

LAW PROJECT NUMBER

NUMBER	PHASE	TASK
52030-0-2196	09	511

PROJECT TYPE

NEW 195' MONOPOLE TOWER WITH MPD WIP ANTENNA AT 195'
 VOICESTREAM'S ANTENNAS AT 120' AND MPD DISH AT 85'
 DEMOLISH EXISTING 200' LATTICE TOWER

DRIVING DIRECTIONS

FROM DOWNTOWN MILWAUKEE, TAKE I-94 WEST TO HWY 45
 NORTH, TAKE CAPITOL DRIVE EXIT EAST TO WEST LISBON AVENUE
 RIGHT TO SITE.



SITE NAME
 FIRE STATION ENGINE # 22

SITE NUMBER
 MW12105B

SITE ADDRESS
 8814 W. LISBON AVENUE
 MILWAUKEE, WI 53222

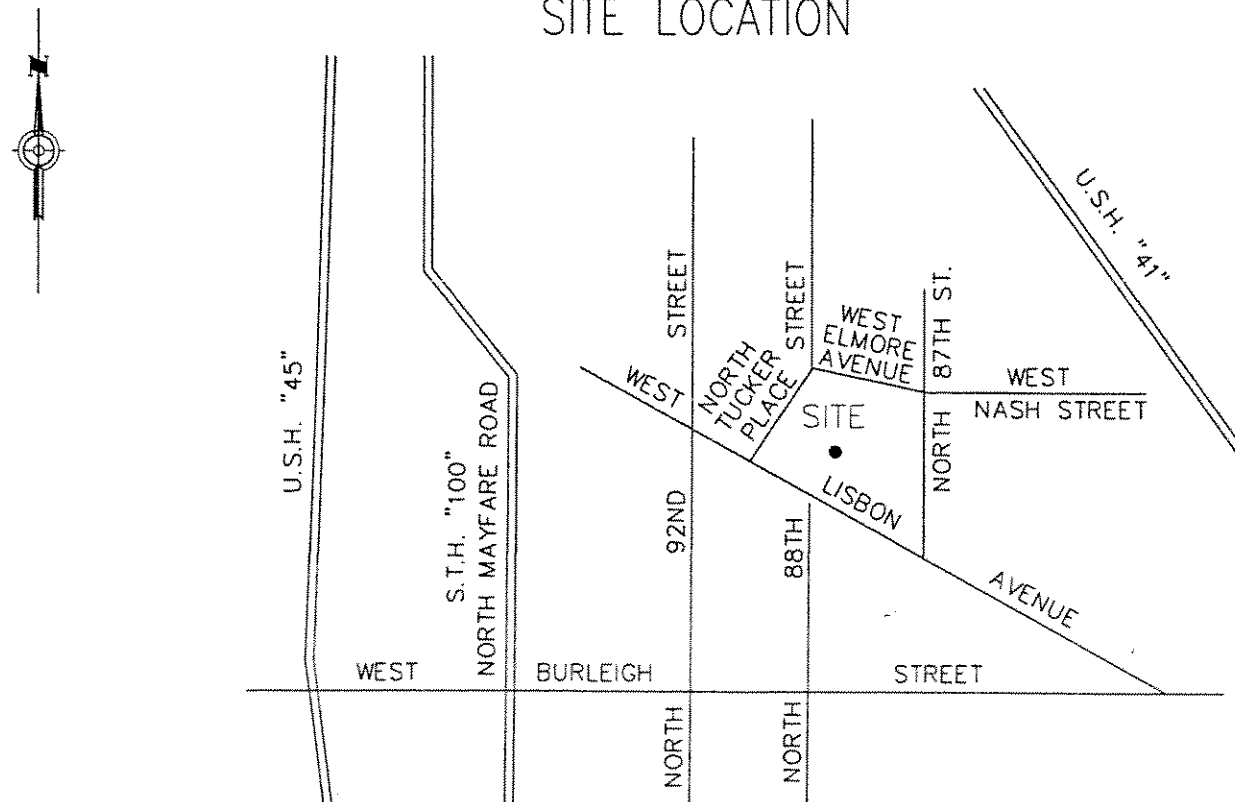
APPROVED FOR CONSTRUCTION

PROPERTY OWNER OR REP.	RF
ZONING	NETWORK
CONSTRUCTION	CONTRACTOR
OPERATIONS	

SHEET INDEX

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SITE LOCATION



SCALE: NTS

PROJECT SUMMARY

SITE INFORMATION
 JURISDICTION: CITY OF MILWAUKEE
 CODE:
 OCCUPANCY:
 ZONING: DESIGNATION R040

LANDLORD
 CITY OF MILWAUKEE
 CITY HALL RM. 103
 MILWAUKEE, WI 53202

APPLICANT
 VOICESTREAM PCS/BTA I CORP.
 5235 N. IRONWOOD, SUITE 200
 GLENDALE, WI. 53217
 PHONE: (414) 906-2622
 FAX: (414) 906-0130

CONSULTANTS

PRIME CONSULTANT
 LAW ENGINEERING & ENVIRONMENTAL
 111 E. WISCONSIN AVE.,
 SUITE 1260
 MILWAUKEE, WI 53202
 PHONE: (414) 765-9133
 FAX: (414) 765-0213

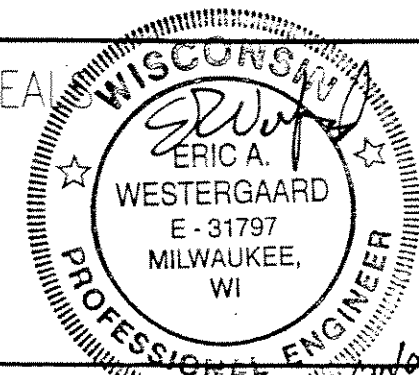
SURVEYOR
 AERO-METRIC, INC.
 539 N. MADISON STREET
 CHILTON, WI 53014
 PHONE: (920) 849-7708
 FAX: (920) 849-7709

STRUCTURAL ENGINEER
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 2055 W. ARMY TRAIL ROAD
 ADDISON, IL 60101
 PHONE: (630) 916-9313
 FAX: (630) 916-9342

UTILITIES

WEPCO
 CONTACT MR. TOM GRASSE
 (262) 968-5717
 AMERITECH

PROFESSIONAL SEAL



REV	DESCRIPTION

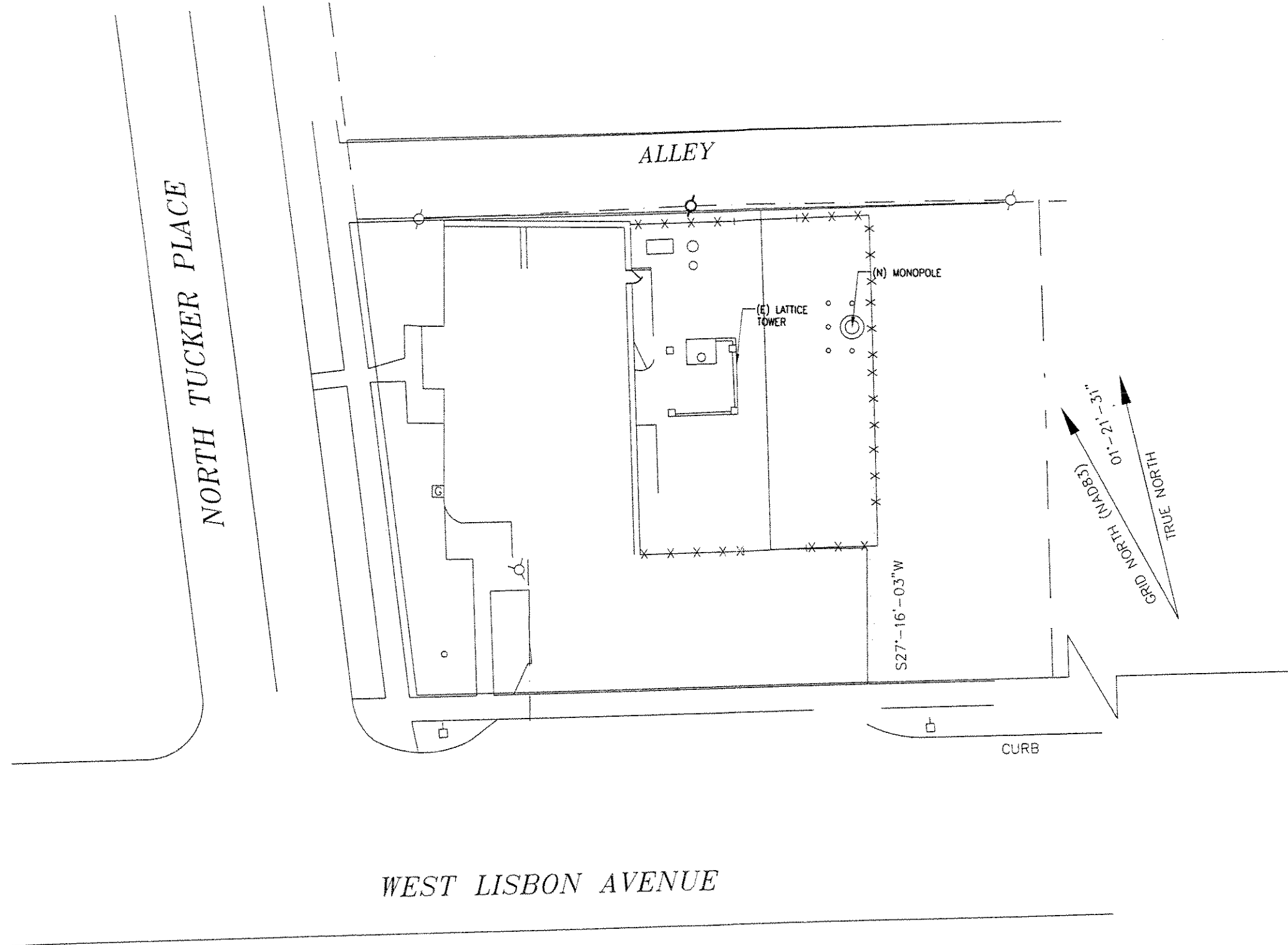
LAWGIBB GROUP
 LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
 111 E. WISCONSIN AVE., SUITE MILWAUKEE, WI 53202

TITLE SHEET
 FIRE STATION ENGINE # 22
 MW12105B
 8814 W. LISBON AVENUE
 MILWAUKEE, WI 53222



PROJECT NO#:	52030-0-2196
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	09 MAY 2006
PLOT SCALE:	1:1
DRAWING NAME:	12105-T-1
SHEET NO.:	T-1

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1 LOCATION PLAN
 C-2 SCALE: 1"=30'-0"

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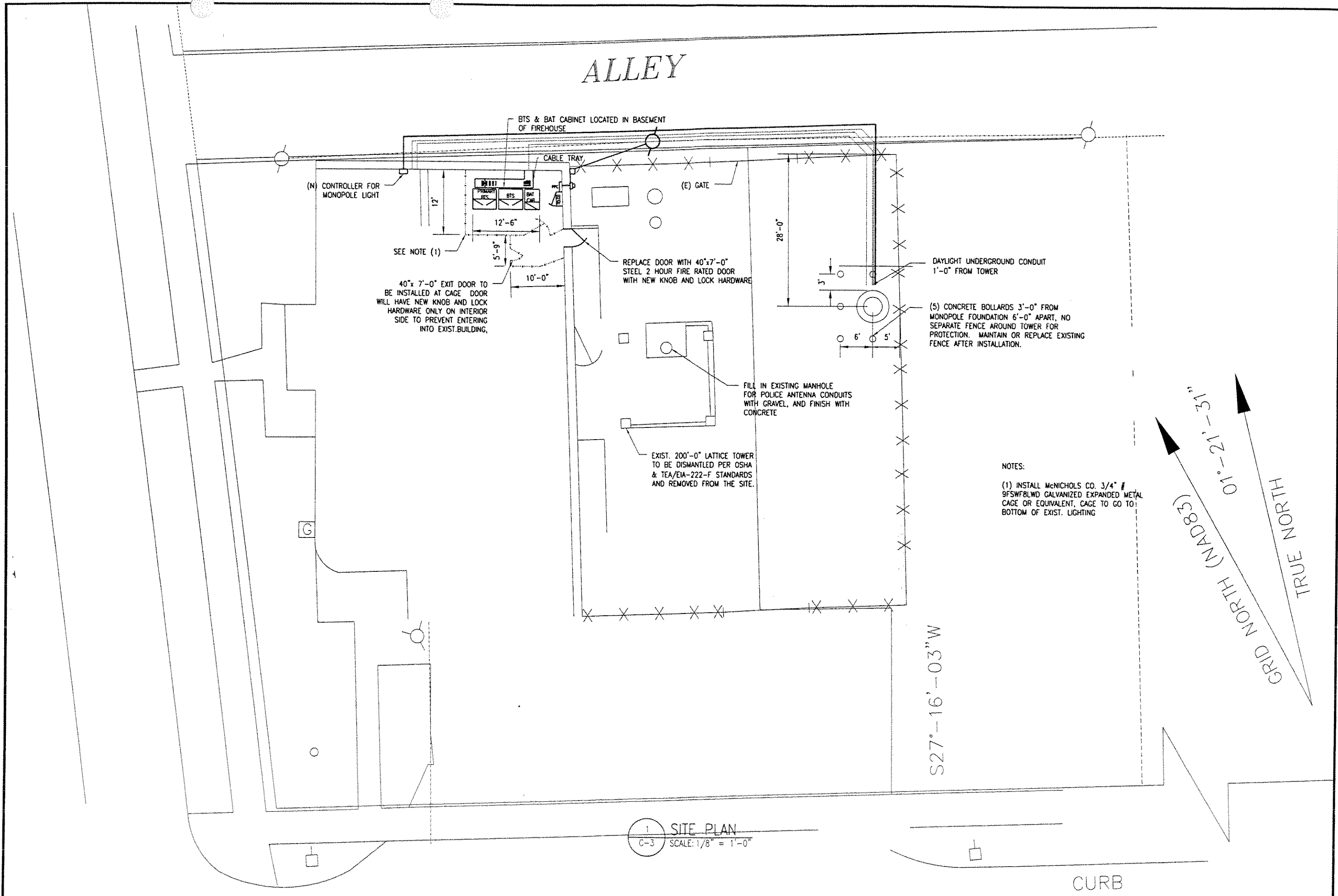
PROJECT NO.:	52030-0-2196
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	09 MAY 2000
PLOT SCALE:	1:1
DRAWING NAME:	12105-C-2
SHEET NO.:	C-2

