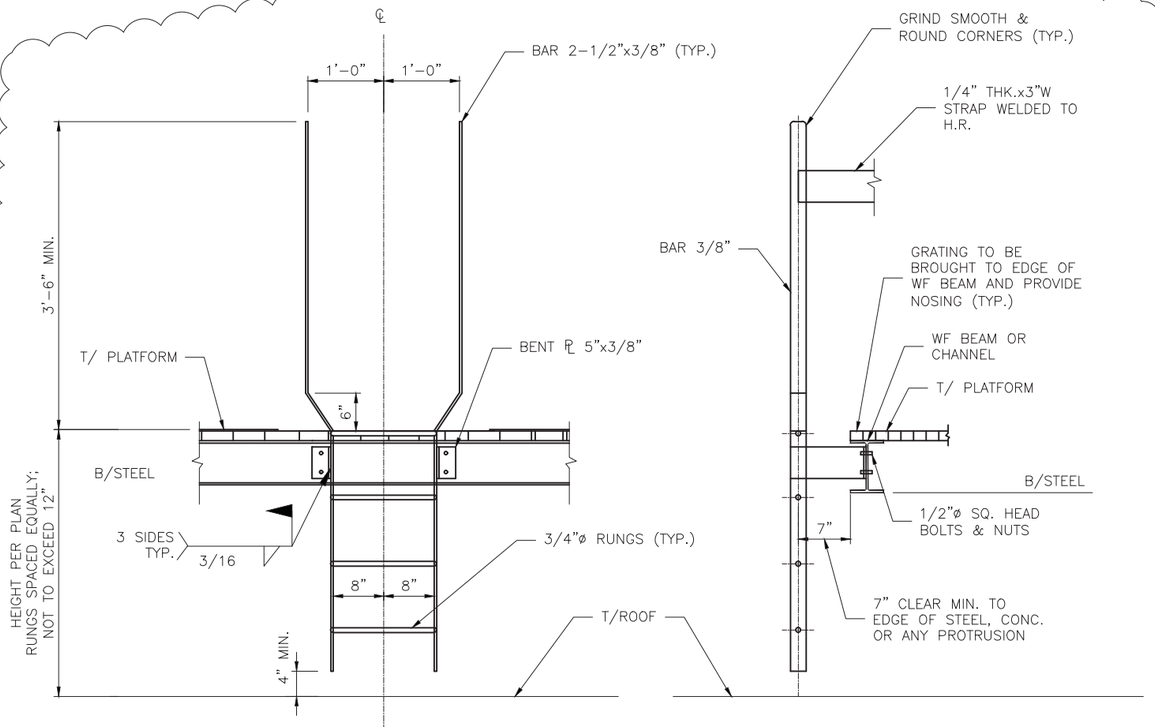
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18
REV.	DESCRIPTION	DATE

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

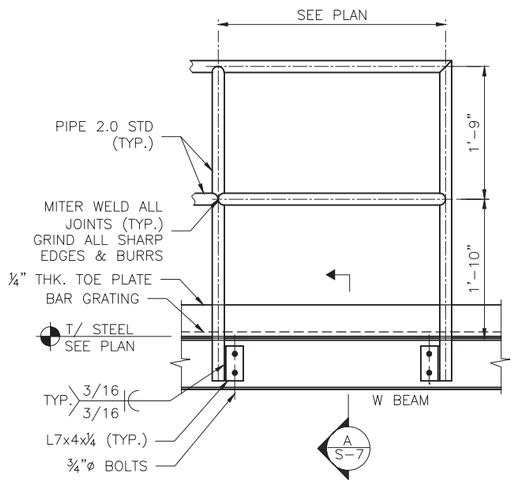
Drawing Title:
PLATFORM FRAMING PLAN & CONNECTION DETAILS

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

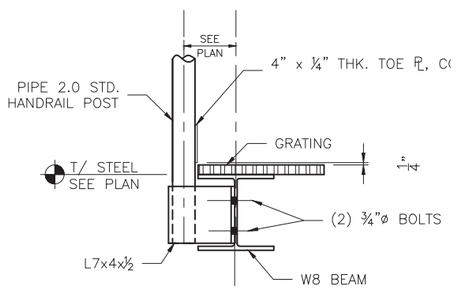
Drawing Number
S-6



1 DETAIL—PLATFORM LADDER
SCALE: 1/2" = 1'-0"

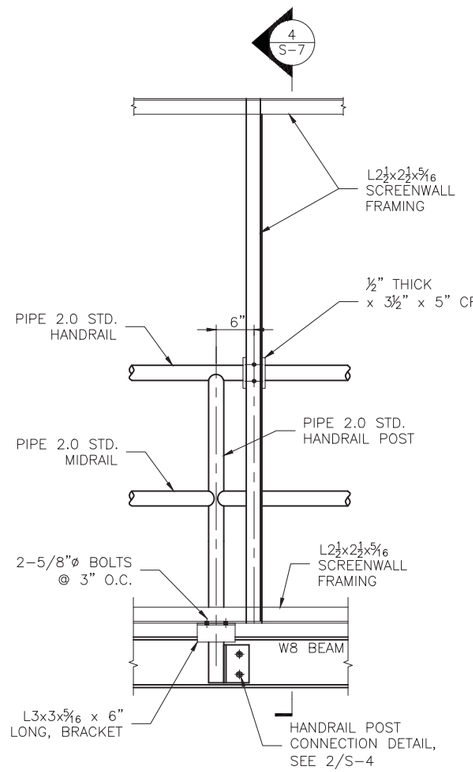


2 DETAIL—HANDRAIL
SCALE: 1/2" = 1'-0"

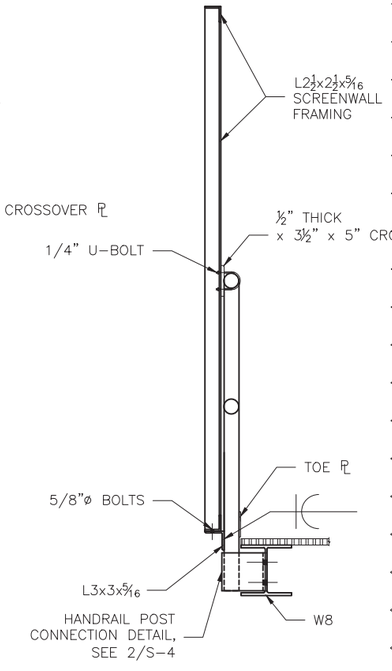


SECTION A

A S-4 SECTION—HANDRAIL CONN.
SCALE: 3/4" = 1'-0"



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



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

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/27/20 EXPIRES: 11/30/20

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

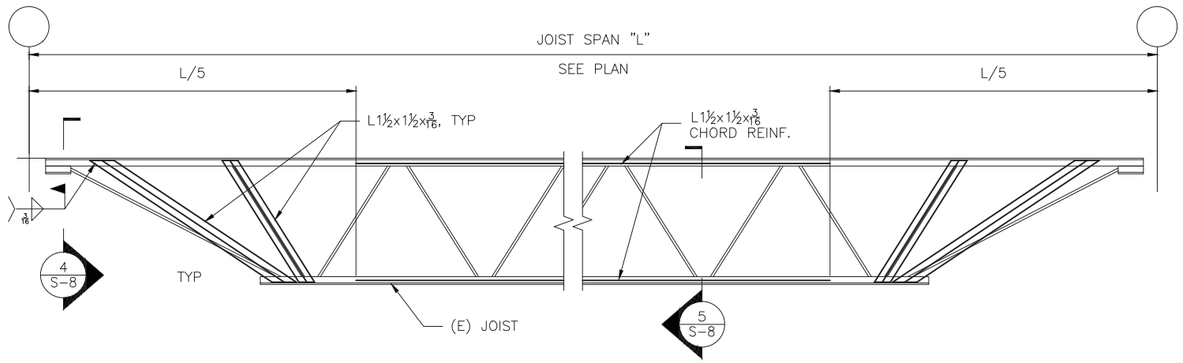
CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
PLATFORM LADDER & HANDRAIL DETAILS,

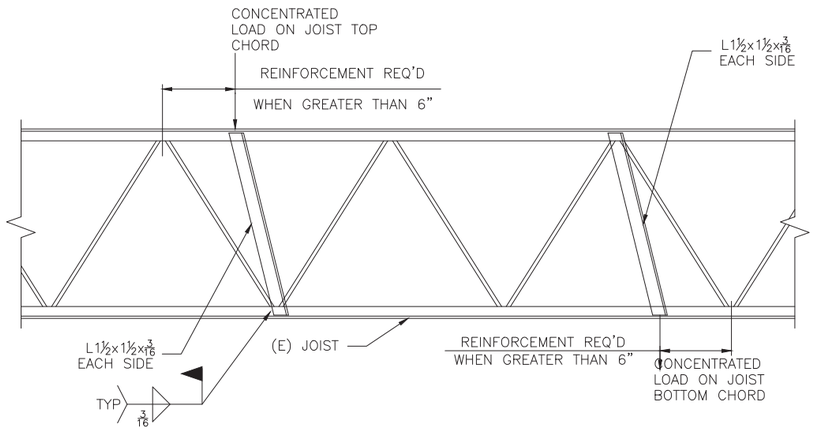
Project Number:	Drawn by: PA
	Date: 8/21/18
Client Project Number:	Checked by: MS
	Date: 8/23/18
Scale:	Approved by:
	Date:

Drawing Number
S-7

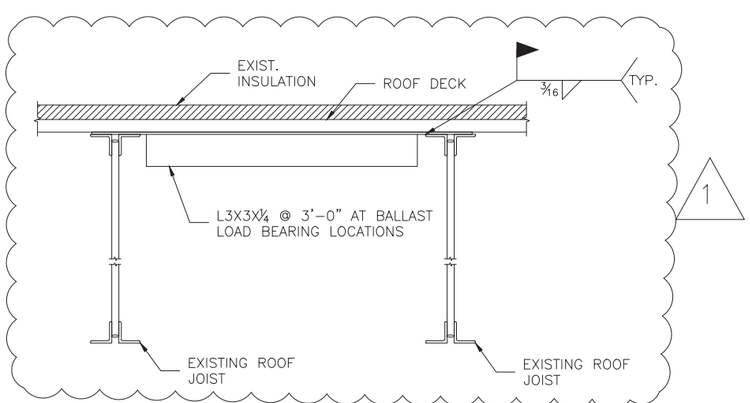
EXHIBIT C



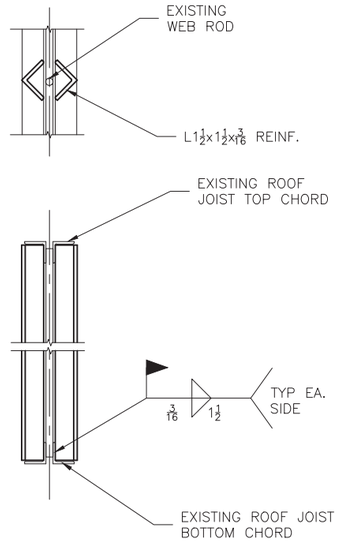
1 JOIST REINFORCEMENT DETAIL
SCALE: 1/2" = 1'-0"



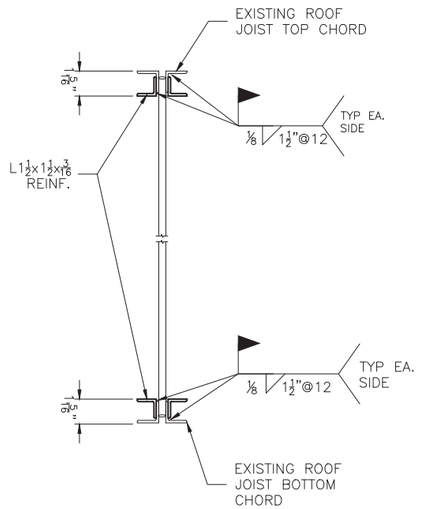
2 JOIST REINFORCEMENT @ PLATFORM SUPPORT
SCALE: 3/4" = 1'-0"



3 SECTION
S-8 SCALE: 1 1/2" = 1'-0"



4 SECTION
S-8 SCALE: 1 1/2" = 1'-0"



5 SECTION
S-8 SCALE: 1 1/2" = 1'-0"

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED STRUCTURAL ENGINEER
RICHARD A. PETERSON
81-3446
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 7/27/20 EXPIRES: 11/30/20

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
JOIST REINFORCEMENT

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
S-8

EXHIBIT C

ELECTRICAL NOTES:

THE GENERAL NOTES AND ACCOMPANYING DRAWINGS ARE TO INDICATE THE PROVISIONS AND REQUIREMENTS IN BY THE ELECTRICAL CONTRACTOR OF ALL LABOR, MATERIALS, AND EQUIPMENT REQUIRED TO INSTALL THE ELECTRICAL WORK COMPLETE IN CONNECTION WITH THIS SITE AND SHALL INCLUDE, BUT NOT LIMITED TO, THE FOLLOWING:

1. THE INSTALLATION, PROVISION, AND CONNECTION OF A GROUND ROD (ELECTRODE) SYSTEM AS INDICATED IN THE DRAWINGS.
2. THE INSTALLATION AND PROVISION OF AN ELECTRICAL SERVICE (OVERHEAD OR UNDERGROUND) AND ALL CONDUIT AND WIRE ASSOCIATED WITH IT AS INDICATED AND/OR REQUIRED ON PLANS.
3. THE INSTALLATION, PROVISION OF CONDUIT AND CONNECTIONS FOR LOCAL TELEPHONE SERVICE.
4. CONDUITS SHALL BE PVC SCHED. 40 UNLESS OTHERWISE NOTED.
5. ALL FISH LINE SHALL BE LEFT IN CONDUITS (PVC) FOR FUTURE USE.
6. THE CONTRACTOR SHALL FURNISH AND INSTALL ELECTRICAL SERVICE ENTRANCE CONDUCTORS, CONDUIT AND METER SOCKET AND MAKE THE NECESSARY CONNECTION TO THE SERVICE EQUIPMENT WITHIN THE BUILDING.

PRIOR TO THE SUBMISSION OF BIDS, THE ELECTRICAL CONTRACTOR SHALL VERIFY ALL DETAILS AND SCHEDULES ON THE DRAWINGS AND SPECIFICATIONS PROVIDED BY THE OWNER. FOR MEANING OF ABBREVIATIONS AND ADDITIONAL REQUIREMENTS AND INFORMATION, CHECK STRUCTURAL AND OTHER MECHANICAL AND ELECTRICAL DRAWINGS FOR SCALE, SPACE LIMITATIONS, BEAMS, DOOR SWINGS, WINDOWS, COORDINATION, AND ADDITIONAL INFORMATION, ETC. REPORT ANY DISCREPANCIES, CONFLICTS, ETC. TO THE OWNER BEFORE SUBMITTING BID.

UNLESS OTHERWISE NOTED, THE ELECTRICAL CONTRACTOR SHALL PROVIDE THE NECESSARY MOTOR STARTERS, DISCONNECTS, CONTROLS, ETC. FOR ALL EQUIPMENT FURNISHED BY OTHER (FBO). ALL ASSOCIATED EQUIPMENT SHALL BE INSTALLED AND COMPLETELY WIRED BY THE ELECTRICAL CONTRACTOR IN ACCORDANCE WITH MANUFACTURER'S WIRE DIAGRAMS AND AS REQUIRED FOR A COMPLETE OPERATING INSTALLATION. ELECTRICAL CONTRACTOR SHALL VERIFY AND COORDINATE CHARACTERISTICS AND REQUIREMENTS OF (FBO) EQUIPMENT PRIOR TO ROUGH-IN OF CONDUIT AND WIRINGS TO AVOID CONFLICT.

ELECTRICAL WIRING AND RACEWAYS

1. ALL WIRINGS OF ALL KINDS MUST BE INSTALLED IN CONDUIT, UNLESS OTHERWISE NOTED OR APPROVED BY THE ENGINEER.
2. ALL WIRING SHALL BE COPPER TYPE THWN AND IN ACCORDANCE WITH THE (NEC) NATIONAL ELECTRICAL CODE OR AS INDICATED ON PLANS.
3. RACEWAYS SHALL BE STEEL, GALVANIZED, WITH SIZE AS SPECIFIED AND IN ACCORDANCE WITH THE (NEC) NATIONAL ELECTRICAL DOE UNLESS OTHERWISE NOTED ON PLANS. ALL RACEWAYS SHALL BE APPROVED PRIOR TO INSTALLATION.
4. JUNCTION BOXES OR PULL BOXES SHALL MEET (NEC) NATIONAL ELECTRICAL CODE STANDARDS AND AS APPROVED FOR INSTALLATION OF RACEWAYS AND WIRING.
5. THE RACEWAY AND WIRING INSTALLATION SHALL BE GROUNDED PERMANENTLY AND EFFECTIVELY IN ACCORDANCE WITH ARTICLE 250 OF THE (NEC) NATIONAL ELECTRICAL CODE.
6. THE CONTRACTOR SHALL BE AWARE THAT ALL STATE AND LOCAL CODES SHALL APPLY TO THIS INSTALLATION AND MUST BE ADHERED TO.

CONDUIT INFORMATION		
FIBER – FROM FIBER VAULT ON W. BENTON AVE. TO NEW FIBER JUNCTION BOX AT TRASH AREA	380 FT.	NOTE: THE CONDUIT LENGTH GIVEN IS BASED ON THE DRAWING +15%. THE EXACT LENGTH TO BE VERIFIED IN FIELD. GENERAL CONTRACTOR TO VERIFY LENGTHS AFTER COORDINATING WITH SERVICE UTILITY COMPANIES.
FIBER – FROM NEW FIBER JUNCTION BOX (ASSUMED LOCATION AT TRASH AREA WALL) TO CIENA BOX	215 FT.	
POWER – FROM NEW ELECTRICAL METER TO PPC	215 FT.	
GROUNDING – FROM MASTER GROUND BAR TO EXISTING GROUND BOX INSIDE 1ST FLOOR ELECT. ROOM	200 FT.	

VOLTAGE DROP (FROM NEW ELECTRICAL SERVICE METER TO PPC)			
LENGTH OF RUN	WIRE SIZE	VOLTAGE DROP (VOLTS)	PERCENTAGE OF VOLTAGE
215 FT.	(3) 3/0 AWG (168 KCMIL)	5.32	2.21%

NOTE: FIBER CONDUIT LENGTH MAY VARY UPON FINAL JUNCTION BOX LOCATION DETERMINED BY UTILITY COMPANY.

CONTRACTOR RESPONSIBILITIES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND SECURING ALL REQUIRED PERMITS, LICENSES, INSPECTIONS, APPROVALS, AND PAYMENT OF ALL FEES.
2. THE INSTALLATION SHALL BE IN ACCORDANCE WITH ALL APPLICABLE: STATE, LOCAL, AND NATIONAL CODES AS WELL AS THE LATEST ISSUE OF THE VARIOUS APPLICABLE STANDARD SPECIFICATIONS OF THE FOLLOWING RECOGNIZED AUTHORITIES:

   NEC – NATIONAL ELECTRIC CODE
   ANSI – AMERICAN NATIONAL STANDARD INSTITUTE
   IEEE – INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
   ASTM – AMERICAN SOCIETY FOR TESTING MATERIALS
   NEMA – NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
   UL – UNDERWRITERS LABORATORY, INC.

3. PRIOR TO COMMENCING WORK, THE ELECTRICAL CONTRACTOR SHALL CONFORM TO THE LOCAL UTILITY COMPANY'S REGULATIONS AND SHALL GET THE APPROVAL FROM THE SAME, BEFORE SUBMITTING HIS BID, TO DETERMINE FROM EACH UTILITY ADDITIONAL COSTS THEY MAY REQUIRE, AND SHALL BE INCLUDED IN HIS BID FOR CONTRACT.

UTILITIES GENERAL NOTES

1. UTILITY POINTS OF SERVICE AND WORK/MATERIALS SHOWN ARE BASED ON PRELIMINARY INFORMATION ONLY, PROVIDED BY THE UTILITY COMPANIES AND ARE FOR BID PURPOSES ONLY.
2. CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANY FOR FINAL AND EXACT WORK/MATERIALS REQUIREMENTS AND CONSTRUCT TO UTILITY COMPANY PLANS AND SPECIFICATIONS ONLY. CONTRACTOR SHALL FURNISH AND INSTALL ALL CONDUIT, PULL WIRES, CABLES, PULL BOXES, CONCRETE ENCASEMENT OF CONDUIT (IF REQUIRED), TRANSFORMER PAD, BARRIERS, POLE RISERS, TRENCHING, BACKFILL.
3. PAY ALL UTILITY COMPANY FEES AND INCLUDE ALL REQUIREMENTS IN SCOPE OF WORK.

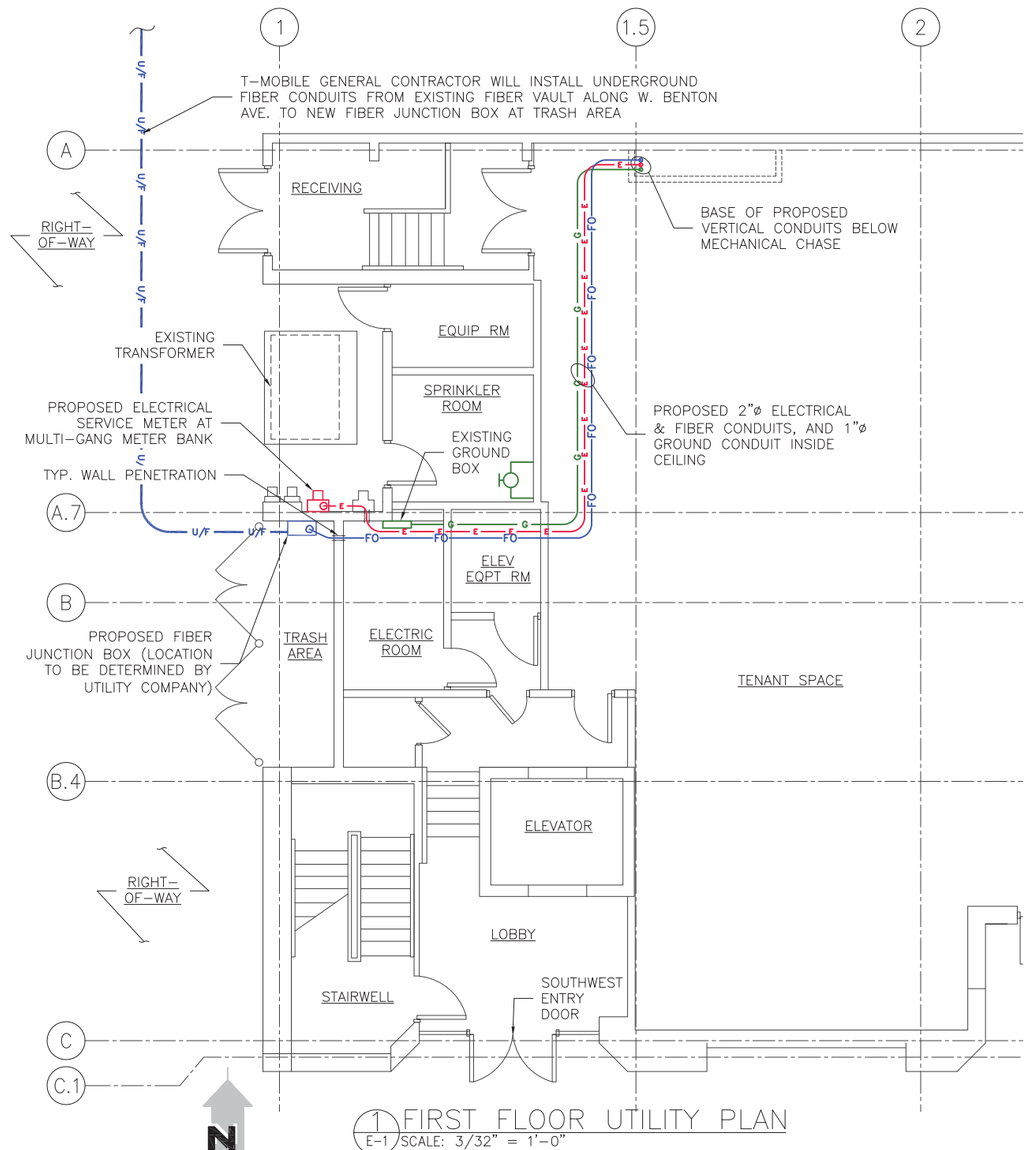
PROPOSED ELECTRICAL SERVICE METER TO BE INSTALLED AT EXISTING MULTI-GANG METER BANK NEAR EXISTING TRANSFORMER

LEGEND

- FO — FIBER CONDUIT
- U/F — U/F — UNDERGROUND FIBER
- E — E — POWER CONDUIT
- G — ELECTRICAL GROUNDING CONDUIT
- GAS — GAS — NATURAL GAS CONDUIT

PROPOSED ROUTE OF UNDERGROUND FIBER CONDUIT ALONG RIGHT-OF-WAY.