Voicestream
 WIRELESS

LOCATION PLAN
 FIRE STATION ENGINE # 22
 MW12105B
 8814 W. LISBON AVENUE
 MILWAUKEE WI 53227

LAWGIBB
 GROUP
 LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
 111 E. WISCONSIN AVE., SUITE

REV	DESCRIPTION	BY



ALLEY

BTS & BAT CABINET LOCATED IN BASEMENT OF FIREHOUSE

(N) CONTROLLER FOR MONOPOLE LIGHT

CABLE TRAY

(E) GATE

SEE NOTE (1)

40"x 7'-0" EXIT DOOR TO BE INSTALLED AT CAGE DOOR WILL HAVE NEW KNOB AND LOCK HARDWARE ONLY ON INTERIOR SIDE TO PREVENT ENTERING INTO EXIST. BUILDING,

REPLACE DOOR WITH 40"x7'-0" STEEL 2 HOUR FIRE RATED DOOR WITH NEW KNOB AND LOCK HARDWARE

DAYLIGHT UNDERGROUND CONDUIT 1'-0" FROM TOWER

(5) CONCRETE BOLLARDS 3'-0" FROM MONOPOLE FOUNDATION 6'-0" APART, NO SEPARATE FENCE AROUND TOWER FOR PROTECTION. MAINTAIN OR REPLACE EXISTING FENCE AFTER INSTALLATION.

FILL IN EXISTING MANHOLE FOR POLICE ANTENNA CONDUITS WITH GRAVEL, AND FINISH WITH CONCRETE

EXIST. 200'-0" LATTICE TOWER TO BE DISMANTLED PER OSHA & TEA/EIA-222-F STANDARDS AND REMOVED FROM THE SITE.

NOTES:

(1) INSTALL McNICOLS CO. 3/4" #9 FSWFBLWD GALVANIZED EXPANDED METAL CAGE OR EQUIVALENT, CAGE TO GO TO BOTTOM OF EXIST. LIGHTING

S27°-16'-03"W

GRID NORTH (NAD83)
01°-21'-31"
TRUE NORTH

CURB

1 SITE PLAN
C-3 SCALE: 1/8" = 1'-0"

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REV	DESCRIPTION	BY
1	06/23/00	FDS

LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
111 E. WISCONSIN AVE., SUITE

Voicestream
WIRELESS

PROJECT NO: 52030-0-2196
DRAWN BY: RLS
CHECKED BY: FDS
DATE: 09 MAY 2000
PLOT SCALE: 1:1
DRAWING NAME: 12105-C-3
SHEET NO: C-3

SITE PLAN
FIRE STATION ENGINE # 22
MW12105B
8814 W. USBON AVENUE
MILWAUKEE WI 53227

ALLEY

(N) CONDUIT FOR TOWER LIGHT CONDUCTORS

(N) CONDUIT FOR POLICE ANTENNAS

(N) CONDUIT FOR VOICESTREAM ANTENNAS

CABLE TRAY SEE
DETAIL 5 SHEET C-8

PRIMARY
RTS

RTS

BAT
CAB

PPC

TELCO

(N) PPC AND TELCO
MOUNTED ON EXIST. WALL

(N) TOWER LIGHT
CONTROLLER (BY OTHERS)

EQUIPMENT TO BE
MOUNTED ON SUPPORT
FRAME SEE SHEET S-1

EXPANDED METAL CAGE

1 FLOOR PLAN
C-3A SCALE: 3/16" = 1'-0"

GRID NORTH (NAD83)
01°-21'-31"
TRUE NORTH

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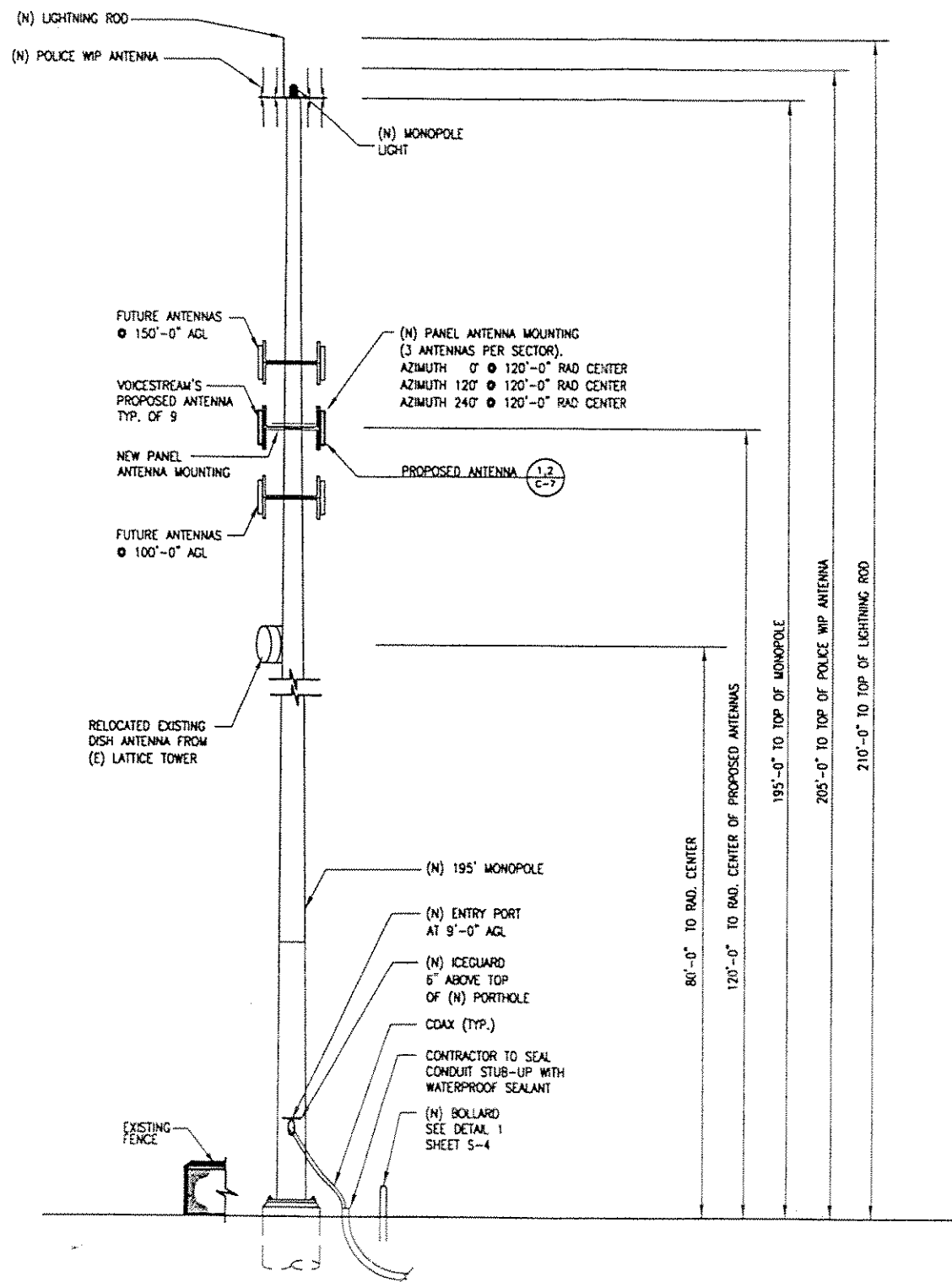
REV	DESCRIPTION	BY	DATE
1		FDS	06/23/00

LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
111 E. WISCONSIN AVE., SUITE 2000

FLOOR PLAN
FIRE STATION ENGINE # 22
MW12105B
8814 W. LISBON AVENUE
MINNEAPOLIS, MN 55420

Voicestream WIRELESS

PROJECT NO:	52030-0-2196
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	09 MAY 2000
PLOT SCALE:	1:1
DRAWING NAME:	12105-C-3A
SHEET NO.:	C-3A



1 ELEVATION
C-4 SCALE: N.T.S.

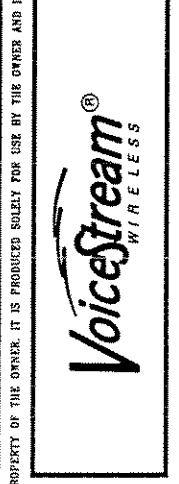
NOTES:

- 1.) THE SIZE, HEIGHT, AND DIRECTION OF THE ANTENNA SHALL BE ADJUSTED TO MEET SYSTEM REQUIREMENTS.
- 2.) CONTRACTOR SHALL VERIFY HEIGHT OF ANTENNA WITH VOICESTREAM PCS PM.
- 3.) CONTRACTOR SHALL VERIFY HEIGHT AND DIRECTION OF ANTENNA'S WITH VOICESTREAM PROJECT MANAGER (WHEN APPLICABLE).
- 4.) ALL ANTENNA AZIMUTH TO BE FROM TRUE NORTH.
- 5.) TOWER DESIGNED TO ACCEPT TWO ADDITIONAL CARRIERS.
- 6.) TOWER WILL BE PAINTED LIGHT GRAY.

REV	DESCRIPTION	BY
1		FDS
2		
3		
4		

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LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
111 E. WISCONSIN AVE., SUITE 53202
MILWAUKEE, WI 53202

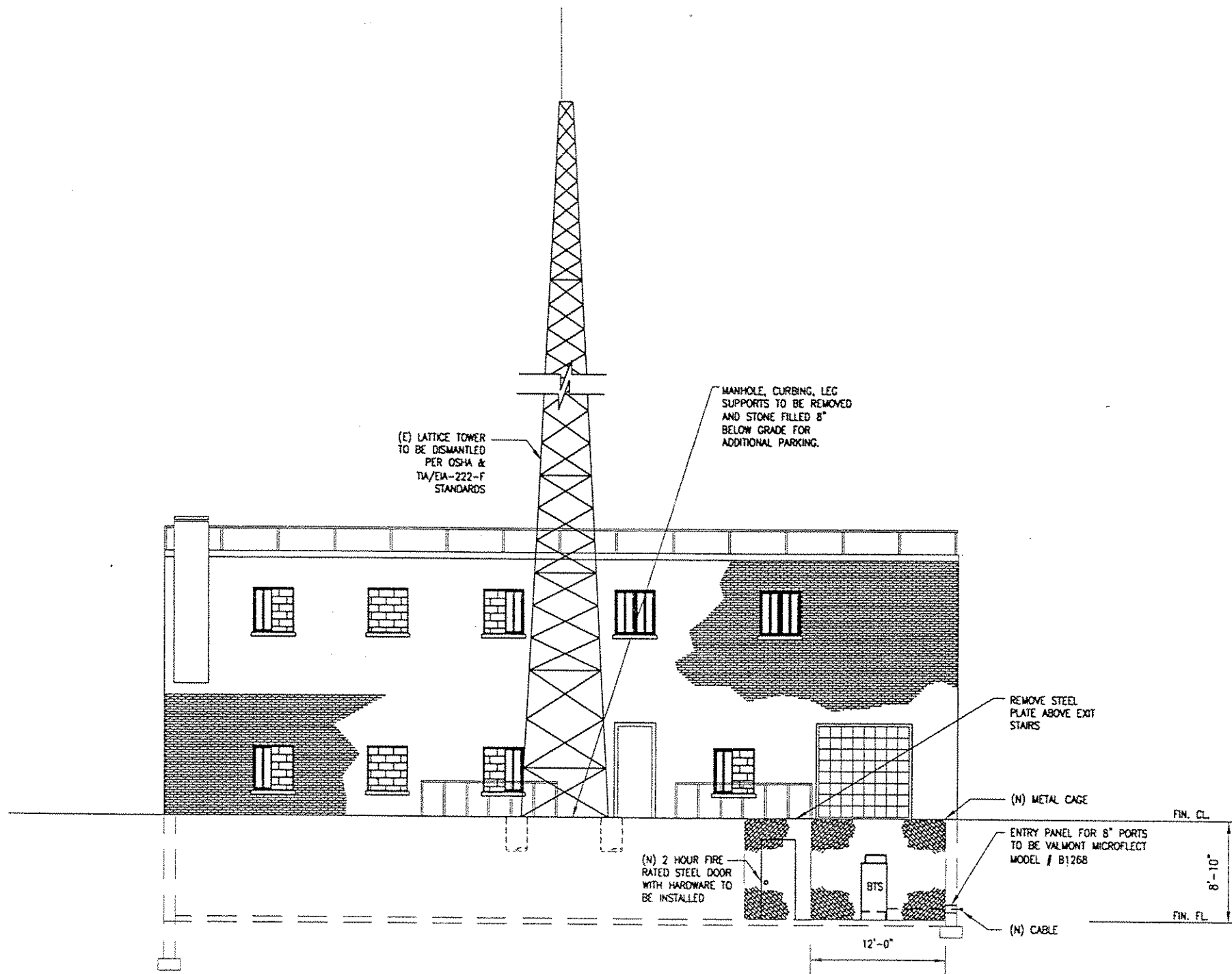
MONOPOLE ELEVATION
FIRE STATION ENGINE # 22
MW12105B
8814 W. LISBON AVENUE
MILWAUKEE, WI 53222