EXISTING FIBER VAULT AT SOUTHWEST CORNER OF W. BENTON AVE. & RIGHT-OF-WAY



1 E-1 FIRST FLOOR UTILITY PLAN
SCALE: 3/32" = 1'-0"

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

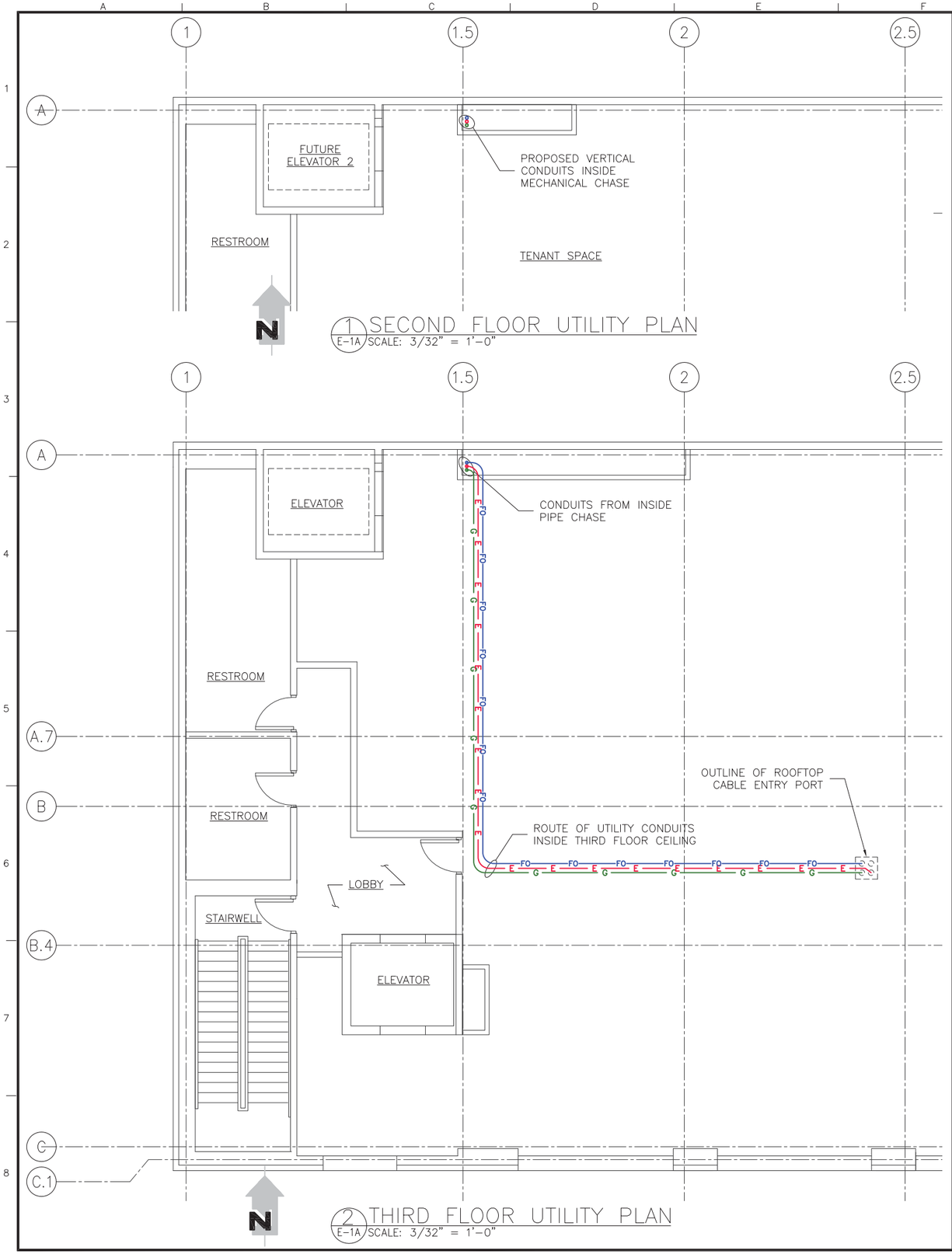
CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
UTILITY PLANS & ELECTRICAL NOTES

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

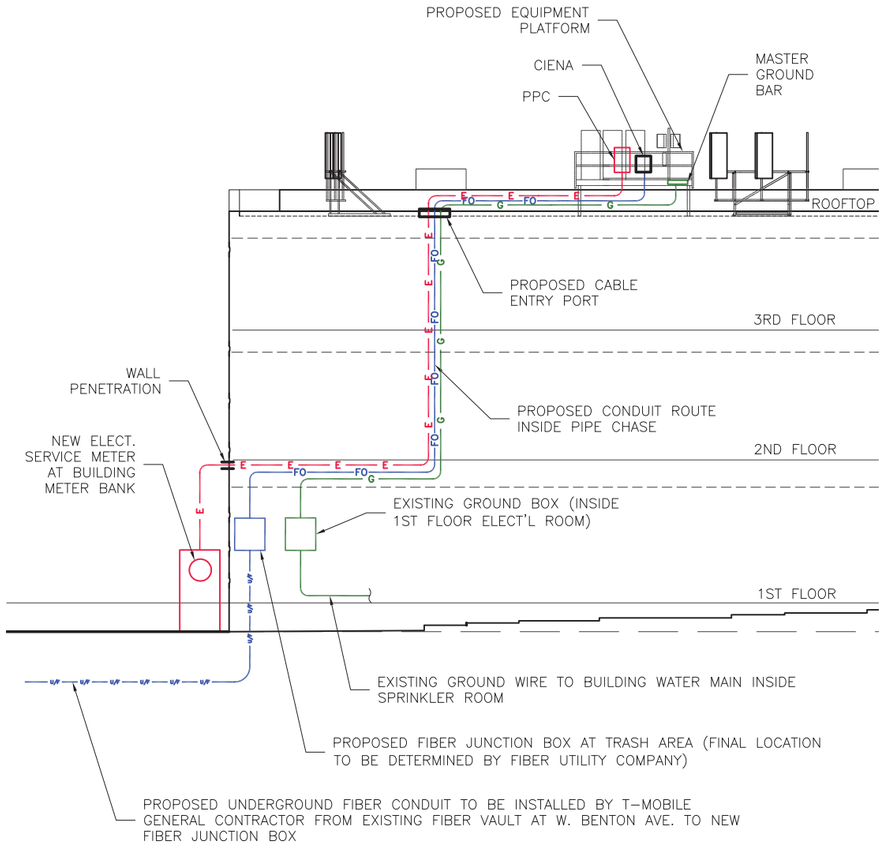
Drawing Number
E-1

EXHIBIT C



1 SECOND FLOOR UTILITY PLAN
E-1A SCALE: 3/32" = 1'-0"

2 THIRD FLOOR UTILITY PLAN
E-1A SCALE: 3/32" = 1'-0"



3 UTILITY RISER DIAGRAM
E-1A SCALE: N.T.S.

LEGEND

- FO — FIBER CONDUIT
- U/F U/F — UNDERGROUND FIBER
- E E — POWER CONDUIT
- G — ELECTRICAL GROUNDING CONDUIT

T-Mobile®
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES:
DATE: 3/13/19 EXPIRES: 11/30/19

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

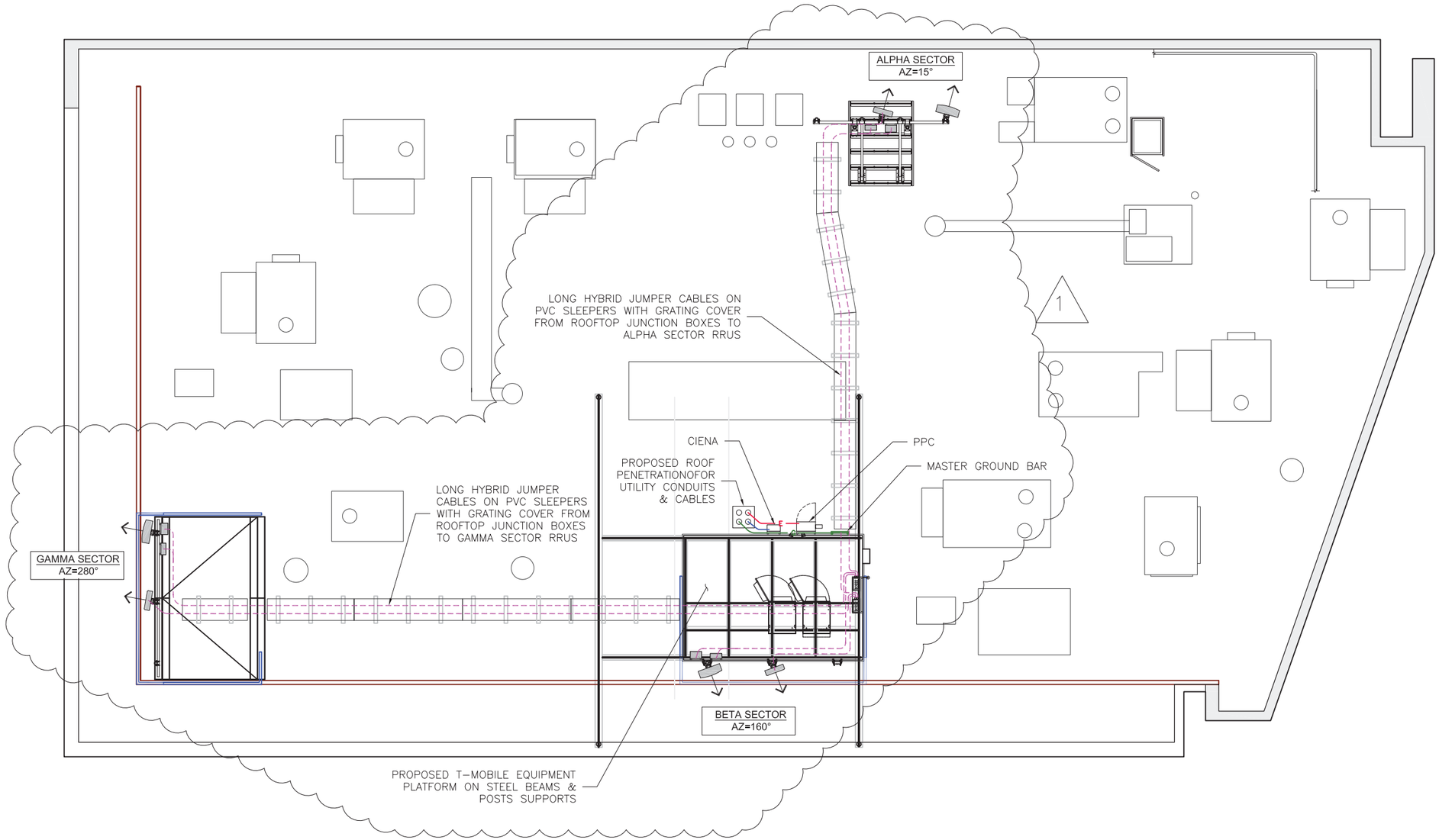
CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
UTILITY PLAN

Project Number:	Drawn by: PA
	Date: 8/21/18
Client Project Number:	Checked by: MS
	Date: 8/23/18
Scale:	Approved by:
	Date:

Drawing Number
E-2

EXHIBIT C



N

1 ROOFTOP UTILITY & CABLE ROUTING PLAN
E-3 SCALE: 3/32" = 1'-0"

LEGEND

- FO — FIBER CONDUIT
- HYBRID JUMPER CABLE
- E — E — POWER CONDUIT
- G — ELECTRICAL GROUNDING CONDUIT
- TELCO CONDUIT

T-Mobile

1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT

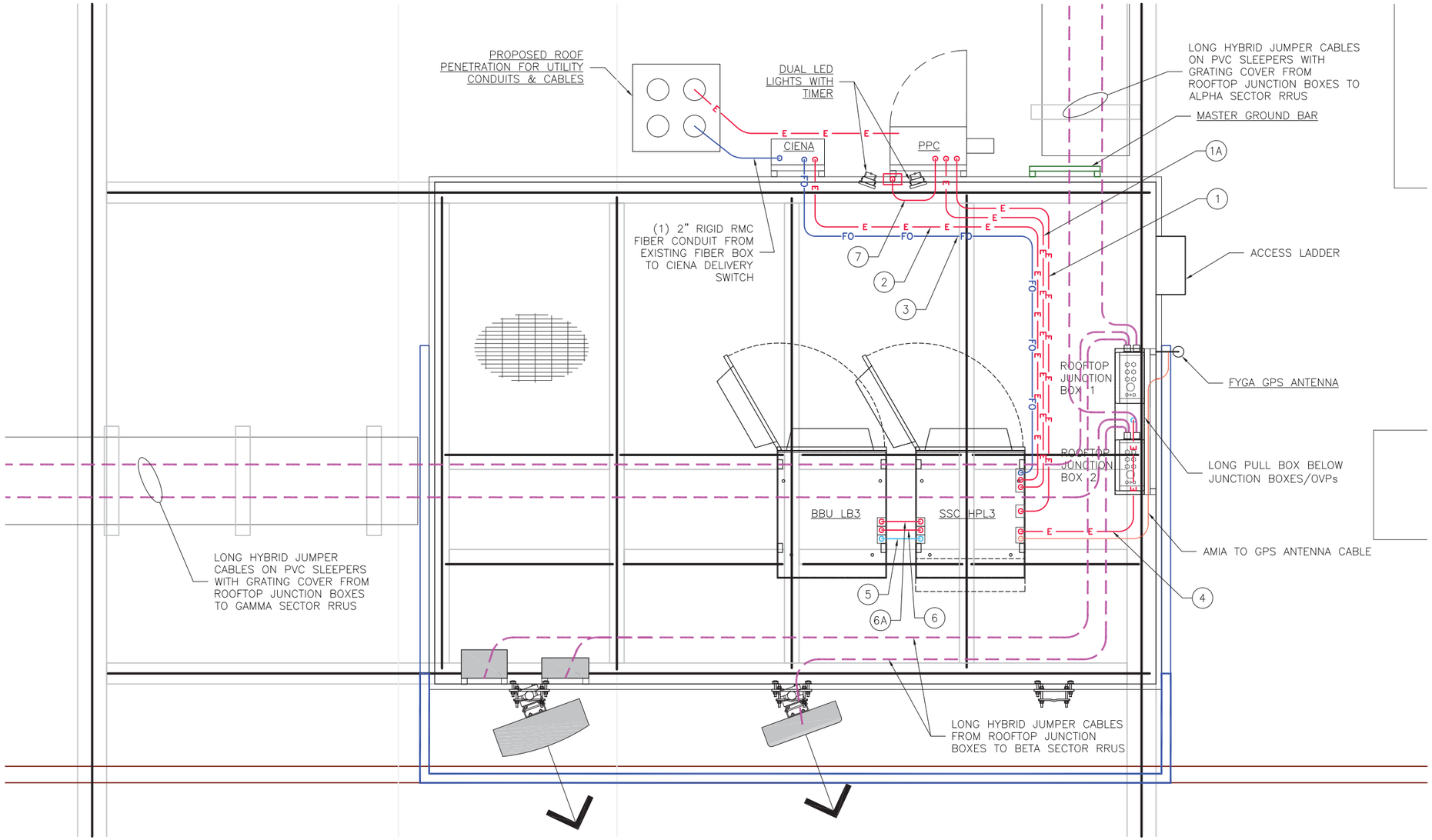
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
ROOFTOP UTILITY AND CABLE ROUTING PLAN

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
E-3

EXHIBIT C



LEGEND

- FO — FIBER CONDUIT
- HYBRID JUMPER CABLE
- E — E — POWER CONDUIT
- G — ELECTRICAL GROUNDING CONDUIT
- TELCO CONDUIT

N

1 LEASE AREA UTILITY PLAN
E-4 SCALE: 3/8" = 1'-0"

UTILITY LEGEND

NO.	FROM	TO	WIRE QTY. & TYPE	GROUND	CONDUIT SIZE	FUNCTION
1	PPC	HP LARGE SSC	(2) 3/0	(1) 3/0 FOR GROUND & (1) #4 NEUTRAL WIRES	2" RIGID RMC W/ 2" THREADED LL TYPE RIGID CONDUIT BODY	ELECTRIC CONDUIT
1A	PPC	HP LARGE SSC	1 PAIR OF BELDEN 27916A	N/A	1" RIGID MMC	ELECTRIC CONDUIT
2	CIENA DELIVERY SWITCH	HP LARGE SSC	(1) CAT-6 CABLE	N/A	1" RIGID MMC	FIBER CONDUIT
3	CIENA POWER JUNCTION BOX	HP LARGE SSC	(2) #12	(1) #6	1" RIGID MMC	ELECTRIC CONDUIT
4	METER WITH NEW 200 DISCONNECT	PULL BOX BELOW OVP/FIBER JUNCTION BOX	3 PAIRS OF #2	N/A	2" RIGID RMC	ELECTRIC CONDUIT
5	HP LARGE SSC	BATTERY CABINET	(2) CAT-5 CABLES	N/A	4" RIGID RMC	TELCO CONDUIT (FOR
6	BATTERY CABINET	HP LARGE SSC	4 PAIRS OF 4/0 TELCO FLEX POWER CABLES,	N/A	4" RIGID RMC	ELECTRIC CONDUIT
6A	BATTERY CABINET	HP LARGE SSC	(3) #12	(1) #10	1" RIGID MMC	ELECTRIC CONDUIT
7	PPC	(2) NEW 15W LED	(3) #12	(1) #12	1/2" RIGID MMC	ELECTRIC CONDUIT

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES:
DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T-MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
LEASE AREA UTILITY PLAN

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
E-4

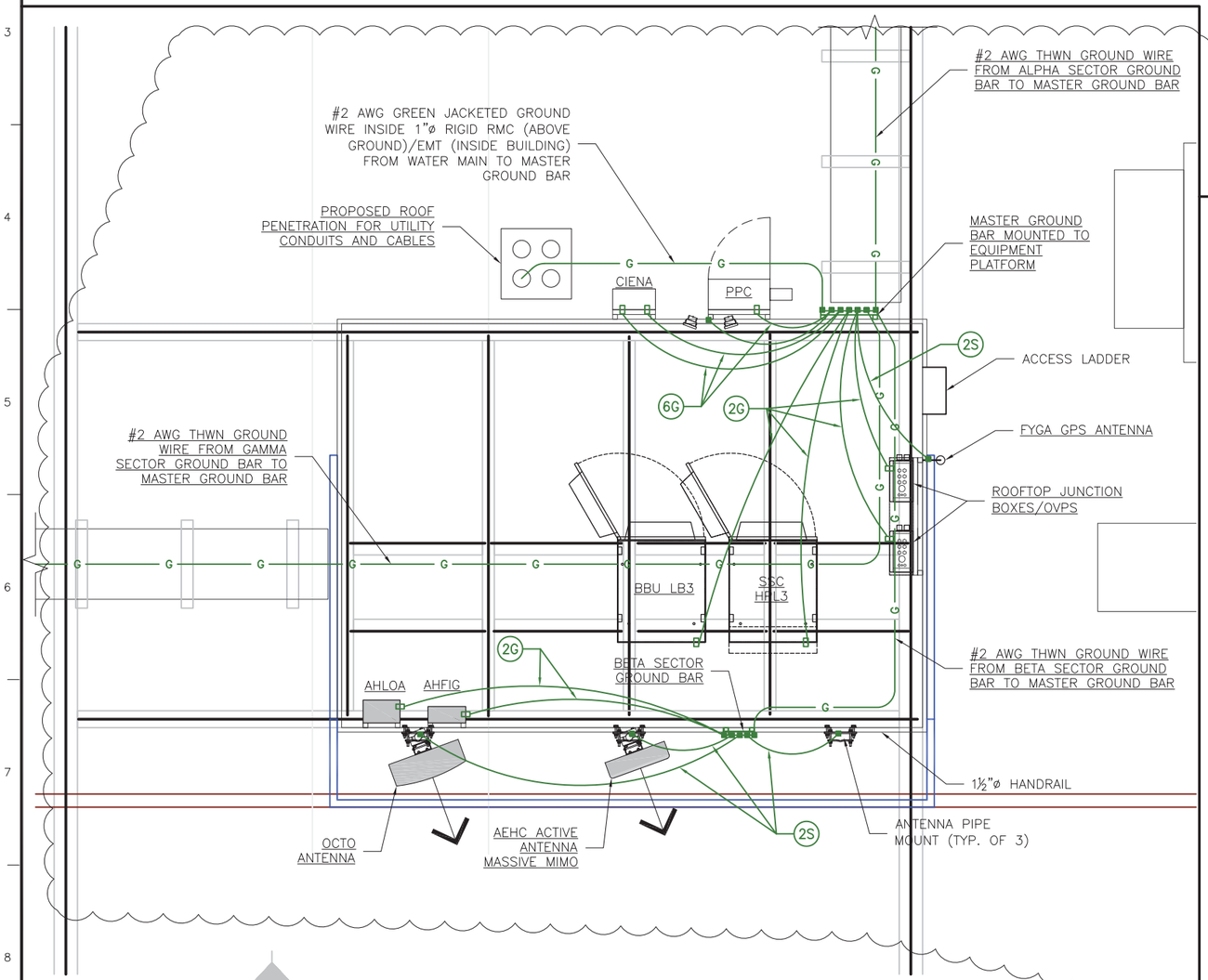
EXHIBIT C

GROUNDING NOTES:

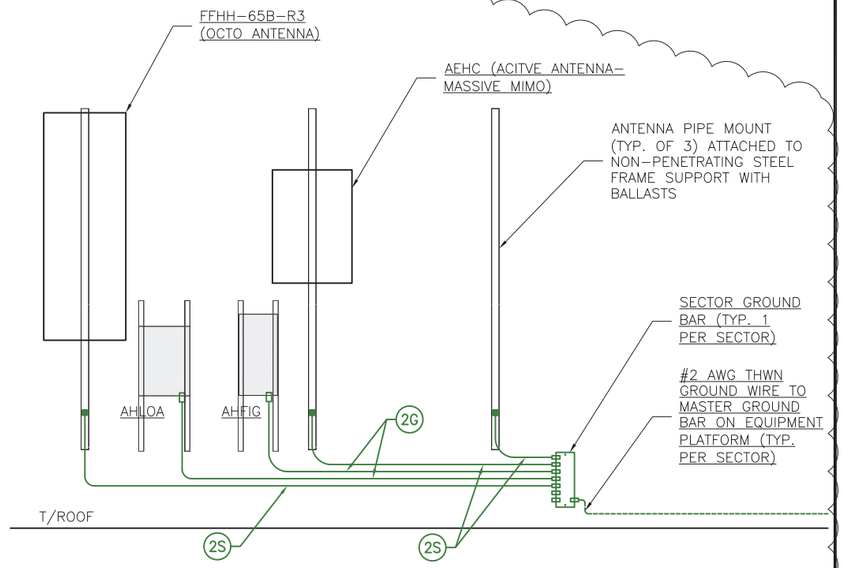
1. GROUNDING CONNECTIONS SHALL BE EXOTHERMIC TYPE ("CADWELD") TO ANTENNA MASTS, FENCE POSTS, MONOPOLE, AND THE GROUND RODS, REMAINING GROUNDING CONNECTIONS SHALL BE COMPRESSION FITTINGS.
2. GROUND CABLE SHIELDS AT BOTH ENDS WITH CABLE GROUNDING KITS.
3. ROUTE GROUNDING CONDUCTORS ALONG THE SHORTEST AND STRAIGHTEST PATH POSSIBLE, EXCEPT AS OTHERWISE INDICATED. GROUNDING LEADS SHOULD NEVER BE BENT AT RIGHT ANGLE, ALWAYS MAKE AT LEAST 12" RADIUS BENDS. #6 WIRE CAN BE BENT AT 6" RADIUS WHEN NECESSARY.
4. CONTRACTOR TO PROVIDE GROUND WIRES, BARS AND CONNECTIONS AS SHOWN ON GROUNDING RISER DIAGRAM. CONTRACTOR SHALL TEST AND VERIFY THAT THE IMPEDANCE DOES NOT EXCEED 5 OHMS TO GROUND BY MEANS OF A 4 POINT BIDDLE–MEGGER TESTER. GROUNDING AND OTHER OPERATIONAL TESTING SHALL BE WITNESSED BY THE OWNER'S REPRESENTATIVE.
5. GROUNDING CONDUCTORS SHALL BE COPPER ONLY. ABOVE GROUND EITHER SOLID OR STRANDED CONDUCTORS ARE PERMITTED. IGR AND ALL EXTERNAL CONDUCTORS (W/ THE EXCEPTION FOR GROUND WIRE BETWEEN THE TOP AND THE BOTTOM OF THE ANTENNA TOWER) MUST BE BARE. EQUIPMENT GROUND LEADS IN CABLE TRAYS MUST BE GREEN INSULATED. BELOW GROUND BARE SOLID TINNED WIRE SHALL BE USED. ALL WIRES MUST BE #2 AWG MIN. WITH THE EXCEPTION OF GROUND WIRES FOR MISCELLANEOUS METALLIC OBJECTS IN THE EQUIPMENT SHELTER, WHERE #6 WIRES CAN BE USED.
6. THE GROUND ELECTRODE SYSTEM SHALL CONSIST OF DRIVEN GROUND RODS UNIFORMLY SPACED AROUND CELL SITE. THE GROUND RODS SHALL BE $\frac{5}{8}$"x10'–0" COPPER CLAD STEEL. THE RODS SHALL BE INTERCONNECTED WITH #2 AWG BARE SOLID TINNED COPPER GROUND WIRE BURIED 42" BELOW THE SURFACE OF THE SOIL. MINIMUM DISTANCE BETWEEN GROUND RODS – 8', MAXIMUM – 16'.
7. METALS WITHIN 6' OF THE GROUND RING SHALL BE BONDED TO THE GROUND RING.
8. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER WHEN THE GROUNDING IS COMPLETE. THE CONSTRUCTION MANAGER SHALL INSPECT THE GROUNDING SYSTEM PRIOR TO BACKFILLING.
9. VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO ANY DIGGING.
10. GROUND CONDUCTOR BENDS SHALL NOT BE LESS THAN 8" RADIUS.
11. GROUND CONDUCTORS TO THE GROUND RING SHALL BE IN $\frac{3}{4}$" "LIQUID–TITE" FLEX DUCT AND SEALED AT EXIT W/ SILICONE CAULK.
12. ANTENNA INSTALLATION CONTRACTOR TO PROVIDE & INSTALL TOP, RF BUSBARS & BUSBAR BELOW CENTERLINE.

LEGEND	
⏤	GROUND BAR
■	CADWELD OR APPROVED CONNECTION
⟅	SPARE GROUND LEAD
▭	MECHANICAL CONNECTION

KEY NOTES	
2G	#2 AWG GREEN STRANDED GROUND COPPER WIRE
2S	#2 AWG SOLID, TINNED BARE COPPER GROUND WIRE
6G	#6 AWG GREEN STRANDED GROUND COPPER WIRE



1 EQUIPMENT PLATFORM GROUNDING PLAN
E-5 SCALE: 1/4" = 1'–0"



2 SECTOR FRAME GROUNDING PLAN
E-5 SCALE: 1/4" = 1'–0"

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____

DATE: 7/24/20 EXPIRES: 11/30/21

REV.	DESCRIPTION	DATE
1	REVISED PER T–MOBILE REDESIGN	7/24/20
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

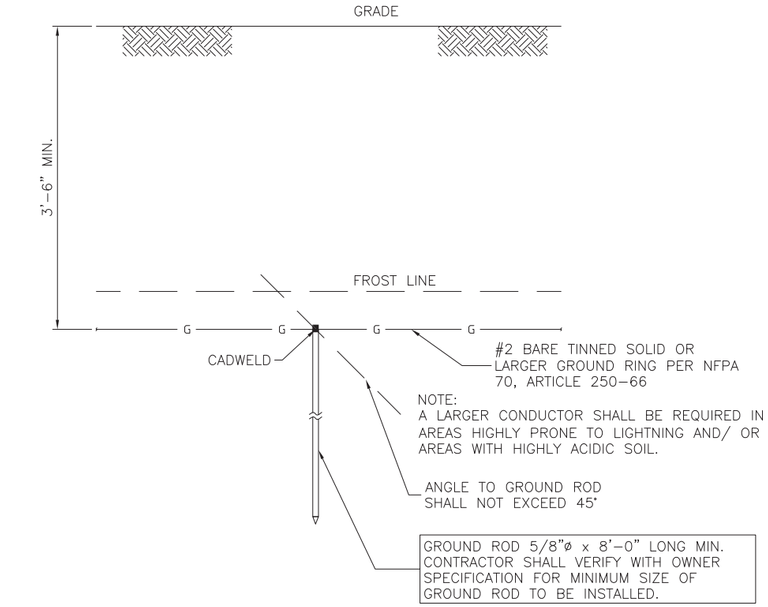
CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
GROUNDING PLAN & NOTES

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
E-5

EXHIBIT C



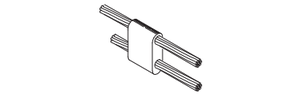
NOTES:

1. GROUND RODS MAY BE:
-COPPER CLAD STEEL
- SOLID COPPER
2. GROUND RODS SHALL HAVE A MAX. SPACING TWICE THE LENGTH OF ROD
3. SEE RESISTIVITY REPORT FOR VERIFICATION AS AVAILABLE
4. GROUND RODS INSTALLED WITHIN CLOSE PROXIMITY TO TOWER OR WHEN SOIL IS AT OR BELOW 2,000 OHM-CM, SHALL BE GALVANIZED TO PREVENT GALVANIC CORROSION OF TOWER (SEE ANSI/TIA-EIA-222-G)

1 GROUNDING ROD (IF REQUIRED)
E-6 SCALE: N.T.S.

SECTION A-A

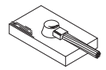
2 GROUNDING BAR CONNECTION
E-6 SCALE: N.T.S.



PARALLEL HORIZONTAL CONDUCTORS
PARALLEL THROUGH CONNECTION OF HORIZONTAL CABLES
TYPE PT

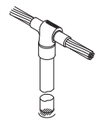
TYPE GR

VERTICAL STEEL SURFACE
CABLE DOWN AT 45° TO VERTICAL STEEL SURFACE INCLUDING PIPE
TYPE VS

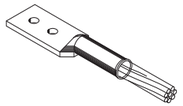


HORIZONTAL STEEL SURFACE
TO FLAT STEEL SURFACE OR HORIZONTAL PIPE
TYPE HS

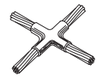
HORIZONTAL SPLICE
SPLICE OF HORIZONTAL CABLES
TYPE SS



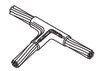
THROUGH CABLE TO GROUND ROD
THROUGH CABLE TO TOP OF GROUND ROD
TYPE GT



TYPE YA-2



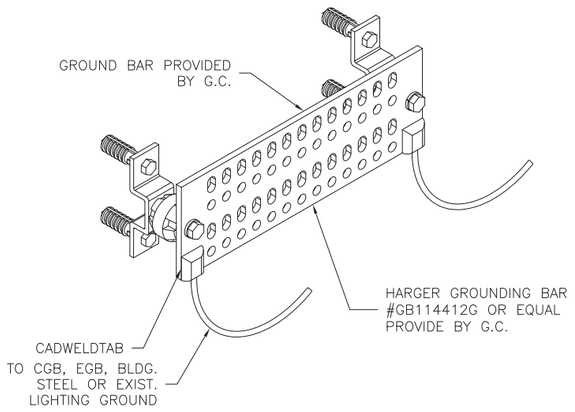
TYPE XA



TYPE TA

NOTE: CADWELD "TYPES" SHOWN ABOVE ARE EXAMPLES. CONSULT WITH PROJECT MANAGER FOR SPECIFIC TYPES OF CADWELDS TO BE USED FOR THIS PROJECT.

4 CADWELD TYPES
E-6 SCALE: N.T.S.



3 COLLECTOR GROUND BAR (CGB)
E-6 SCALE: N.T.S.

T-Mobile®
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES:
DATE: 3/13/19 EXPIRES: 11/30/19

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
GROUNDING DETAILS

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
E-6

EXHIBIT C

DIVISION 1 – GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 INTENT

THESE SPECIFICATIONS AND CONSTRUCTION DRAWINGS ACCOMPANYING THEM DESCRIBE THE WORK TO BE DONE AND THE MATERIALS TO BE FURNISHED FOR CONSTRUCTION.

THE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO BE FULLY EXPLANATORY AND SUPPLEMENTARY. HOWEVER, SHOULD ANYTHING BE SHOWN, INDICATED OR SPECIFIED ON ONE AND NOT THE OTHER, IT SHALL BE DONE THE SAME AS IF SHOWN, INDICATED OR SPECIFIED IN BOTH.

THE INTENTION OF THE DOCUMENTS IS TO INCLUDE ALL LABOR AND MATERIALS REASONABLY NECESSARY FOR THE PROPER EXECUTION AND COMPLETION OF THE WORK AS STIPULATED IN THE CONTRACT.

THE PURPOSE OF THE SPECIFICATIONS IS TO INTERPRET THE INTENT OF THE DRAWINGS AND TO DESIGNATE THE METHOD OF THE PROCEDURE, TYPE AND QUALITY OF MATERIALS REQUIRED TO COMPLETE THE WORK.

MINOR DEVIATIONS FROM THE DESIGN LAYOUT ARE ANTICIPATED AND SHALL BE CONSIDERED AS PART OF THE WORK. NO CHANGES THAT ALTER THE CHARACTER OF THE WORK WILL BE MADE OR PERMITTED BY THE OWNER WITHOUT ISSUING A CHANGE ORDER.

1.2 CONFLICTS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL MEASUREMENTS AT THE SITE BEFORE ORDERING ANY MATERIALS OR DOING ANY WORK. NO EXTRA CHARGE OR COMPENSATION SHALL BE ALLOWED DUE TO DIFFERENCE BETWEEN ACTUAL DIMENSIONS AND DIMENSIONS INDICATED ON THE CONSTRUCTION DRAWINGS. ANY SUCH DISCREPANCY IN DIMENSION WHICH MAY BE FOUND SHALL BE SUBMITTED TO THE OWNER FOR CONSIDERATION BEFORE THE CONTRACTOR PROCEEDS WITH THE WORK IN THE AFFECTED AREAS.

THE BIDDER, IF AWARDED THE CONTRACT, WILL NOT BE ALLOWED ANY EXTRA COMPENSATION BY REASON OF ANY MATTER OR THING CONCERNING WHICH SUCH BIDDER MIGHT HAVE FULLY INFORMED THEMSELVES PRIOR TO THE BIDDING.

NO PLEA OF IGNORANCE OF CONDITIONS THAT EXIST, OR OF DIFFICULTIES OR CONDITIONS THAT MAY BE ENCOUNTERED OR OF ANY OTHER RELEVANT MATTER CONCERNING THE WORK TO BE PERFORMED IN THE EXECUTION OF THE WORK WILL BE ACCEPTED AS AN EXCUSE FOR ANY FAILURE OR OMISSION ON THE PART OF THE CONTRACTOR TO FULFILL EVERY DETAIL OF ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS GOVERNING THE WORK.

1.3 CONTRACTS AND WARRANTIES

CONTRACTOR IS RESPONSIBLE FOR APPLICATION AND PAYMENT OF CONTRACTOR LICENSES AND BONDS.

SEE MASTER CONSTRUCTION SERVICES AGREEMENT FOR ADD'L DETAILS.

1.4 STORAGE

ALL MATERIALS MUST BE STORED IN A LEVEL AND DRY FASHION AND IN A MANNER THAT DOES NOT NECESSARILY OBSTRUCT THE FLOW OF OTHER WORK. ANY STORAGE METHOD MUST MEET ALL RECOMMENDATIONS OF THE ASSOCIATED MANUFACTURER.

1.5 CLEAN UP

THE CONTRACTORS SHALL AT ALL TIMES KEEP THE SITE FREE FROM ACCUMULATION OF WASTE MATERIALS OR RUBBISH CAUSED BY THEIR EMPLOYEES AT WORK AND AT THE COMPLETION OF THE WORK, THEY SHALL REMOVE ALL RUBBISH FROM AND ABOUT THE BUILDING AREA, INCLUDING ALL THEIR TOOLS, SCAFFOLDING AND SURPLUS MATERIALS AND SHALL LEAVE THEIR WORK CLEAN AND READY FOR USE.