PROJECT NO.:	52030-0-2196
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	09 MAY 2000
PLOT SCALE:	1:1
DRAWING NAME:	12105-C-4
SHEET NO.:	

C-4

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1 EAST ELEVATION
C-5 SCALE: 3/32" = 1'-0"

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REV	DESCRIPTION	BY
1		
2		
3		

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 111 E. WISCONSIN AVE. SUITE
 MILWAUKEE, WI 53202

EAST ELEVATION
 FIRE STATION ENGINE # 22
 MW12105B
 8614 W. LISBON AVENUE
 MILWAUKEE, WI 53222

Voicestream
 WIRELESS

PROJECT NO:	52030-0-2196
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	06 MAY 2000
PLOT SCALE:	1:1
DRAWING NAME:	12105-C-5
SHEET NO.:	

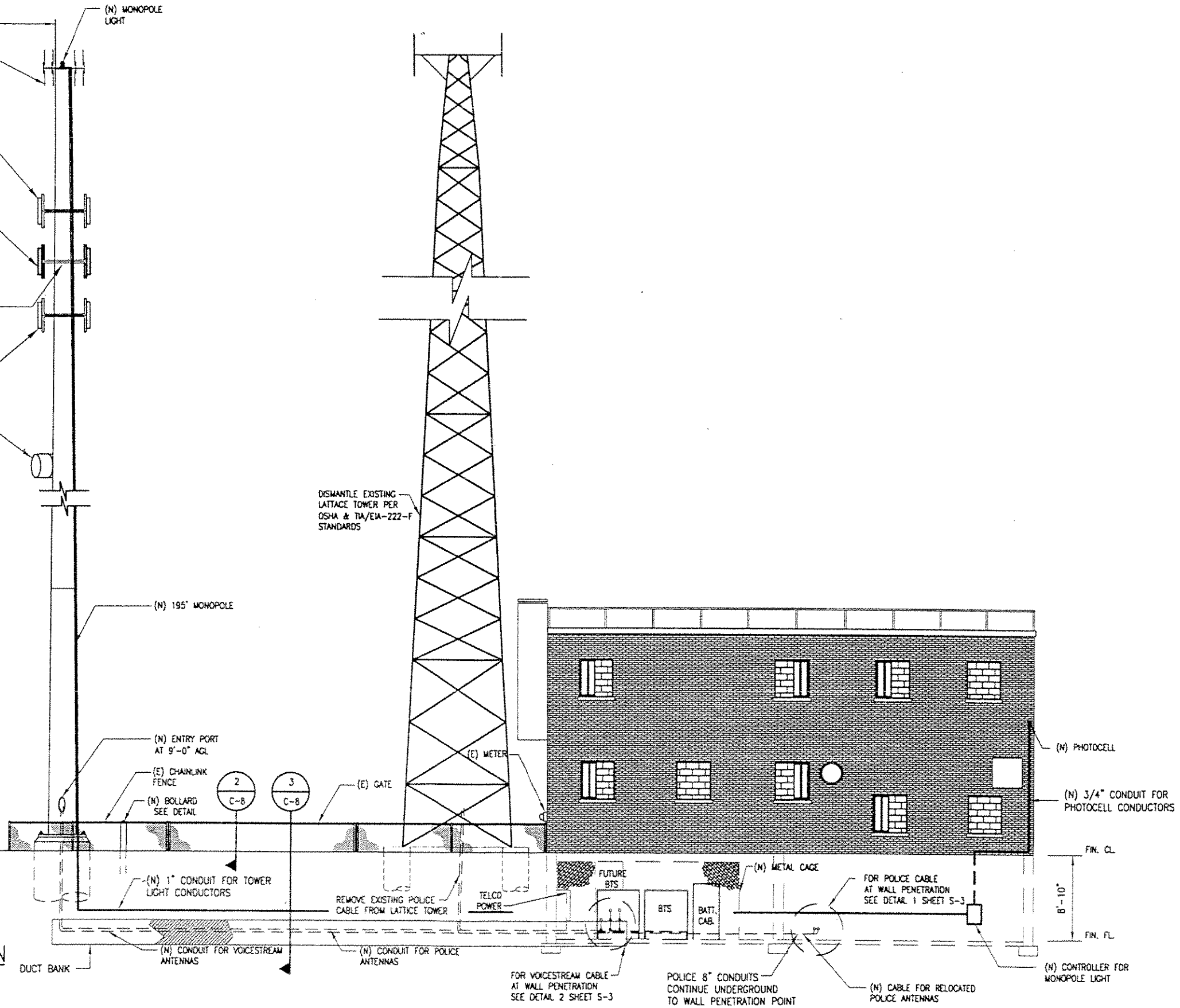
C-5

- (N) LIGHTNING ROD
- RELOCATED POLICE WIP ANTENNA
- FUTURE ANTENNAS
Ø 150'-0" AGL
- VOICESTREAM'S PROPOSED ANTENNA
TYP. OF 9
- NEW PANEL ANTENNA MOUNTING
- FUTURE ANTENNAS
Ø 100'-0" AGL
- RELOCATED EXISTING DISH ANTENNA FROM (E) LATTICE TOWER

NOTE: TOWER DESIGNED TO ACCEPT TWO ADDITIONAL CARRIERS.

DISMANTLE EXISTING LATTICE TOWER PER OSHA & TA/EIA-222-F STANDARDS

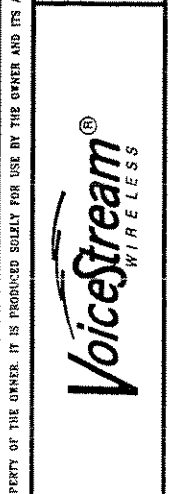
1 NORTH ELEVATION
C-6 SCALE: N.T.S.



REV	DESCRIPTION	BY
1		FDS
2		
3		
4		

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111 E. WISCONSIN AVE., SUITE 200
MILWAUKEE, WI 53202

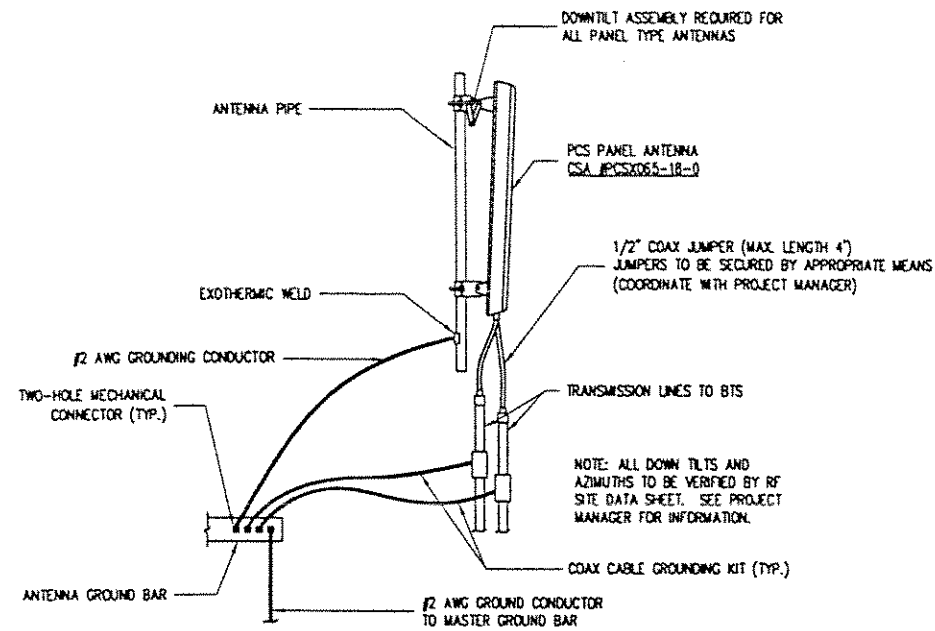
SOUTH ELEVATION
FIRE STATION ENGINE # 22
MW12105B
8814 W. LISSON AVENUE
MILWAUKEE, WI 53222



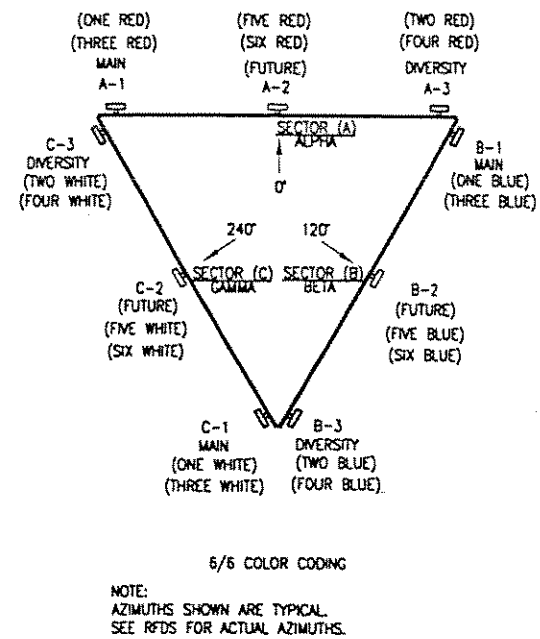
PROJECT NO:	52030-0-2198
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	09 MAY 2000
PLOT SCALE:	1:1
DRAWING NAME:	12105-C-6
SHEET NO.:	

C-6

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1 BIPOLAR PANEL ANTENNA DETAIL
C-7 SCALE: N.T.S.



2 TYPICAL ANTENNA PLAN
C-7 SCALE: N.T.S.

COAX CABLE IDENTIFICATION

CONTRACTOR MUST PROVIDE EASY IDENTIFICATION AND UNIFORM MARKING OF ANTENNA CABLING, PER THE FOLLOWING INSTRUCTIONS:

1. LOCATION: MARKINGS SHALL BE MADE USING COLOR TAPE W/ 3" OF COVERAGE AFFIXED AT THREE PLACES ON THE COAX CABLE RUN AS FOLLOWS:

FIRST - ON THE COAX AT THE CONNECTOR NEAREST THE ANTENNA (WHERE THE COAX AND JUMPER ARE CONNECTED).

SECOND - AT THE BASE OF THE TOWER STRUCTURE. (FOR TOWERS ONLY).

THIRD - AT A POINT OUTSIDE THE BTS. (JUST PRIOR TO MASTER GROUND BAR (MGB))

2. SECTOR IDENTIFICATION: NORMALLY A SITE WILL HAVE UP TO THREE SECTORS. SECTORS SHALL BE DESIGNATED IN A CLOCKWISE MANNER; THE ALPHA SECTOR IS CLOSEST TO ZERO DEGREES (NORTH) THE BETA AND GAMMA FOLLOW CLOCKWISE IN SEQUENCE.

ALPHA SECTOR COAX WILL BE MARKED MAIN 1 AND DIVERSITY 1. NORMALLY SITES WILL INITIALLY GO ON THE AIR WITH AS FEW AS TWO ANTENNAS PER SECTOR AND AS THE SYSTEM GROWS, ADDITIONAL ANTENNA WILL BE ADDED.

BETA SECTOR COAX WILL BE MARKED MAIN 2 AND DIVERSITY 2.

GAMMA SECTOR WILL BE MARKED MAIN 3 AND DIVERSITY 3.

COLOR CODE AS FOLLOWS:

ALPHA SECTOR - RED
BETA SECTOR - BLUE
GAMMA SECTOR - WHITE

MAIN WILL BE MARKED WITH ONE BAND OF TAPE
DIVERSITY WILL BE MARKED WITH TWO BANDS OF TAPE
EXTRA WILL BE MARKED WITH THREE BANDS OF TAPE

NOTES:

1. ALL COAXIAL CABLE SHALL BE MARKED AT THE TOP AND BOTTOM WITH COLORED TAPE, 10" FROM EACH END.
2. MAIN WILL HAVE ONE BAND, SECONDARY WILL HAVE TWO BANDS, ETC.