EXTERIOR: VISUALLY INSPECT EXTERIOR SURFACES AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER.

1. REMOVE ALL TRACES OF SPLASHED MATERIALS FROM ADJACENT SURFACES.
2. IF NECESSARY TO ACHIEVE A UNIFORM DEGREE OF CLEANLINESS, HOSE DOWN THE EXTERIOR OF THE STRUCTURE.

INTERIOR:

VISUALLY INSPECT INTERIOR SURFACE AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER FROM WALLS/FLOOR/CEILING.

1. REMOVE ALL TRACES OF SPLASHED MATERIAL FROM ADJACENT SURFACES.
2. REMOVE PAINT DROPPINGS, SPOTS, STAINS AND DIRT FROM FINISHED SURFACES.

1.6 CHANGE ORDER PROCEDURE

CHANGE ORDERS MAY BE INITIATED BY THE OWNER AND/OR THE CONTRACTOR INVOLVED. THE CONTRACTOR, UPON VERBAL REQUEST FROM THE OWNER SHALL PREPARE A WRITTEN PROPOSAL DESCRIBING THE CHANGE IN WORK OR MATERIALS AND ANY CHANGES IN THE CONTRACT AMOUNT AND PRESENT TO THE OWNER WITHIN 72 HRS FOR APPROVAL. SUBMIT REQUESTS FOR SUBSTITUTIONS IN THE FORM AND IN ACCORDANCE WITH PROCEDURES REQUIRED FOR CHANGE ORDER PROPOSALS. ANY CHANGES IN SCOPE OF WORK OR MATERIALS WHICH ARE PERFORMED BY THE CONTRACTOR WITHOUT A WRITTEN CHANGE ORDER AS DESCRIBED AND APPROVED BY THE OWNER SHALL PLACE FULL RESPONSIBILITY OF THESE ACTIONS ON THE CONTRACTOR.

1.7 RELATED DOCUMENTS AND COORDINATION

GENERAL NOTES, CIVIL, STRUCTURAL, ELECTRICAL AND ANTENNA DRAWINGS ARE INTERRELATED. IN PERFORMANCE OF THE WORK; THE CONTRACTOR MUST REFER TO ALL DRAWINGS. ALL COORDINATION TO BE THE RESPONSIBILITY OF THE CONTRACTOR.

1.8 SHOP DRAWINGS

A. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AS REQUIRED AND LISTED IN THESE SPECIFICATIONS TO THE OWNER FOR APPROVAL.

B. ALL SHOP DRAWINGS SHALL BE REVIEWED, CHECKED AND CORRECTED BY CONTRACTOR PRIOR TO SUBMITTAL TO THE OWNER.

1.9 PRODUCTS AND SUBSTITUTIONS

A. SUBMIT 3 COPIES OF EACH REQUEST FOR SUBSTITUTION. IN EACH REQUEST IDENTIFY THE PRODUCT OR FABRICATION OR INSTALLATION METHOD TO BE REPLACED BY THE SUBSTITUTION. INCLUDE RELATED SPECIFICATION SECTION AND DRAWING NUMBERS AND COMPLETE DOCUMENTATION SHOWING COMPLIANCE WITH THE REQUIREMENTS FOR SUBSTITUTIONS.

B. SUBMIT ALL NECESSARY PRODUCT DATA AND CUT SHEETS WHICH PROPERLY INDICATE AND DESCRIBE THE ITEMS, PRODUCTS AND MATERIALS BEING INSTALLED. THE CONTRACTOR SHALL, IF DEEMED NECESSARY BY THE OWNER SUBMIT ACTUAL SAMPLES TO THE OWNER FOR APPROVAL IN LIEU OF CUT SHEETS.

1.10 QUALITY ASSURANCE

ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS. THESE SHALL INCLUDE BUT NOT BE LIMITED TO THE LATEST VERSION OF THE FOLLOWING:

ANSI/EIA – 222 – G
INTERNATIONAL BUILDING CODE: 2012 IBC
ELECTRICAL CODE: 2014 NEC
UNDERWRITER LABORATORIES APPROVED ELECTRICAL PRODUCTS
AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATIONS (AISC)
LIFE SAFETY CODE NFPA – 101–2012

1.11 ADMINISTRATION

A. BEFORE THE COMMENCEMENT OF ANY WORK, THE CONTRACTOR WILL ASSIGN A PROJECT MANAGER WHO WILL ACT AS A SINGLE POINT OF CONTACT FOR ALL PERSONNEL INVOLVED IN THIS PROJECT. THIS PROJECT MANAGER WILL DEVELOP A MASTER SCHEDULE FOR THE PROJECT WHICH WILL BE SUBMITTED TO THE OWNER PRIOR TO THE COMMENCEMENT OF ANY WORK.

B. SUBMIT A BAR TYPE PROGRESS CHART NOT MORE THAN 3 DAYS AFTER THE DATE ESTABLISHED FOR COMMENCEMENT OF THE WORK ON THE SCHEDULE, INDICATING A TIME BAR FOR EACH MAJOR CATEGORY OR UNIT OF WORK TO BE PERFORMED AT SITE, PROPERLY SEQUENCED AND COORDINATED WITH OTHER ELEMENTS OF WORK AND SHOWING COMPLETION OF THE WORK SUFFICIENTLY IN ADVANCE OF THE DATE ESTABLISHED FOR SUBSTANTIAL COMPLETION OF THE WORK.

C. PRIOR TO COMMENCING CONSTRUCTION, THE OWNER SHALL SCHEDULE AN ON–SITE MEETING WITH ALL MAJOR PARTIES. THIS WOULD INCLUDE (THOUGH NOT LIMITED TO) THE OWNER, PROJECT MANAGER, CONTRACTOR, LAND OWNER REPRESENTATIVE, LOCAL TELEPHONE COMPANY, TOWER ERECTION FOREMAN (IF SUBCONTRACTED).

D. CONTRACTOR SHALL BE EQUIPPED WITH SOME MEANS OF CONSTANT COMMUNICATIONS, SUCH AS A MOBILE PHONE OR A BEEPER. THIS EQUIPMENT WILL NOT BE SUPPLIED BY THE OWNER, NOR WILL WIRELESS SERVICE BE ARRANGED.

E. DURING CONSTRUCTION, CONTRACTOR MUST ENSURE THAT EMPLOYEES AND SUBCONTRACTORS WEAR HARD HATS AT ALL TIMES. CONTRACTOR WILL COMPLY WITH ALL SAFETY REQUIREMENTS IN THEIR AGREEMENT.

F. PROVIDE WRITTEN DAILY UPDATES ON SITE PROGRESS TO THE OWNER.

G. COMPLETE INVENTORY OF CONSTRUCTION MATERIALS AND EQUIPMENT IS REQUIRED PRIOR TO START OF CONSTRUCTION.

H. NOTIFY THE OWNER / PROJECT MANAGER IN WRITING NO LESS THAN 48 HOURS IN ADVANCE OF CONCRETE POURS, TOWER ERECTIONS, AND EQUIPMENT CABINET PLACEMENTS.

1.12 INSURANCE AND BONDS

A. CONTRACTOR SHALL AT THEIR OWN EXPENSE CARRY AND MAINTAIN FOR THE DURATION OF THE PROJECT ALL INSURANCE AS REQUIRED AND LISTED AND SHALL NOT COMMENCE WITH THEIR WORK UNTIL THEY HAVE PRESENTED AN ORIGINAL CERTIFICATE OF INSURANCE STATING ALL COVERAGES TO THE OWNER. REFER TO THE MASTER AGREEMENT FOR REQUIRED INSURANCE LIMITS.

B. THE OWNER SHALL BE NAMED AS AN ADDITIONAL INSURED ON ALL POLICIES.

C. CONTRACTOR MUST PROVIDE PROOF OF INSURANCE.

DIVISION 13 – SPECIAL CONSTRUCTION

13100 TOWER & ANTENNA INSTALLATION

PART 1 – GENERAL

1.1 WORK INCLUDED

A. INSTALL ANTENNAE AS INDICATED ON DRAWINGS AND OWNER SPECIFICATIONS.

B. INSTALL GALVANIZED STEEL ANTENNA MOUNTS AS INDICATED ON DRAWINGS.

C. SUPPLY AND INSTALL ONE ISOLATED GROUND BAR AT EQUIPMENT CABINET.

D. SUPPLY AND INSTALL GROUNDING STRAP KITS WITH LONG BARREL COMPRESSION LUGS (SIM. TO ANDREW–223700TBD OR APPROVED EQUAL) ATOP TOWER BASE BEFORE ENTERING THE EQUIPMENT. GROUNDING STRAPS TO BE CONNECTED TO INSULATED GROUND BAR.

E. ASSIST OWNER TECHNICIANS IN PERFORMING SWEEP TEST OF INSTALLED COAX.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

A. FURNISH U.L. LISTED EQUIPMENT WHERE SUCH LABEL IS AVAILABLE, INSTALL IN CONFORMANCE WITH U.L. STANDARDS WHERE APPLICABLE.

B. INSTALL ANTENNA, ANTENNA CABLES, GROUNDING SYSTEM IN ACCORDANCE WITH DRAWINGS AND SPECIFICATION IN EFFECT AT PROJECT LOCATION AND RECOMMENDATIONS OF STATE AND LOCAL BUILDING CODES, SPECIAL CODES HAVING JURISDICTION OVER SPECIFIC PORTIONS OF WORK. THIS INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1.3 APPLICABLE STANDARDS

A. EIA – ELECTRONIC INDUSTRIES ASSOCIATION EIA/TIA–222 – G STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES.

B. FAA – FEDERAL AVIATION ADMINISTRATION ADVISORY CIRCULAR AC 70/7460–IH, OBSTRUCTION MARKING AND LIGHTING.

C. FCC – FEDERAL COMMUNICATIONS COMMISSION RULES AND REGULATIONS FORM 715, OBSTRUCTION MARKING AND LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES AND FORM 715A, HIGH INTENSITY OBSTRUCTION LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES.

D. AISC – AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS.

E. NATIONAL ELECTRIC CODE, 2014 – ON TOWER LIGHTING KITS.

F. UL – UNDERWRITER'S LABORATORIES APPROVED ELECTRICAL PRODUCTS.

G. IN ALL CASES, PART 77 OR THE FAA RULES AND PARTS 17 AND 22 OF THE FCC RULES ARE APPLICABLE AND IN THE EVENT OF CONFLICT, SUPERSEDE ANY OTHER STANDARDS OR SPECIFICATIONS.

H. LIFE SAFETY CODE NFPA – 101–1997.

DIVISION 16 – GENERAL ELECTRIC

GENERAL ELECTRICAL PROVISION

1. SUBMITTAL OF BID INDICATES CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.
2. CONTRACTOR SHALL PERFORM ALL VERIFICATION OBSERVATION TEST, AND EXAMINATION WORK PRIOR TO THE ORDERING OF THE ELECTRICAL EQUIPMENT AND THE ACTUAL CONSTRUCTION. CONTRACTOR SHALL ISSUE A WRITTEN NOTICE OF ALL FINDINGS TO THE ARCHITECT LISTING ALL MALFUNCTIONS, FAULTY EQUIPMENT AND DISCREPANCIES.
3. HEIGHTS SHALL BE VERIFIED WITH OWNER PRIOR TO INSTALLATION.
4. THESE PLANS ARE DIAGRAMMATIC ONLY, FOLLOW AS CLOSELY AS POSSIBLE.
5. ELECTRICAL SERVICE SHALL BE 120/240 VAC SINGLE PHASE 3 WIRE 200 AMP SERVICE
6. EACH CONDUCTOR OF EVERY SYSTEM SHALL BE PERMANENTLY TAGGED IN EACH PANEL BOARD, PULL BOX, J–BOX, SWITCH BOX, ETC., IN COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ACT (O.S.H.A.).
7. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR A COMPLETE AND PROPERLY OPERATIVE SYSTEM ENERGIZED THROUGHOUT AND AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.
8. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED AND SHALL BE OF THE BEST GRADE AND OF THE SAME MANUFACTURER THROUGHOUT FOR EACH CLASS OR GROUP OF EQUIPMENT. MATERIALS SHALL BE LISTED "J" WHERE SUBJECT TO SUCH APPROVAL. MATERIALS SHALL MEET WITH APPROVAL OF THE DIVISION OF INDUSTRIAL SAFETY AND ALL GOVERNING BODIES HAVING JURISDICTION. MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH APPLICABLE STANDARDS ESTABLISHED BY ANSI, NEMA AND NBFU.
9. ALL CONDUIT INSTALLED SHALL BE SURFACE MOUNTED OR DIRECT BURIAL UNLESS OTHERWISE NOTED.
10. CONTRACTOR SHALL CARRY OUT THEIR WORK IN ACCORDANCE WITH ALL GOVERNING STATE,COUNTY AND LOCAL CODES AND O.S.H.A.
11. CONTRACTOR SHALL SECURE ALL NECESSARY BUILDING PERMITS AND PAY ALL REQUIRED FEES.
12. COMPLETE JOB SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF JOB ACCEPTANCE BY OWNER. ANY WORK, MATERIAL OR EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE CONTRACTOR.
13. ALL CONDUIT ONLY SHALL HAVE A PULL WIRE OR ROPE.
14. PROVIDE PROJECT MANAGER WITH ONE SET OF COMPLETE ELECTRICAL "AS INSTALLED" DRAWINGS AT THE COMPLETION OF THE JOB, SHOWING ACTUAL DIMENSIONS, ROUTINGS AND CIRCUITS.