COAX BEND TABLE						
CABLE SIZE	HELIX CABLE TYPE #	MANUF. MIN BEND RADIUS	HANGER ANDREW CAT. #	CABLE TO CABLE SPACING	MAX VER. HANGER SPACING	MAX HOR. HANGER SPACING
1/2"	FS4-50B	1-1/4"	43211A	1/2"	4'-0"	3'-0"
7/8"	LDF5-50A	10"	42396A-5	1/2"	4'-0"	3'-0"
1-5/8"	LDF7-50A	20"	42396A-2	1/2"	4'-0"	3'-0"
2-1/4"	LDF12-50	24"	42395A-4	1/2"	4'-0"	3'-0"

NOTE: PW/RF ENGINEER TO VERIFY

COAXIAL CABLE TABLE					
SECTOR	AZIMUTH	CABLE LENGTH	CABLE SIZE	LOSS/100'	TOTAL LOSS
A	0°	259'	1 5/8"	0.72	1.80 dB
B	120°	259'	1 5/8"	0.72	1.80 dB
C	240°	259'	1 5/8"	0.72	1.80 dB

2 RUNS PER ANTENNA CURRENTLY
18 RUNS TOTAL
TOTAL COAX LENGTH: 4662'±

REV	DESCRIPTION	BY
1		
2		
3		

LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
111 E. WISCONSIN AVE., SUITE 5100
MILWAUKEE, WI 53222

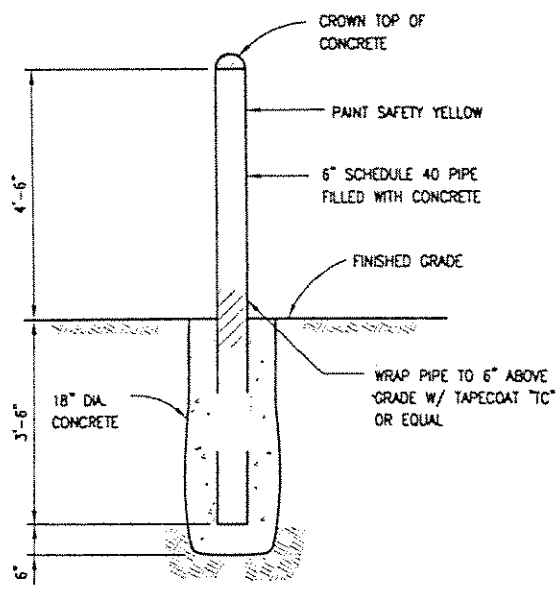
DETAILS & NOTES
FIRE STATION ENGINE # 22
MW12105B
6814 W. LISBON AVENUE
MILWAUKEE, WI 53222

Voicestream
WIRELESS

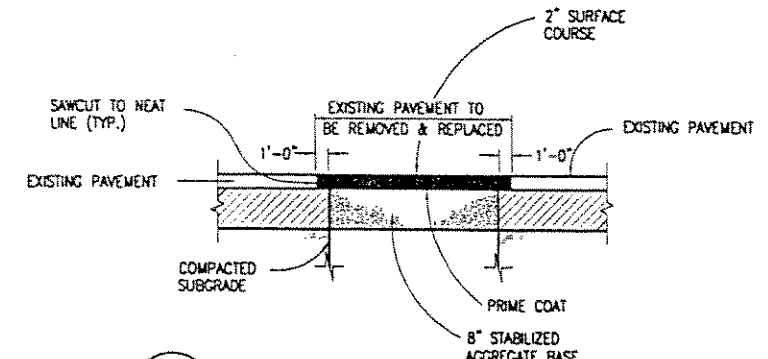
PROJECT NO:	52030-0-2198
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	09 MAY 2000
PLOT SCALE:	1:1
DRAWING NAME:	12105-C-7
SHEET No.:	C-7

C-7

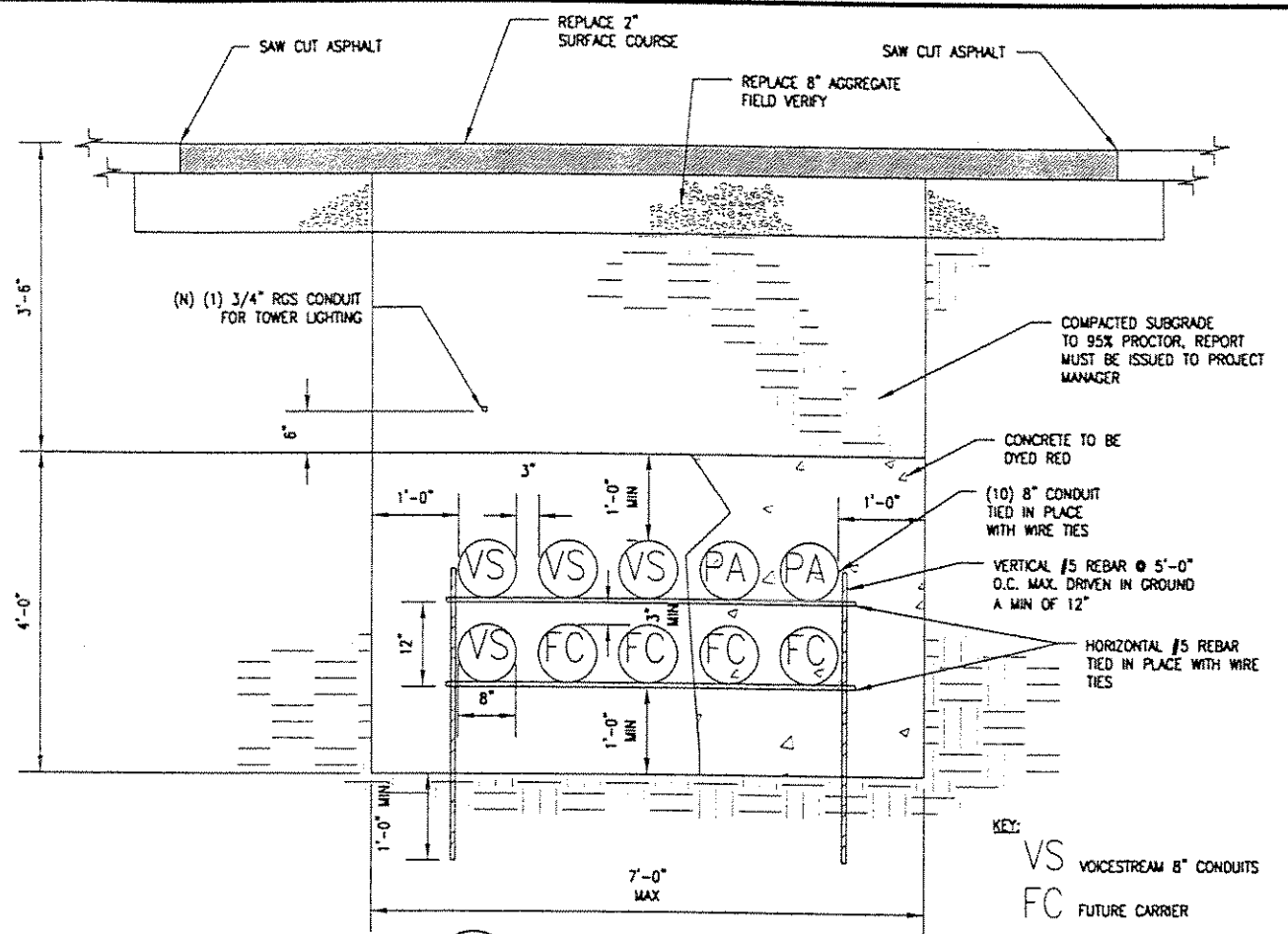
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1 TYP. BOLLARD DETAIL
C-8 SCALE: N.T.S.

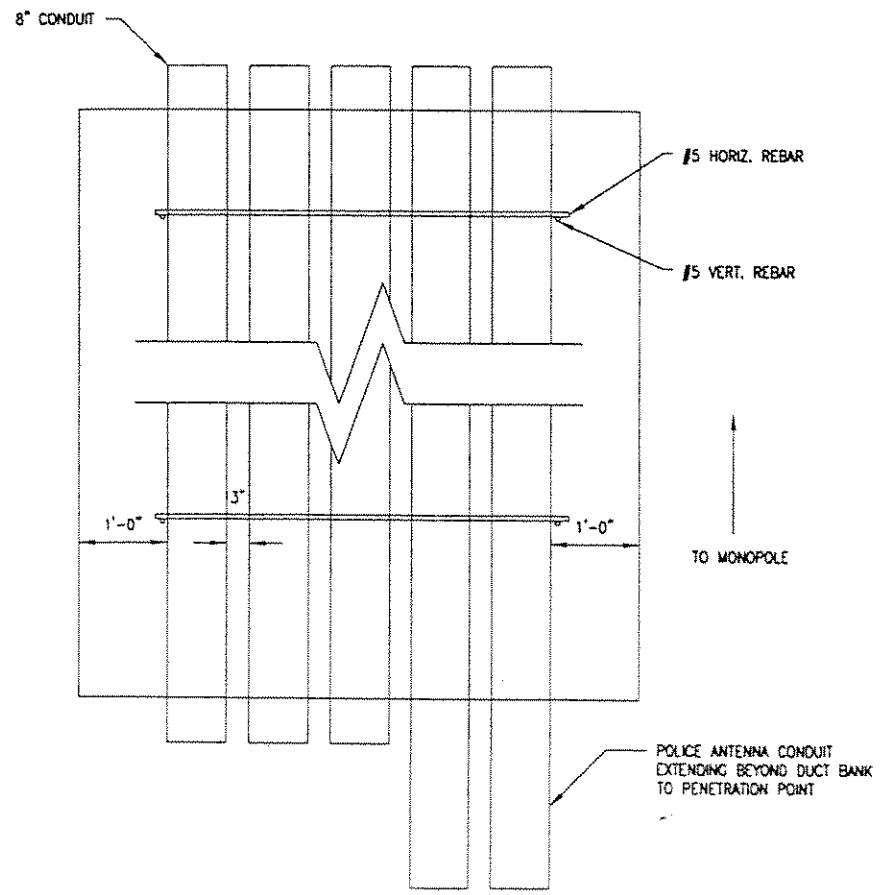


2 PAVEMENT REPLACEMENT DETAIL
C-8 SCALE: N.T.S.

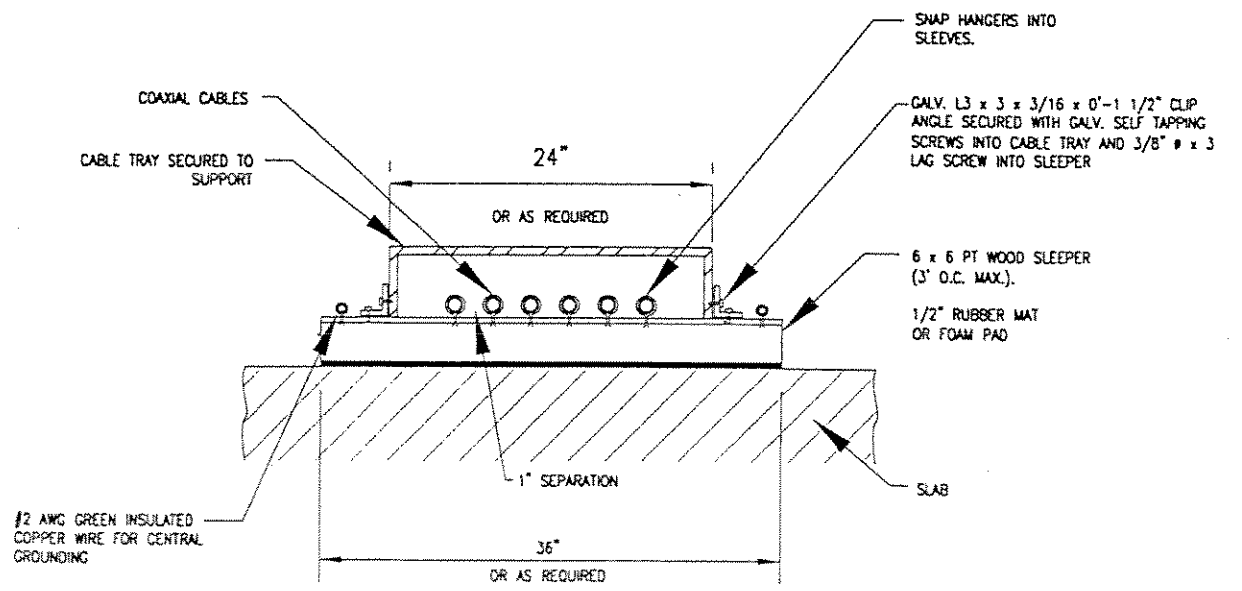


3 TRENCH DETAIL (SECTION)
C-8 SCALE: N.T.S.

KEY:
VS VOICESTREAM 8" CONDUITS
FC FUTURE CARRIER
PA POLICE ANTENNA



4 TRENCH DETAIL (PLAN)
C-8 SCALE: N.T.S.



5 CABLE TRAY DETAIL
C-8 SCALE: N.T.S.

BY	FDS
DESCRIPTION	06/23/00
REV	▲▲▲

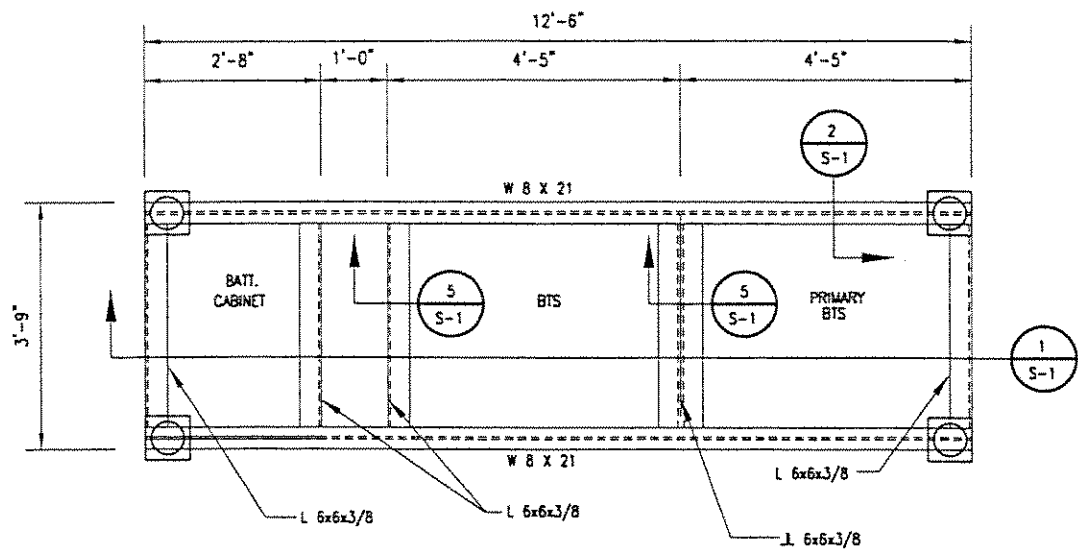
LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
111 E. WISCONSIN AVE., SUITE 510
MILWAUKEE, WI 53202

DETAILS
FIRE STATION ENGINE # 22
MW12105B
8814 W. LISBON AVENUE
MILWAUKEE, WI 53222

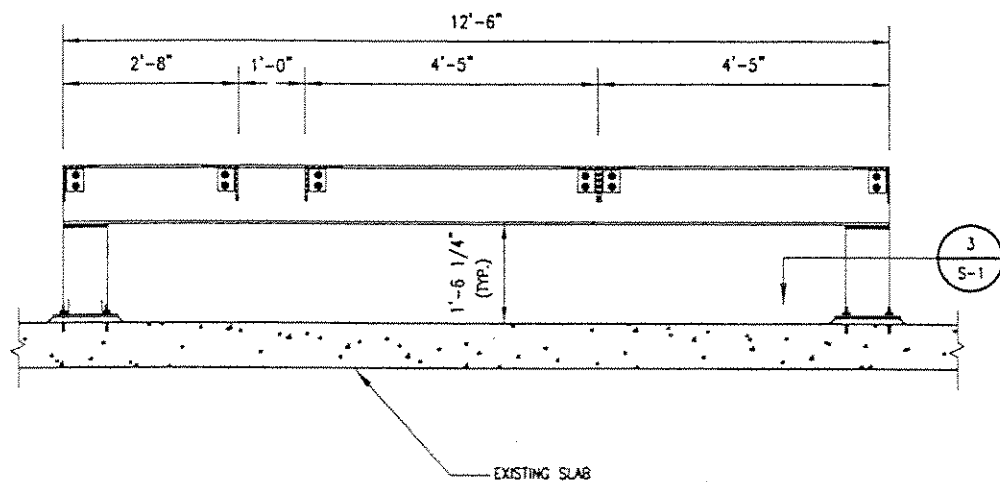
Voicestream
WIRELESS

PROJECT NO:	52030-0-2198
DRAWN BY:	RLS
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DATE:	09 MAY 2000
PLT SCALE:	1:1
DRAWING NAME:	12105-C-8
SHEET No.	C-8

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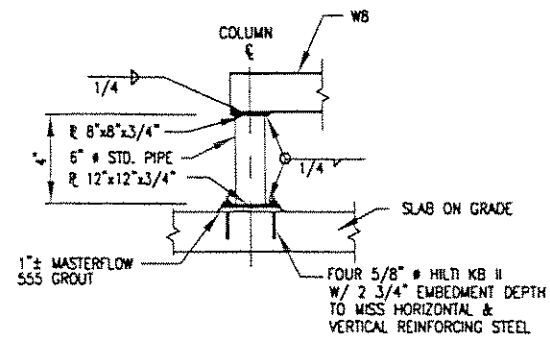


PLAN VIEW

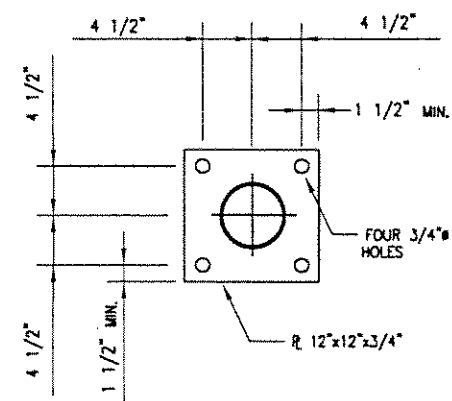


ELEVATION VIEW

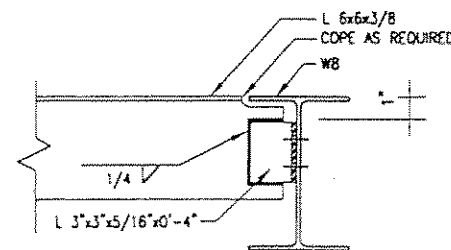
1 BTS EQUIPMENT SUPPORT FRAME
SCALE: 3/8" = 1'-0"



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

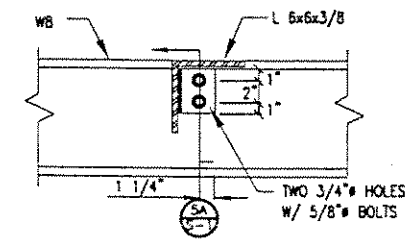


3 BASE PLATE
SCALE: 3/4" = 1'-0"

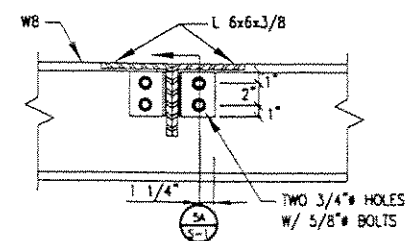


5A SECTION
SCALE: 1-1/2" = 1'-0"

NOTE:
NO EXISTING STRUCTURAL DRAWINGS WERE AVAILABLE FOR THIS SITE. EXISTING STRUCTURAL DATA WAS OBTAINED BY OBSERVATION AND MEASUREMENT IN THE FIELD. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS BEFORE FABRICATING STEEL. SEE FULTON TECHNOLOGIES DRAWING FFW1005 "MORTEL EQUIPMENT FRAME FMT 055" FOR HOLE PATTERN USED TO FASTEN BTS PLINTH TO EQUIPMENT FRAME SHOWN IN PLAN VIEW 1/5-1.



SINGLE ANGLE



DOUBLE ANGLE

5 L6 TO W8 CONNECTION
SCALE: 3/4" = 1'-0"

REV	DESCRIPTION	BY
1		
2		
3		

LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
111 E. WISCONSIN AVE., SUITE 5202
MILWAUKEE, WI 53202

STRUCTURAL DETAILS
FIRE STATION ENGINE # 22
MW12105B
8814 W. LISBON AVENUE
MILWAUKEE, WI 53222

VoiceStream
WIRELESS

PROJECT NO: 52030-0-2198
DRAWN BY: RLS
CHECKED BY: FDS
DATE: 09 MAY 2000
PILOT SCALE: 1:1
DRAWING NAME: 12105-S-1
SHEET NO.

S-1

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- GENERAL NOTES
- CODES
- STATE OF WISCONSIN BUILDING CODES - REFERENCES NOTED THUS
 - STRUCTURAL STEEL: MANUAL OF STEEL CONSTRUCTION, AMERICAN INSTITUTE OF STEEL CONSTRUCTION, NINTH EDITION, ALLOWABLE STRESS DESIGN
 - STRUCTURAL CONCRETE: BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318-95
 - AMERICAN WELDING SOCIETY - STRUCTURAL WELDING CODE STEEL, AWS D1.1 - 1988

DESIGN LOADS

WIND LOADS

- WIND LATERAL LOADS ON EQUIPMENT AND EQUIPMENT SUPPORT PLATFORM: DESIGN WIND LOADS ARE CALCULATED IN ACCORDANCE WITH THE STATE OF WISCONSIN BUILDING CODE: 25 PSF FOR MAIN WIND FORCE RESISTING SYSTEM. FOR HEIGHTS OF 50-100 FEET

2. LIVE LOADS

- SUPERIMPOSED (MINIMUM) ROOF LIVE LOAD = 20 PSF
- EQUIPMENT PLATFORM LIVE LOAD = 75 PSF
- 1/2" RADIAL ICE ON ANTENNA AND ANTENNA MOUNTS
- SNOW LOAD = 30 PSF

3. EQUIPMENT LOADS

- 2 - BTS WITH AC AT 1300 LBS. EACH
- 1 - TELCO UNIT AT 200 LBS.
- 2 - BATTERY BACKUP AT 1100 LBS. EACH

GENERAL

- CONTRACTOR SHALL VERIFY EQUIPMENT PLATFORM SIZE, LOCATION, AND WEIGHT, AND LOCATION OF NEW AND EXISTING ROOF PENETRATIONS PRIOR TO STARTING WORK. NOTIFY ENGINEER OF ANY DISCREPANCIES FROM PLANS.
- CONTRACTOR SHALL VERIFY TYPE OF CONSTRUCTION AND CONDITION OF EXISTING ROOF STRUCTURE AND NOTIFY ENGINEER OF ANY DISCREPANCIES FROM PLANS.
- NOTIFY ENGINEER PRIOR TO ANY MODIFICATIONS AND/OR ADDITIONS TO THE EQUIPMENT PLATFORM OR ANTENNA SUPPORT STRUCTURE FOR VERIFICATION OF STRUCTURAL ADEQUACY TO SUPPORT ADDITIONAL LOADS.

PREFABRICATED EQUIPMENT PLATFORM AND ANTENNA SKID MOUNTS

- PROVIDE AND INSTALL PREFABRICATED, ENGINEERED SUPPORT SYSTEM DESIGNED SPECIFICALLY FOR USE ON ROOFING WITHOUT ADHESIVES, ROOF PENETRATIONS, FLASHING, OR ROOF DAMAGE AS SHOWN ON PLANS.
- THE CONTRACT DOCUMENTS ARE BASED ON PRODUCTS BY:

VALMONT MICROFLECT CO., INC.
800-547-2151

FULTON TECHNOLOGIES
630-893-1395

- SUBMIT SHOP DRAWINGS FOR REVIEW BY THE ENGINEER THAT INDICATE LAYOUT, SUPPORT COMPONENTS, AND METHODS OF INSTALLATION.
- CONTRACTOR SHALL CAREFULLY REMOVE BUILT UP ROOF BALLAST, REMOVE LOOSE AND FOREIGN MATTER AND CLEAN SURFACES TO RECEIVE SUPPORT BASES.
- INSTALL NEOPRENE SUPPORT PADS ON TOP OF ROOF MEMBRANE, ACCURATELY LOCATE AND ALIGN SUPPORT BASES AND INSTALL SUPPORT BASES ON TOP OF THE NEOPRENE PADS AS PER MANUFACTURER'S RECOMMENDATIONS AND APPROVED SHOP DRAWINGS.
- ASSEMBLE FRAMING, SUPPORTS, AND HANGERS AS PER MANUFACTURER'S RECOMMENDATIONS AND APPROVED SHOP DRAWINGS.

7. TIGHTEN BOLTED CONNECTION TO A SNUG TIGHT CONDITION.

8. CAREFULLY REPLACE BALLAST AROUND SUPPORT BASES AS PER ORIGINAL CONDITION.

9. ALL EXPOSED STEEL SHALL BE HOT-DIPPED GALVANIZED AS PER ASTM A 153, G90, INCLUDING ANY ASSOCIATED FASTENERS.

10. THESE SPECIFICATIONS DETERMINE THE NATURE SETTING, WORKMANSHIP, AND QUALITY OF MATERIALS; THE DRAWINGS ESTABLISH THE DESIGN, QUANTITIES, DIMENSIONS, AND DETAILS.

A) THE DRAWINGS SHOW THE WORK IS TO BE COMPLETED, BUT THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR TAKING HIS OWN MEASUREMENTS AND INSTALLING HIS WORK TO FIT THE CONDITIONS ENCOUNTERED.

B) THE CONTRACT DRAWINGS INDICATE THE EXTENT AND GENERAL ARRANGEMENT OF THE VARIOUS SYSTEMS. IF ANY DEPARTURES FROM THE CONTRACT DRAWINGS ARE DEEMED NECESSARY BY THE CONTRACTOR, DETAILS OF SUCH DEPARTURES AND THE REASONS THEREFORE SHALL BE SUBMITTED AS SOON AS PRACTICABLE TO THE OWNER AND THE ENGINEER FOR APPROVAL. NO SUCH DEPARTURES SHALL BE MADE WITHOUT WRITTEN APPROVAL FROM THE OWNER.