T-Mobile®
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 3/13/19 EXPIRES: 11/30/19

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
NOTES

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
N-1

EXHIBIT C

15. ALL BROCHURES, OPERATING MANUALS, CATALOGS, SHOP DRAWINGS, ETC., SHALL BE TURNED OVER TO THE OWNER AT JOB COMPLETION.
16. USE T–TAP CONNECTIONS ON ALL MULTI– CIRCUITS WITH COMMON NEUTRAL CONDUCTOR FOR LIGHTING FIXTURES.
17. ALL CONDUCTORS SHALL BE COPPER.
18. ALL CIRCUIT BREAKERS, FUSES AND ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING SHORT CIRCUIT CURRENT TO WHICH THEY MAY BE SUBJECTED, AND A MINIMUM OF 10,000 A.I.C.
19. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES.
20. PATCH, REPAIR AND PAINT ANY AREA THAT HAS BEEN DAMAGED IN THE COURSE OF THE ELECTRICAL WORK.
21. N/A
22. WIRE AND CABLE CONDUCTORS SHALL BE COPPER #12 AWG MINIMUM UNLESS SPECIFICALLY NOTED OTHERWISE ON DRAWINGS.
23. GROUNDING CONDUCTORS SHALL BE SOLID TINNED COPPER UNLESS OTHERWISE NOTED.
24. METER SOCKET AMPERES, VOLTAGE, NUMBER OF PHASES SHALL BE AS NOTED ON THE DRAWINGS, MANUFACTURED BY "SQUARE D COMPANY", OR APPROVED EQUAL.
25. ALL MATERIALS SHALL BE U.L. LISTED.
26. CONDUIT
    A. RIGID CONDUIT SHALL BE U.L. LABEL GALVANIZED ZINC COATED WITH ZINC INTERIOR AND SHALL BE USED WHEN INSTALLED IN OR UNDER CONCRETE SLABS IN CONTACT WITH THE EARTH, UNDER PUBLIC ROADWAYS, IN MASONRY WALLS OR EXPOSED ON BUILDING EXTERIOR. RIGID CONDUIT IN CONTACT WITH EARTH SHALL BE 1/2 LAPPED WRAPPED WITH HUNTS WRAP PROCESS NO. 3
    B. ELECTRICAL METALLIC TUBING SHALL HAVE U.L. LABEL, FITTING SHALL BE GLAND RING COMPRESSION TYPE. EMT SHALL BE USED ONLY FOR INTERIOR RUNS.
    C. FLEXIBLE METALLIC CONDUIT SHALL HAVE U.L. LISTED LABEL AND MAY BE USED WHERE PERMITTED BY CODE. FITTINGS SHALL BE "JAKE" OR "SQUEEZE" TYPE, SEAL TIGHT FLEXIBLE CONDUIT. ALL CONDUIT SHALL HAVE FULL SIZE EQUIPMENT GROUND WIRE.
    D. UNDERGROUND CONDUITS SHALL BE SCHEDULE 40 PVC UNLESS NOTED OTHERWISE. USE SCHEDULE 80 PVC UNDER ROADS. USE LONG–SWEEP RIGID GALVANIZED STEEL (RGS) FOR ELBOWS. USE RGS FOR RISERS TO EQUIPMENT. MANUFACTURED BENDS SHALL HAVE A MINIMUM RADIUS OF 36" FOR CONDUIT.
    E. PARALLEL UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 (UNLESS NOTED OTHERWISE) AT A MINIMUM DEPTH OF 42" BELOW GRADE– STACKED UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 (UNLESS NOTED OTHERWISE) AT A MINIMUM DEPTH OF 42" BELOW GRADE.
    F. ABOVE GROUND CONDUIT SHALL BE RGS (UNLESS NOTED OTHERWISE).
27. ALL ELECTRICAL EQUIPMENT SHALL BE LABELED WITH PERMANENT ENGRAVED PLASTIC LABELS.
28. COORDINATE THE ELECTRICAL SERVICE WITH THE UTILITY COMPANY, AND PROVIDE DAILY UPDATES TO PM UNTIL FINAL ELECTRICAL SERVICE IS EFFECTED.
29. UPON COMPLETION OF WORK, CONDUCT CONTINUITY, SHORT CIRCUIT, AND FALL OF POTENTIAL GROUND TESTS FOR APPROVAL. SUBMIT TEST REPORTS TO PROJECT MANAGER. CLEAN PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION.
30. CONTRACTOR TO COORDINATE WITH UTILITY COMPANY FOR CONNECTION OF TEMPORARY AND PERMANENT POWER TO THE SITE. THE TEMPORARY POWER AND ALL HOOKUP COSTS TO BE PAID BY CONTRACTOR.

<u>GROUNDING STANDARDS</u>

1. DEFINITIONS

AGB ANTENNA GROUND BAR

AWG AMERICAN WIRE GAUGE.

CAD WELDING: AN EXOTHERMIC WELDING PROCESS WHICH CREATES POSITIVE CONTACT OF POSITIVE CONTACT OF GROUNDING CONDUCTORS

EMT ELECTRICAL METAL TUBING (LIGHT GAUGE METAL CONDUIT)

RGS RIGID GALVANIZED STEELCONDUIT, SCH 40 OR HIGHER

PVC POLY VINYL CHLORIDE CONDUIT

MGB MASTER GROUND BAR

RFI RADIO FREQUENCY INTERFERENCE

THW LETTER TYPE DESIGNATION FOR CONDUCTOR INSULATION THAT IS A MOISTURE AND HEAT RESISTANT THERMOPLASTIC WITH A MAXIMUM OPERATING TEMPERATURE OF 75 DEGREES CELSIUS OR 167 DEGREES FAHRENHEIT.

T/I TENANT IMPROVEMENT

2. BACKGROUND

2.1. AREAS OF CONCERN: WHEN DESIGNING A GROUNDING SYSTEM FOR A MOBILE RADIO FACILITY THERE ARE FOUR INTERRELATED AREAS OF CONCERN. THE BASIC OBJECTIVE FOR EACH IS:

A. LIGHTNING PROTECTION – TO MAINTAIN ALL EQUIPMENT AT THE SAME POTENTIAL DURING A LIGHTNING IMPULSE.

B. RFI FOR NOISE INDUCTION CONTROL – TO ESTABLISH THE LOWEST POSSIBLE IMPEDANCE AMONG ALL EQUIPMENT.

C. ELECTROSTATIC CONTROL – TO REDUCE ELECTROSTATIC DISCHARGE PROBLEMS.

D. PERSONNEL SAFETY – TO MAINTAIN A MINIMUM VOLTAGE DIFFERENCE BETWEEN ANY TWO METALLIC OBJECTS WHICH PERSONNEL MIGHT CONTACT SIMULTANEOUSLY.

2.1. A/C GROUNDING:

IN THIS GROUNDING SYSTEM THE A/C SERVICE GROUND SHALL BE KEPT ISOLATED FROM THE EQUIPMENT FRAME WORK AND LIGHTNING PROTECTION GROUND SYSTEMS EXCEPT FOR ONE THIS WOULD TYPICALLY BE CONNECTING THE A/C SERVICE GROUND AT THE COMMERCIAL POWER RISER POLE DISCONNECT/METER BASE TO THE EXTERNAL GROUND RING. ALL GROUNDING CONNECTIONS INSIDE OF CABINETS SHALL BE SCRAPED TO BARE METAL AND COATED WITH NOALOX.

2.2. LIGHTNING CONSIDERATIONS:

LIGHTNING DAMAGE OCCURS FROM EITHER INDUCTION OR FROM AN ACTUAL DIRECT STRIKE TO THE BUILDING, USUALLY TAKEN THROUGH THE TOWER AND/OR ANTENNAS. STRIKES TO OTHER NEARBY OBJECTS INDUCE HIGH ENERGY INTO POWER OR TELEPHONE CABLES ENTERING THE BUILDING. THIS TYPE OF EFFECT HISTORICALLY CAUSES MOST OF THE DAMAGE TO THE BUILDING AND ITS CONTENTS.

3. STATION GROUNDING SYSTEM

3.1. MATERIALS:

A. #2 AWG, BARE SOLID TINNED COPPER WIRE, FOR ALL EXTERIOR CONDUCTORS AND TOWER GROUND BAR CONDUCTORS OR AS OTHERWISE SPECIFIED. GROUNDS TO THE LNAS SHALL BE NO. 6 STANDARD GREEN INSULATED JUMPERS. THE GROUND WIRE TO THE MGB SHALL BE GREEN JACKETED STRANDED #2 TINNED WIRE BURNDY CONNECTED TO THE BUSS BAR AND CONNECTED TO THE GROUND RING ON A GROUND ROD.

B. #2 AWG, INSULATED STRANDED COPPER CABLE IS ACCEPTABLE FOR INTERIOR GROUND BAR CONDUCTORS ON TENANT IMPROVEMENT SITES.

C. 5/8" øX 10' GROUND RODS OF SOLID COPPER, STAINLESS STEEL OR COPPER CLAD HIGH STRENGTH STEEL.

D. ABOVE GRADE CONNECTIONS SHALL BE BURNDY HYGROUND COMPRESSION. BELOW GRADE CONNECTIONS SHALL BE CAD WELD OR OTHER APPROVED EXOTHERMIC WELDING SYSTEM FOR BONDING AS SPECIFIED.

E. XIT OR ADVANCED GROUNDING ELECTRODE (AGE), ALL CHEMICAL GROUND RODS SHALL BE UL APPROVED.

F. SOLID COPPER PLATES OF MINIMUM 3'X3'X1/4" SIZE AS SPECIFIED.

G. NOALOX OR APPROVED EQUAL CONDUCTIVE MEDIUM MATERIAL SHALL BE USED IN ALL MECHANICAL CONNECTIONS.

H. #6 AWG STRANDED INSULATED (GREEN) FOR ALL INTERNAL EQUIPMENT GROUNDING.

I. MECHANICAL FASTENERS (I.E., DOUBLE LUGS, SPLIT BOLTS PARALLEL CONNECTORS) SHALL BE BRONZE, BRASS, COPPER OR STAINLESS STEEL AND HAVE NOALOX BETWEEN CONDUCTOR AND CONNECTION.

J. BOLTS, NUTS AND SCREWS USED TO FASTEN MECHANICAL CONNECTORS SHALL BE STAINLESS STEEL WITH STAR TYPE STAINLESS STEEL LOCK WASHERS.

K. ALL LUG TUBE FASTENERS SHALL PROVIDE TWO HOLES TO ALLOW A DOUBLE BOLT CONNECTION.

3.2 MASTER GROUND BAR (MGB):

THE PURPOSE OF THE MASTER GROUND BAR IS TO GROUND THE BTS AND ANY OTHER METALLIC OBJECTS AROUND THE BTS. IF AN MGB IS NOT PROVIDED WITH THE BTS, THE MGB SHALL BE AS FOLLOWS:

THE MGB IS A COPPER BAR MEASURING 4"W X 24"L X 1/4" LOCATED AS CLOSE TO THE BTS AS POSSIBLE. THE MGB SHALL HAVE A MINIMUM NUMBER OF 28 EACH 3/8" HOLES. GROUND BAR SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. (2) #2 TINNED SHALL BE MECHANICALLY ATTACHED ((2) HOLE COMPRESSION LUG 3/8" HOLES, 1" CENTER TO CENTER SPACING) TO THE MGB AND DOWN LEADS THEN TAKEN THROUGH CONDUIT TO THE GROUND RING. THIS CONDUCTOR SHALL BE KEPT SEPARATE AND ISOLATED UNTIL TERMINATING AT THE MAIN GROUNDING POINT, (I.E. EXTERIOR GROUND RING OR BUILDING STEEL).