C) SHOULD THE DRAWINGS DISAGREE IN THEMSELVES OR WITH THE SPECIFICATIONS, THE BETTER QUALITY OR GREATER QUANTITY OF WORK OR MATERIALS SHALL BE ESTIMATED UPON AND, UNLESS OTHERWISE ORDERED BY THE OWNER IN WRITING, SHALL BE PERFORMED AND FURNISHED. FIGURES GIVEN ON DRAWINGS GOVERN SCALE MEASUREMENTS, AND LARGE SCALE DRAWINGS GOVERN SMALL SCALE DRAWINGS. ANY DISCREPANCIES FOUND DURING CONSTRUCTION SHALL BE REPORTED TO THE OWNER IMMEDIATELY.

11. CONSTRUCTION PERMITS SHALL BE OBTAINED AND PAID FOR BY THE OWNER, BUT ANY AND ALL INSPECTIONS SHALL BE CALLED IN BY CONTRACTOR.

12. THE UNDERTAKING OF PERIODIC INSPECTIONS BY THE OWNER, THE ARCHITECT, OR THE ENGINEER SHALL NOT BE CONSTRUED AS SUPERVISION OF ACTUAL CONSTRUCTION NOR MAKE THEM RESPONSIBLE FOR PROVIDING A SAFE PLACE FOR THE PERFORMANCE OF WORK BY THE CONTRACTOR OR THE CONTRACTOR'S EMPLOYEES, OR BY EMPLOYEES OF THOSE SUPPLIERS OR SUBCONTRACTORS, OR FOR ACCESS, VISITS, USE, WORK, TRAVEL, OR OCCUPANCY BY ANY PERSON.

SUMMARY OF WORK

1. WORK COVERED BY CONTRACT DOCUMENTS: WORK INCLUDES INSTALLATION OF ASP PLATFORM AND SUPPORT STRUCTURE, PCS ANTENNAS AND THEIR CORRESPONDING SUPPORTS, CABLING, AND ELECTRICAL AND MECHANICAL WORK.

2. WORK BY OTHERS: THE OWNER WILL MAKE SEPARATE CONTRACTS FOR FURNISHING AND INSTALLING THE TRANSMISSION EQUIPMENT TO THE EQUIPMENT PLATFORM.

3. OWNER FURNISHED PRODUCTS: THE CONTRACTOR MUST VERIFY WITH THE OWNER EXACTLY WHAT MATERIAL AND/OR EQUIPMENT WILL BE PROVIDED FOR THIS PROJECT BY THE OWNER.

ALTERATIONS PROJECT PROCEDURES

1. PATCHING

A) IN AREAS WHERE ANY PORTION OF AN EXISTING FINISHED SURFACE IS DAMAGED, LIFTED, STAINED, OR OTHERWISE MADE OR FOUND TO BE IMPERFECT, PATCH OR REPLACE THE IMPERFECT PORTION OF THE SURFACE WITH MATCHING MATERIAL.

B) PROVIDE ADEQUATE SUPPORT OR SUBSTRATE FOR PATCHING.

2. QUALITY

A) IN THE SECTIONS OF THE PRODUCT AND EXECUTION, SPECIFICATIONS WHICH FOLLOW THESE GENERAL REQUIREMENTS, NO CONCERTED ATTEMPT HAS BEEN MADE TO DESCRIBE EACH OF THE VARIOUS EXISTING PRODUCTS THAT MUST BE USED TO PATCH, MATCH, EXTEND, OR REPLACE EXISTING WORK. OBTAIN ALL SUCH PRODUCTS IN TIME TO COMPLETE THE WORK ON SCHEDULE. SUCH PRODUCTS SHALL BE PROVIDED IN QUALITY WHICH IS IN NO WAY INFERIOR TO THE EXISTING PRODUCTS.

B) THE QUALITY OF THE PRODUCTS THAT EXIST IN THE BUILDING, AS APPARENT DURING PRE-BID SITE VISITS, SHALL SERVE AS THE SPECIFICATION REQUIREMENT FOR STRENGTH, APPEARANCE, AND OTHER CHARACTERISTICS.

3. TRANSITIONS: WHERE NEW WORK ABUTS OR FINISHES FLUSH WITH EXISTING WORK, MAKE THE TRANSITION AS SMOOTH AND WORKMANLIKE AS POSSIBLE. PATCHED WORK SHALL MATCH EXISTING ADJACENT WORK IN TEXTURE AND APPEARANCE SO AS TO MAKE THE PATCH OR TRANSITION INVISIBLE TO THE EYE AT A DISTANCE OF THREE FEET.

4. MATCHING: RESTORE EXISTING WORK THAT IS DAMAGED DURING CONSTRUCTION TO A CONDITION EQUAL TO OR BETTER THAN ITS CONDITION AT THE TIME OF THE START OF THE WORK.

5. REPAIR

A) REPLACE WORK DAMAGED IN THE COURSE OF ALTERATIONS, EXCEPT AT AREAS APPROVED BY THE OWNER OR THE ENGINEER.

B) IF THE REPAIRED WORK IS NOT BROUGHT UP TO THE STANDARD FOR NEW WORK, THE OWNER WILL DIRECT THAT IT BE CUT OUT AND REPLACED WITH ADEQUATE QUALITY NEW WORK.

BUILDING OCCUPANCY

- LESSOR WILL OCCUPY AREAS ADJOINING THE WORK AREA DURING THE ENTIRE PERIOD OF CONSTRUCTION FOR THE CONDUCT OF TENANT'S NORMAL DAILY OPERATIONS. COOPERATE WITH BUILDING OWNER'S REPRESENTATIVE IN ALL CONSTRUCTION OPERATIONS TO MINIMIZE CONFLICT AND TO FACILITATE LESSOR USAGE. CONTRACTOR SHALL CONDUCT HIS OPERATIONS AS TO ENSURE LEAST INCONVENIENCE TO LESSOR'S OPERATIONS. CONTRACTOR SHALL TAKE PRECAUTIONS TO AVOID EXCESSIVE NOISE OR VIBRATIONS THAT WOULD DISTURB LESSOR'S OPERATIONS. WHEN DIRECTED BY THE BUILDING OWNER'S REPRESENTATIVE, CONTRACTOR SHALL PERFORM CERTAIN OPERATIONS, INCLUDING CORE DRILLING, AND OTHER NOISY WORK, BETWEEN THE HOURS OF 9:00 A.M. AND 5:00 P.M. WEEKDAYS, IN ORDER TO MINIMIZE DISTURBANCE TO LESSOR'S OPERATIONS.

ALTERATIONS CUTTING AND PROTECTIONS

- CUTTING AND REMOVAL WORK SHALL BE PERFORMED SO AS NOT TO CUT OR REMOVE MORE THAN IS NECESSARY AND SO AS NOT TO DAMAGE ADJACENT WORK. CONDUCT SUCH WORK IN SUCH A MANNER AS TO MINIMIZE NOISE AND TO MINIMIZE ACCUMULATION AND SPREAD OF DIRT AND DUST. PROTECT REMAINING FINISHES, EQUIPMENT AND ADJACENT WORK FROM DAMAGE CAUSED BY CUTTING, REMOVAL AND PATCHING OPERATIONS. PROTECT SURFACES WHICH WILL REMAIN A PART OF THE FINISHED WORK. PROTECT EXISTING FACILITIES AND FEATURES WITHIN DESIGNATED CONSTRUCTION LIMITS. COVER EXISTING WALL AND FLOOR FINISHES SCHEDULED TO REMAIN IN WORK AREAS TO PREVENT DAMAGE FROM PRODUCTS DELIVERY AND CONSTRUCTION OPERATIONS. AFTER MATERIALS AND EQUIPMENT ARE INSTALLED, PROPERLY PROTECT WORK UNTIL FINAL ACCEPTANCE. ANY DAMAGE RESULTING FROM CONSTRUCTION OPERATIONS SHALL BE REPAIRED BY THE CONTRACTOR WITHOUT COST TO THE OWNER.

QUALITY CONTROL

- MAINTAIN QUALITY CONTROL OVER SUPPLIERS, MANUFACTURERS, PRODUCTS, SERVICES, SITE CONDITIONS, AND WORKMANSHIP, TO PRODUCE WORK OF SPECIFIED QUALITY.
- COMPLY WITH INDUSTRY STANDARDS FOR COMMERCIAL CONSTRUCTION EXCEPT WHEN MORE RESTRICTIVE TOLERANCES OR SPECIFIED REQUIREMENTS INDICATE MORE RIGID STANDARDS OR MORE PRECISE WORKMANSHIP.
- PERFORM WORK BY PERSONS QUALIFIED TO PRODUCE WORKMANSHIP OF SPECIFIED QUALITY.
- SECURE PRODUCTS IN PLACE WITH POSITIVE ANCHORAGE DEVICES DESIGNED AND SIZED TO WITHSTAND STRESSES, VIBRATION, AND RACKING.
- COMPLY WITH INSTRUCTIONS IN FULL DETAIL, INCLUDING EACH STEP IN SEQUENCE. SHOULD INSTRUCTIONS CONFLICT WITH CONTRACT DOCUMENTS, REQUEST CLARIFICATION FROM THE OWNER OR ENGINEER BEFORE PROCEEDING.
- OWNER MAY EMPLOY AND PAY FOR SERVICES OF AN INDEPENDENT TESTING LABORATORY TO PERFORM TESTING OF MATERIALS AND CONSTRUCTION. CONTRACTOR SHALL COOPERATE WITH LABORATORY TO FACILITATE EXECUTION OF REQUIRED SERVICES.
- EMPLOYMENT OF LABORATORY SHALL IN NO WAY RELIEVE CONTRACTOR'S OBLIGATIONS TO PERFORM THE WORK OF THE CONTRACT.

WATERPROOFING

- GENERAL: FURNISH AND INSTALL ALL NECESSARY REINFORCED MEMBRANE MATERIAL TO PROPERLY SEAL NEW CONSTRUCTION. VERIFY WITH BUILDING MANAGEMENT IF EXISTING MEMBRANE HAS A MANUFACTURER'S WARRANTY IN EFFECT. IF SO, CONTACT MANUFACTURER FOR A LIST OF APPROVED ROOFING SUBCONTRACTORS WHO MAY PERFORM WORK AND MAINTAIN WARRANTY. USE ONLY APPROVED ROOFING CONTRACTORS IN ORDER TO MAINTAIN WARRANTY. MEET OR EXCEED EXISTING BUILDING WATERPROOFING SYSTEM REQUIREMENTS FOR ROOF PENETRATIONS.

2. WATERPROOFING SHALL BE PROVIDED AT ALL EXISTING ROOF SURFACES ALTERED, CUT, OR REPLACED BY REQUIREMENTS OF THE NEW CONSTRUCTION.

3. INSTALL THE WATERPROOFING ONLY TO CLEAN AND DRY MATERIALS FREE OF DEBRIS AND LOOSE MATERIAL. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

THERMAL AND MOISTURE PROTECTION

1. FLASHING AND SHEET METAL

A) SHEET METAL FLASHING AND OTHER ACCESSORIES SHALL BE GALVANIZED STEEL, 22 GAUGE, FABRICATED AND INSTALLED IN ACCORDANCE WITH APPLICABLE SMACNA PUBLISHED STANDARDS.

2. BUILT-UP ROOFING

A) GENERAL: FURNISH AND INSTALL ALL NECESSARY MEMBRANE AND FLASHING MATERIALS COMPATIBLE WITH EXISTING ROOFING SYSTEM TO PROPERLY SEAL AND FLASH ROOF PENETRATIONS. VERIFY WITH BUILDING MANAGEMENT IF EXISTING ROOF HAS A MANUFACTURER'S WARRANTY IN EFFECT. IF SO, CONTACT MANUFACTURER FOR A LIST OF APPROVED ROOFING SUBCONTRACTORS WHO MAY PERFORM WORK AND MAINTAIN WARRANTY. USE ONLY APPROVED ROOFING CONTRACTORS IN ORDER TO MAINTAIN WARRANTY. MEET OR EXCEED EXISTING BUILDING ROOF SYSTEM REQUIREMENTS FOR ROOF PENETRATIONS.

SEALANT

- SEALANT TO BE A ONE OR TWO PART POLYURETHANE CHEMICAL SEALANT WITH A SHORE A HARDNESS BETWEEN 20 AND 30 AFTER 7 DAYS CURE. CLASS A NON-SAG, OF MANUFACTURER'S STANDARD COLORS TO MATCH ORIGINAL. EQUAL TO PECORA DYNATROL 1 OR II. FURNISH NECESSARY NON-STAINING IMPREGNATED JOINT FILLER AND SEALANT MANUFACTURER'S JOINT PRIMER.
- SEAL JOINTS AT PERIMETER BETWEEN SLEEVE AND PIPE, CONDUIT, ETC., PENETRATIONS OF WALLS, FLASHING CONNECTIONS AND AS INDICATED WITH A SEALANT. PACK ALL JOINTS TO WITHIN 3/8 IN AND 1/2 IN OF JOINT FACE WITH JOINT FILLER AND PRIME POROUS SEALANT CONTACT SURFACES WITH JOINT PRIMER.
- APPLY SEALANT ONLY TO CLEAN, DRY SURFACES AND WHEN TEMPERATURE IS ABOVE 40°F. APPLY PER MANUFACTURER'S RECOMMENDATIONS. HOLD FACE OF SEALANT APPROXIMATELY 1/8 IN BEHIND FACE OF ADJACENT METAL FRAMES AND PRODUCE JOINTS WITH UNIFORM SURFACES AND STRAIGHT EDGES. DO NOT TOUCH SEALED JOINTS, WASH OR OTHERWISE DISTURB, ALLOWING SEALANT TO CURE UNTIL IT IS FIRM AND RUBBERY.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- PROVIDE GUARDRAILS AND HANDRAILS IN ACCORDANCE WITH APPLICABLE SAFETY LAWS.
- PROVIDE BARRICADES AS REQUIRED TO PROTECT EXISTING SITE FEATURES, EXISTING BUILDINGS, ADJACENT PROPERTY AND PASSERSBY.
- DURING CONSTRUCTION, CONTRACTOR AND HIS SUBCONTRACTORS AND SUB-SUBCONTRACTORS AND THEIR AGENTS AND EMPLOYEES SHALL COMPLY WITH FIRE SAFETY PRACTICES AND OUTLINED IN NFPA PAMPHLET 241 AND LOCAL FIRE PROTECTION CODES.

REV	DESCRIPTION	BY

LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
111 E. WISCONSIN AVE., SUITE 1100
MILWAUKEE, WI 53202

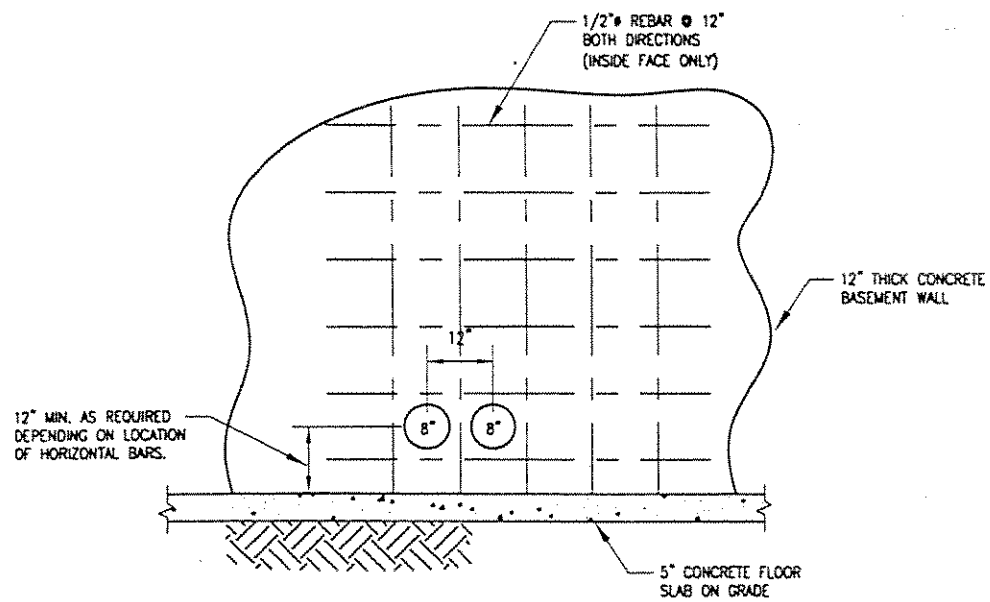
STRUCTURAL NOTES
FIRE STATION ENGINE # 22
MW12105B
111 W. LISBON AVENUE
MILWAUKEE, WI 53222

Voicestream
PROFESSIONAL EN
WIRE

PROJECT NO: 52030-0-2198
DRAWN BY: RLS
CHECKED BY: EDS
DATE: 08 MAY 2000
PLOT SCALE: 1:1
DRAWING NAME: 12105-S-2
SHEET NO.

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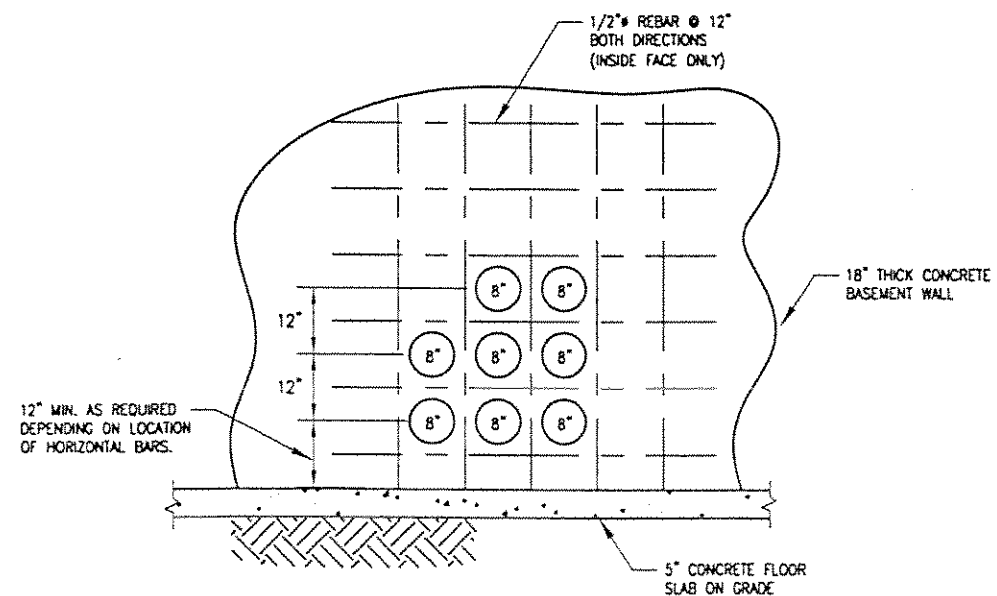




NOTE:
 1. 2-8" PENETRATION FOR POLICE CONDUITS CAN BE LINED UP HORIZONTALLY (12") TO ALSO MISS EXISTING REINFORCING BARS.

ELEVATION FOR POLICE CONDUITS

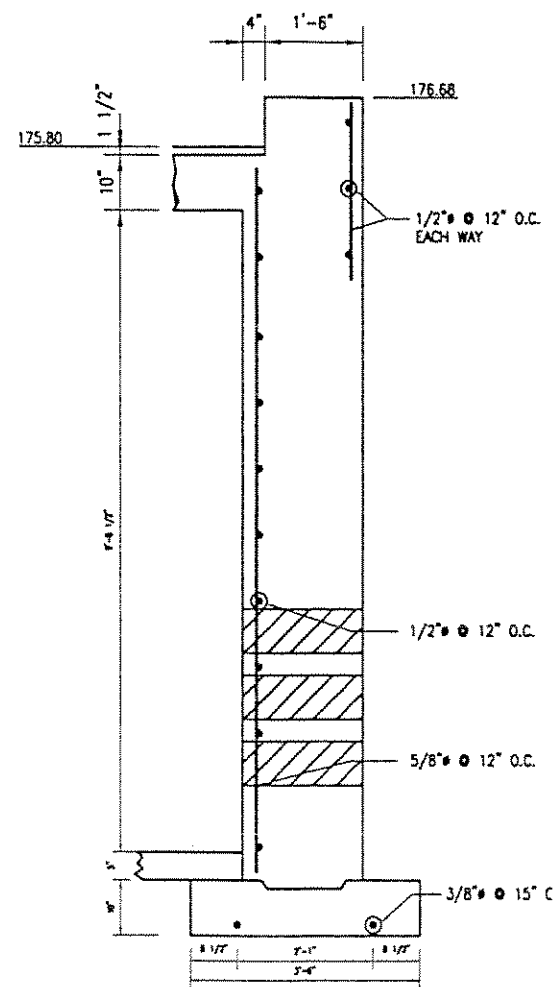
1 CABLE PENETRATION THRU BASEMENT WALL
 S-3 SCALE: 3/8" = 1'-0"



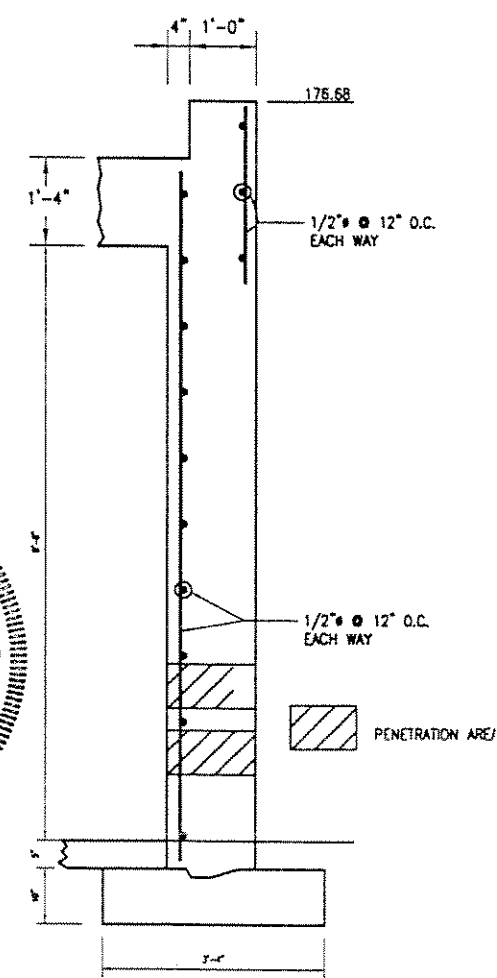
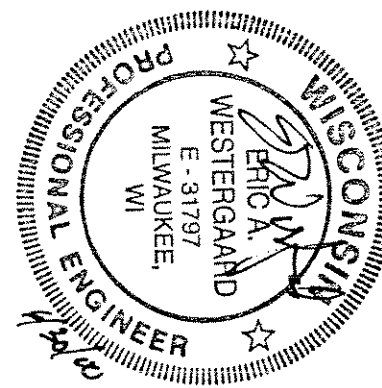
NOTE:
 1. REBAR TO BE LOCATED PRIOR TO DRILLING HOLES. ATTEMPT TO LOCATE 8" HOLES TO MISS REINFORCING BARS. ALLOW DAMAGING ONLY 1 HORIZONTAL AND 1 VERTICAL BAR TOTAL.

ELEVATION FOR VOICESTREAM CONDUITS

2 CABLE PENETRATION THRU BASEMENT WALL
 S-3 SCALE: 3/8" = 1'-0"



3 PENETRATION FOR VOICESTREAM CONDUITS
 S-3 SCALE: 3/8" = 1'-0"



4 PENETRATION FOR POLICE CONDUITS
 S-3 SCALE: 3/8" = 1'-0"

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REV	DESCRIPTION	BY

STRUCTURAL DETAILS
 FIRE STATION ENGINE # 22
 MW12105B
 8814 W. LISBON AVENUE
 MILWAUKEE, WI 53222

LAWGIBB GROUP
 LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
 111 E. WISCONSIN AVENUE SUITE 200
 MILWAUKEE, WI 53102

Voicestream
 WIRELESS

PROJECT NO: 52030-0-2196
 DRAWN BY: RLS
 CHECKED BY: FDS
 DATE: 09 MAY 2000
 PLOT SCALE: 1:1
 DRAWING NAME: 12105-S3
 SHEET No. S-3