3.3 ANTENNA GROUND BAR (AGB):

THE PURPOSE OF THE ANTENNA GROUND BAR IS PRIMARILY FOR LIGHTNING PROTECTION. COAXIAL CABLE IS USUALLY THE ONLY ITEM GROUNDED TO THIS BAR. HOWEVER IT IS ACCEPTABLE TO BOND EXTERIOR; CABLE TRAY, WAVE GUIDE PORTS AND CANTILEVERED WAVE GUIDE BRIDGES TO THE AGB.

THE AGB IS A COPPER BAR MEASURING 4"W X 24"L X 1/4" ON WHICH THE COAXIAL CABLE FROM THE ANTENNAS ARE PRIMARILY GROUNDED. THERE SHALL BE TWO AGBS, ONE LOCATED AT THE TOP OF THE TOWER AT THE START OF THE VERTICAL RUN OF COAX, THE OTHER AT THE BOTTOM OF THE VERTICAL RUN OF COAX BEFORE IT MAKES ITS BEND. (IF THE TOWER IS OVER 200 THERE SHALL BE A THIRD AGB LOCATED AT THE MIDDLE OF THE TOWER). THE AGB SHALL HAVE A MINIMUM OF 28 EACH 3/8" HOLES. GROUND BARS SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. USE #2 AWG SOLID TINNED WIRE W/ 2–HOLE SHORT BARREL COMPRESSION LUGS 3/8" HOLES, 1" CENTER TO CENTER SPACING). THIS CONDUCTOR SHALL BE KEPT SEPARATE AND ISOLATED UNTIL TERMINATING AT THE MAIN GROUNDING POINT (I.E., EXTERIOR GROUND RING, OR BUILDING STEEL.)

3.4 SURGE ARRESTOR GROUND BAR: N/A

3.5 GROUND ROD AND GROUND RING PLACEMENT:

THE OUTSIDE GROUND RING SHALL BE PLACED AROUND THE BTS AT A DISTANCE OF TWO (2) FEET FROM THE BTS AT A DEPTH OF 3'–6" OR 6" BELOW THE FROST LINE, WHICHEVER IS DEEPER. RODS SHALL BE DRIVEN TO A DEPTH SUCH THAT THE TOP OF THE RODS IS AT THE LEVEL OF THE GROUND RING CONDUCTOR. THE RODS SHALL BE PLACED ALONG THE RING AT THE FOLLOWING LOCATIONS:

A. BELOW THE AREA OF THE INTERNAL MASTER GROUND BAR (MGB) FOR CONNECTION TO THE MGB.

B. NEAR THE CORNERS OF THE BTS.

C. AS REQUIRED TO ACHIEVE A MAXIMUM SPACING OF EIGHT (8) FEET BETWEEN GROUND RODS ALONG THE RING PERIMETER.

D. AS REQUIRED ALONG THE RING PERIMETER TO ACHIEVE 5 OHMS OR LESS RESISTANCE WHEN TESTED.

E. TWO RODS LOCATED ON OPPOSITE SIDES AT EACH TOWER LEG OR MONOPOLE.

F. ONE ROD LOCATED BENEATH EACH END OF THE WAVE GUIDE BRIDGE OR CABLE TRAY.

G. ONE ROD LOCATED ADJACENT TO THE STANDBY GENERATOR, AND IF SEPARATED BY MORE THAN EIGHT (8) FEET, ONE LOCATED ADJACENT TO THE FUEL TANK.

H. ONE ROD LOCATED AT THE BASE OF THE TOWER FOR THE AGB.

3.6 TOWER GROUNDING (IF REQUIRED):

ALL MONOPOLES SHALL HAVE TWO GROUND RODS (MINIMUM). ALL OTHER TOWERS SHALL HAVE TWO GROUND RODS PLACED AT THE BASE OF EACH TOWER LEG. EACH MONOPOLE OR TOWER LEG SHALL BE BONDED TO THE SYSTEM VIA TWO #2 BARE TINNED SOLID COPPER CONDUCTORS. BURNDY CONNECT THE CONDUCTORS TO ONLY STRUCTURAL BASE PLATES OR LUGS OR EARS AS MAY BE PROVIDED. NO BURNDY CONNECTIONS SHALL BE MADE TO THE VERTICAL WALLS OF THE STRUCTURE. NEVER GROUND TO HOLLOW LEG MEMBERS.

3.7 ANTENNA GROUNDING:

EACH ANTENNA COAXIAL CABLE SHALL TYPICALLY BE GROUNDED AT THREE POINTS USING A HARD–SHELL COAXIAL CABLE KIT FROM THE MANUFACTURER OF THE ANTENNA CABLE. A TYPICAL INSTALLATION SHALL BE AS FOLLOWS:

A. THE FIRST GROUND CONNECTION SHALL OCCUR AS CLOSE TO THE ANTENNA AS POSSIBLE, BELOW THE FIRST POINT THE COAX CABLE BEGINS TO RUN VERTICAL DOWN THE TOWER. THIS GROUND SHALL TERMINATE DIRECT TO THE TOP AGB. ON A T/I, GROUND TO THE AGB AT THE ANTENNA MOUNTS.

B. THE SECOND GROUND SHALL BE MADE AT THE BOTTOM OF THE VERTICAL RUN OF THE COAXIAL CABLE AS IT TURNS OUT AWAY FROM THE TOWER TOWARDS THE BTS. THIS GROUND SHALL BE TERMINATED AT THE GROUND BAR AT BASE OF TOWER. THE GROUND BAR SHALL HAVE TWO (2) LEADS OF #2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE ENCASED IN PVC PIPE.

C. THE THIRD GROUND SHALL BE MADE PRIOR TO COAX ENTRY INTO BTS. THE GROUND WIRE SHALL BE TERMINATED AT THE MASTER GROUND BAR SHALL MASTER GROUND BAR. HAVE TWO (2) LEADS OF #2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE ENCASED IN PVC PIPE.

3.13 GENERATOR RECEPTACLE GROUNDING:

THE GENERATOR RECEPTACLE (HUBBLE PLUG) SHALL BE GROUNDED TO THE EGR.

3.14 COAX BRIDGE / CABLE TRAY GROUNDING :

BOND THE COAX BRIDGE OR CABLE TRAY TO THE AGB WITH #2 SOLID TINNED GROUND WIRE. THESE CONNECTIONS SHALL BE DOUBLE LUG BOLTED / SCREWED MECHANICAL CONNECTIONS WITH STAR LOCK WASHERS AND NOALOX. ALL BRIDGE SPLICES SHALL HAVE JUMPERS OF #2 SOLID WITH COMPRESSION LUGS.

3.15 CAD WELD & BURNDY CONNECTION:

CAD WELDS (EXOTHERMIC WELDS) AND BURNDY CONNECTIONS SHALL BOND ALL UNDERGROUND AND DAMP LOCATION CONNECTIONS, SHELTER SKID GROUNDS, TOWER OR MONOPOLE GROUNDS, FENCING CORNER AND AND GATE POSTS, ANTENNA GROUND BARS, (AGB) SURGE ARRESTER GROUND BAR, AND THE MASTER GROUND BAR (MGB). MECHANICAL CONNECTIONS SHALL BE TYPICALLY USED TO BOND ALL INTERIOR EQUIPMENT, COAX CABLE BRIDGES AND COAXIAL CABLE GROUND KITS. ALL LUG TYPE MECHANICAL CONNECTORS TO THE MGB OR AGB SHALL BE TWO HOLE TYPE CONNECTED WITH STAINLESS STEEL BOLTS AND NUTS WITH STAINLESS STEEL LOCK WASHERS AND NOALOX ON EITHER SIDE OF THE BUSS BAR.

3.16 CHEMICAL GROUND RODS (IF REQUIRED):

CHEMICAL GROUND RODS SHALL NOT BE INSTALLED ON GROUND RING INSTALLATIONS WITH NORMAL SOIL. CHEMICAL GROUND RODS SHALL BE INSTALLED ONLY FOR SPECIAL DESIGN APPLICATIONS THAT REQUIRE SINGLE POINT GROUNDING DUE TO SPECIFIC SITE CONDITIONS.

3.17 TENANT IMPROVEMENT SITE GROUNDING:

N/A

3.18 LIMITS OF BEND RADIUS:

IT IS IMPORTANT THAT THE GROUNDING CONDUCTOR CONNECTING THE INSIDE AND OUTSIDE GROUND SYSTEMS BE AS STRAIGHT AS POSSIBLE, WITH NO TURN OR BEND SHORTER THAN ONE FOOT RADIUS WITH A THREE FOOT RADIUS PREFERRED. NO RIGHT ANGLE OR SHARP BENDS SHALL BE ALLOWED.

3.19 BONDING PREPARATION & FINISH:

ALL SURFACES REQUIRE PREPARATION PRIOR TO BONDING OF EITHER CAD WELD OR BURNDY FASTENERS. GALVANIZED SURFACES SHALL BE GROUND OR SANDED TO THE POINT OF EXPOSING THE STEEL SURFACE BELOW, PRIOR TO BONDING THE GROUND CONDUCTOR. FOR OTHER SURFACES INCLUDING COPPER BUSS BARS ALL PAINT, RUST TARNISH AND GREASE SHALL BE REMOVED PRIOR TO BONDING THE GROUND CONDUCTOR. CAD WELD TYPE BONDS SHALL BE FINISHED WITH THE APPLICATION OF COLD GALVANIZATION AND WHEN APPLICABLE, FINISH PAINTED WITH AN APPROPRIATE COLOR AS REQUIRED. MECHANICAL TYPE BONDS ON BUSS BARS SHALL BE FINISHED WITH THE APPLICATION OF NOALOX OR OTHER APPROVED CONDUCTIVE MEDIUM MATERIAL BETWEEN CONNECTOR AND BUSS BAR. MECHANICAL TYPE BONDS ON ALL OTHER SURFACES SHALL BE FINISHED WITH THE APPLICATION OF COLD GALVANIZATION AND OR THE APPROPRIATE PAINT TO MATCH AS REQUIRED.

3.20 TESTING:

THE OUTSIDE GROUND RING SHALL BE TESTED AFTER INSTALLATION BUT PRIOR TO BACKFILLING THE GROUND RING TRENCH. THE GROUND FIELD RESISTANCE SHALL MEASURE 5 OHMS OR LESS TO GROUND. ANY DIFFICULTY IN ACHIEVING THIS LEVEL OF RESISTANCE MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT MANAGER. THE RESISTANCE TO GROUND SHALL BE MEASURED USING THE FALL OF POTENTIAL METHOD. TESTING SHALL BE PERFORMED BY AN OWNER PROVIDED INDEPENDENT TESTING LABORATORY FROM WHICH A WRITTEN REPORT SHALL BE PRODUCED FOR REVIEW BY THE PROJECT MANAGER.

T-Mobile
1400 OPUS PLACE, SUITE 700
DOWNERS GROVE, IL 60515
PHONE:
FAX:

KCS CORPORATION
CONSULTING ENGINEERS
ILLINOIS DESIGN FIRM REGISTRATION NO.: 184.002139
1125 REMINGTON RD., SCHAUMBURG, IL 60173
PHONE: 847-490-8200; FAX: 847-490-8225
www.kcscorp.com

LICENSED PROFESSIONAL ENGINEER
SEEMESH M. SETHI
0062-051290
STATE OF ILLINOIS

SIGNATURES: _____
DATE: 3/13/19 EXPIRES: 11/30/19

REV.	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	3/13/19
D	ISSUED FOR REVIEW	2/26/19
C	ISSUED FOR REVIEW	1/18/19
B	ISSUED FOR REVIEW	11/1/18
A	ISSUED FOR REVIEW	10/19/18

CH95063B
35 S. WASHINGTON ST. RT
35 S. WASHINGTON ST, NAPERVILLE, IL 60540

Drawing Title:
NOTES

Project Number:	Drawn by: PA Date: 8/21/18
Client Project Number:	Checked by: MS Date: 8/23/18
Scale:	Approved by: Date:

Drawing Number
N-2

EXHIBIT C