ELECTRICAL NOTES

- ALL WORK IS TO COMPLY WITH THE NATIONAL ELECTRICAL CODE (N.E.C.) AND ANY LOCAL ORDINANCES, CODES, AND ALL OTHER ADMINISTRATIVE AUTHORITIES HAVING JURISDICTION. THE CONTRACTOR SHALL FURNISH AND PAY FOR ALL PERMITS AND RELATED FEES.
- ALL EQUIPMENT AND MATERIAL FURNISHED AND INSTALLED UNDER THIS CONTRACT SHALL BE UNDERWRITERS LABORATORIES (U.L.) LISTED, NEW, FREE FROM DEFECTS, AND SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE BY OWNER OR HIS REPRESENTATIVE. SHOULD ANY TROUBLE DEVELOP DURING THIS PERIOD DUE TO FAULTY WORKMANSHIP, MATERIAL OR EQUIPMENT, THE CONTRACTOR SHALL FURNISH ALL NECESSARY MATERIALS AND LABOR TO CORRECT THE TROUBLE WITHOUT COST TO THE OWNER.
- ALL WORK SHALL BE EXECUTED IN A WORKMAN LIKE MANNER AND SHALL PRESENT A NEAT MECHANICAL APPEARANCE WHEN COMPLETED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING RELATED TO ELECTRICAL WORK, AND SHALL RESTORE ALL EXISTING LANDSCAPING, SPRINKLER SYSTEMS, CONDUITS, WIRING, PIPING, ETC. DAMAGED BY THE ELECTRICAL WORK TO MATCH EXISTING CONDITIONS.
- ELECTRICAL WORK SHALL INCLUDE, BUT NOT BE LIMITED TO, ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED TO COMPLETE ELECTRICAL POWER AND LIGHTING SYSTEMS, TELEPHONE AND COMMUNICATION SYSTEMS, PANEL BOARDS, CONDUIT, CONTROL WIRING, GROUNDING, ETC. AS INDICATED ON ELECTRICAL DRAWINGS AND/OR AS REQUIRED BY GOVERNING CODES.
- PRIOR TO INSTALLING ANY ELECTRICAL WORK, THE CONTRACTOR SHALL VISIT THE JOB SITE AND VERIFY EXISTING SITE LOCATIONS AND CONDITIONS AND UTILITY SERVICE REQUIREMENTS OF THE JOB, AND BY REFERENCE TO ARCHITECTURE AND EQUIPMENT SUPPLIERS DRAWINGS. SHOULD THERE BE ANY QUESTION OR PROBLEM CONCERNING THE NECESSARY PROVISIONS TO BE MADE, PROPER DIRECTIONS SHALL BE OBTAINED BEFORE PROCEEDING WITH ANY WORK.
- PROVIDE POWER AND TELEPHONE TO SERVICE POINTS PER UTILITY COMPANY REQUIREMENTS. CONTRACTOR SHALL CONTACT UTILITY SERVICE PLANNERS AND OBTAIN ALL SERVICE REQUIREMENTS AND INCLUDE COSTS FOR SUCH IN HIS BID.
- SERVICE EQUIPMENT SHALL HAVE A SHORT CIRCUIT WITHSTAND RATING EQUAL TO OR EXCEEDING THE MAXIMUM AVAILABLE FAULT CURRENT AT THE SUPPLY TERMINAL. THE INSTALLATION SHALL BE FREE FROM ANY SHORT CIRCUITS AND GROUNDS.
- ALL WIRING SHALL BE COPPER WITH THHN/THWN DUAL RATED 600 VOLTS INSULATION.
- IN THE EVENT OF ANY CONFLICT OR INCONSISTENCY BETWEEN ITEMS SHOWN ON THE PLANS AND/OR SPECIFICATIONS, THE NOTE, SPECIFICATION OR CODE WHICH PRESCRIBES AND ESTABLISHES THE HIGHEST STANDARD OF PERFORMANCE SHALL PREVAIL.
- SERVICE CONDUITS SHALL HAVE NO MORE THAN (2) - 90° BENDS IN ANY SINGLE RUN. THE CONTRACTOR SHALL PROVIDE PULL BOXES AS NEEDED WHERE CONDUIT REQUIREMENTS EXCEED THESE CONDITIONS.
- ALL ELECTRICAL EQUIPMENT SHALL BE ANCHORED TO WITHSTAND 100 M.P.H. WIND SPEED AND DESIGNED FOR EXPOSURE C.
- ALL COAX, POWER AND TELEPHONE SYSTEM CONDUITS SHALL HAVE A MINIMUM 24" RADIUS SWEEPS TO EQUIPMENT, PULLBOXES, MONOPOLE, ETC., UNLESS OTHERWISE NOTED, OR AS REQUIRED BY UTILITY COMPANIES.

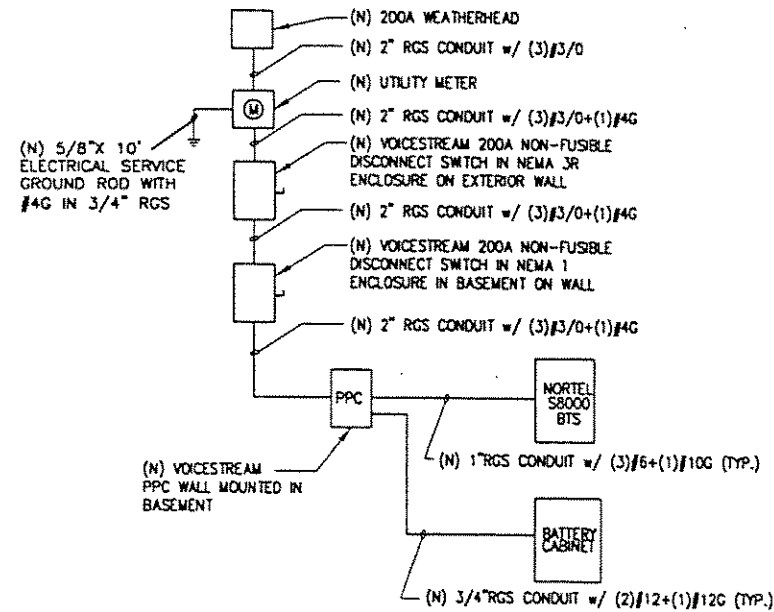
- ALL PVC CONDUIT RUNS SHALL BE SCHEDULE 40.
- FUSE TYPE SHALL BE BUSSMAN RK1 LOW PEAK FUSE (LPU-RK-100).
- UPON COMPLETION OF THE JOB, THE CONTRACTOR SHALL FURNISH AS-BUILT DRAWINGS TO THE OWNER.
- GENERAL GROUNDING CRITERIA (FOR TENANT IMPROVEMENTS):
1ST STEP: GROUND TO EXISTING BUILDING STRUCTURAL STEEL AND TO THE EXISTING COLD WATER LINE, THEN TEST GROUNDING RESISTANCE TO WITHIN 1 TO 5 OHMS OVERALL GROUND RESISTANCE. WHERE THE EFFECTIVE RESISTANCE DOES NOT MEET THIS CRITERIA, PROVIDE SUPPLEMENTAL GROUNDING AND RE-TEST UNTIL GROUND RESISTANCE FALLS BELOW THIS LEVEL.

SUPPLEMENTAL GROUND MAY CONSIST OF ONE OR MORE OF THE FOLLOWING:

- COUNTERPOISE,
- UFER GROUND,
- GROUND ROD AND/OR GROUND WELL IN EXTREMELY ADVERSE SOIL CONDITIONS.

WHERE THE EXISTING BUILDING STEEL DOES NOT PROVIDE AN EFFECTIVE GROUND RESISTANCE, THE CONTRACTOR SHALL PROVIDE A SEPARATE #250 kcmil GROUND CONDUCTOR IN 1-1/4" RGS CONDUIT FROM ROOF-MOUNTED BITS EQUIPMENT LOCATIONS EITHER DOWN THROUGH THE INSIDE OF THE BUILDING OR DOWN THE OUTSIDE OF THE BUILDING, DEPENDING UPON OWNER'S PREFERENCE. WHERE THE GROUND CONDUCTOR FROM THE ROOF-MOUNTED EQUIPMENT IS ROUTED IN CONDUIT, THE CONDUIT SHALL BE EFFECTIVELY GROUNDED TO THE GROUND CONDUCTOR AT BOTH ENDS OF THE CONDUIT.

- CONTRACTOR TO COLOR PHASE CONDUCTORS RED (PHASE A), BLACK (PHASE B), WHITE (NEUTRAL), AND GREEN (GROUND).
- CABLE TRAYS ARE FOR COAXIAL CABLE ONLY. ALL CABLES RUN IN CABLE TRAY ARE LOW VOLTAGE RADIO FREQUENCY CABLES. THE COAXIAL CABLE IS CLASS II ENERGY LIMITED COAXIAL CABLE AND THE TRAY IS UL LISTED.
- BACKUP BATTERIES ARE SEALED CELL BATTERIES WITH TEST LABORATORY EVALUATED "PRESSURE RELEASE VENTS".
- THE INTERNAL ELECTRIC HEATING ELEMENT WITHIN THE BITS CABINETS IS A 2.5 KW TEST LABORATORY EVALUATED HEATER WITH NO FEEDER OR BRANCH CIRCUIT COMPONENTS.
- ABBREVIATIONS ARE AS FOLLOWS: BITS = BASE TRANSMICER STATION.
- THE CONTRACTOR SHALL VERIFY LOAD SUMMARY WITH THE EQUIPMENT CUT SHEETS PRIOR TO PURCHASE. IF CUT SHEET LOAD REQUIREMENTS DIFFER FROM THE LOAD SUMMARY THEN THE CONTRACTOR SHALL CONSULT THE ENGINEER AND PROJECT MANAGER FOR FURTHER DIRECTION.
- WHERE THE PPC IS NOT USED AS SERVICE ENTRANCE ELECTRICAL EQUIPMENT, REMOVE THE BOND BETWEEN GROUND BUSS AND NEUTRAL BUSS.



1 ELECTRICAL SINGLE LINE
E-1 SCALE: N.T.S.

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REV	DESCRIPTION	BY
1	06/23/00	FDS

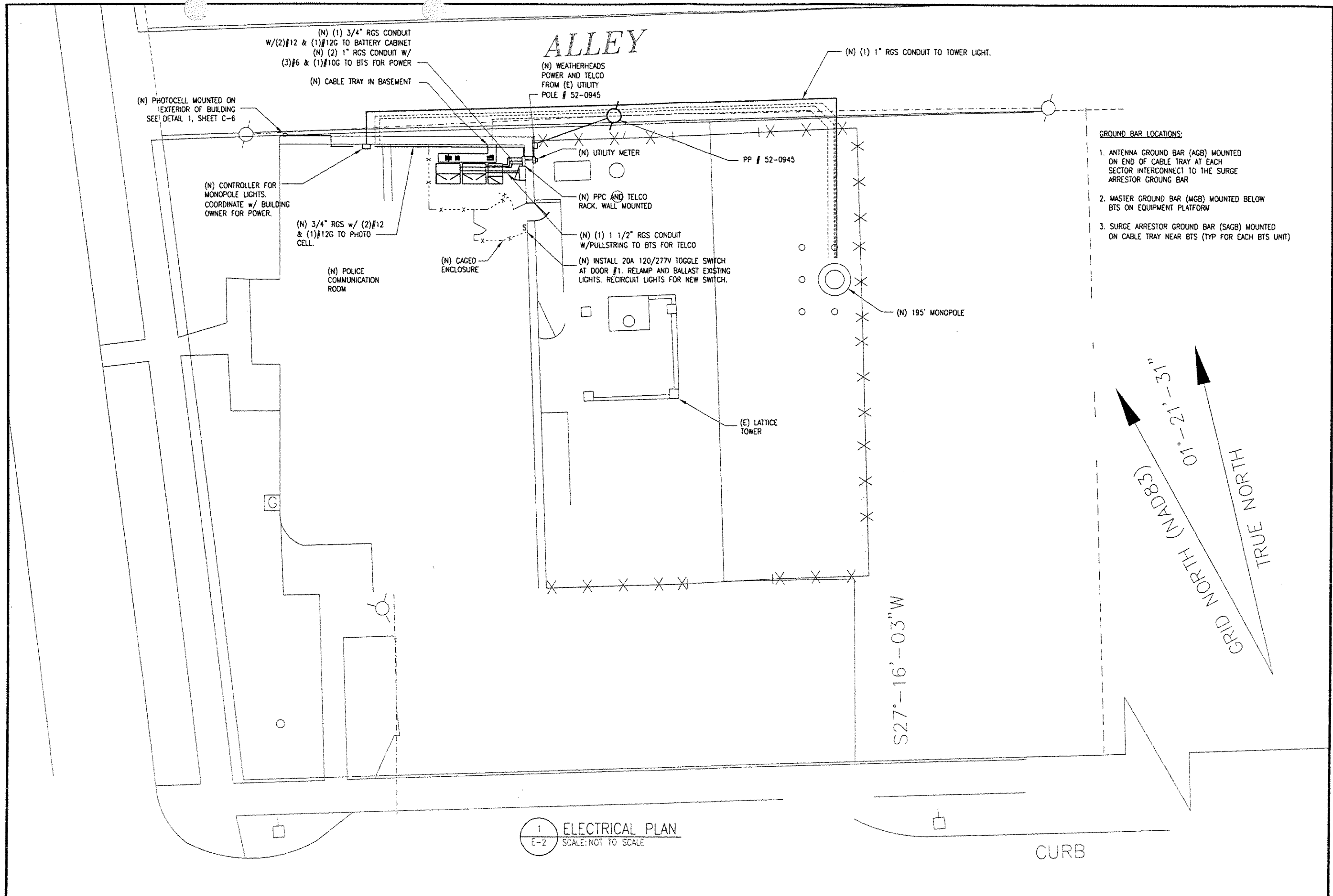
LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL
111 E. WISCONSIN AVE. SUITE
MILWAUKEE, WI 53202

ELEC/TELCO WIRING
FIRE STATION ENGINE # 22
NW12105B
8814 W. LISBON AVENUE
MILWAUKEE, WI 53222

VoiceStream
WIRELESS

PROJECT NO.:	52030-0-2196
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	09 MAY 2000
PLT SCALE:	1:1
DRAWING NAME:	12105-E1
SHEET No.:	E-1

E-1



- GROUND BAR LOCATIONS:**
1. ANTENNA GROUND BAR (AGB) MOUNTED ON END OF CABLE TRAY AT EACH SECTOR INTERCONNECT TO THE SURGE ARRESTOR GROUND BAR
 2. MASTER GROUND BAR (MGB) MOUNTED BELOW BTS ON EQUIPMENT PLATFORM
 3. SURGE ARRESTOR GROUND BAR (SAGB) MOUNTED ON CABLE TRAY NEAR BTS (TYP FOR EACH BTS UNIT)

1 ELECTRICAL PLAN
E-2 SCALE: NOT TO SCALE

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PROJECT NO: 52030-0-2196
DRAWN BY: RLS
CHECKED BY: FDS
DATE: 09 MAY 2000
PLOT SCALE: 1:1
DRAWING NAME: 12105-E2
SHEET No.: E-2

ELEC/TELCO WIRING
FIRE STATION ENGINE # 22
MW12105B
8814 W. LISBON AVENUE
WISCONSIN, WI 53098

LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.
111 E. WISCONSIN AVE., SUITE

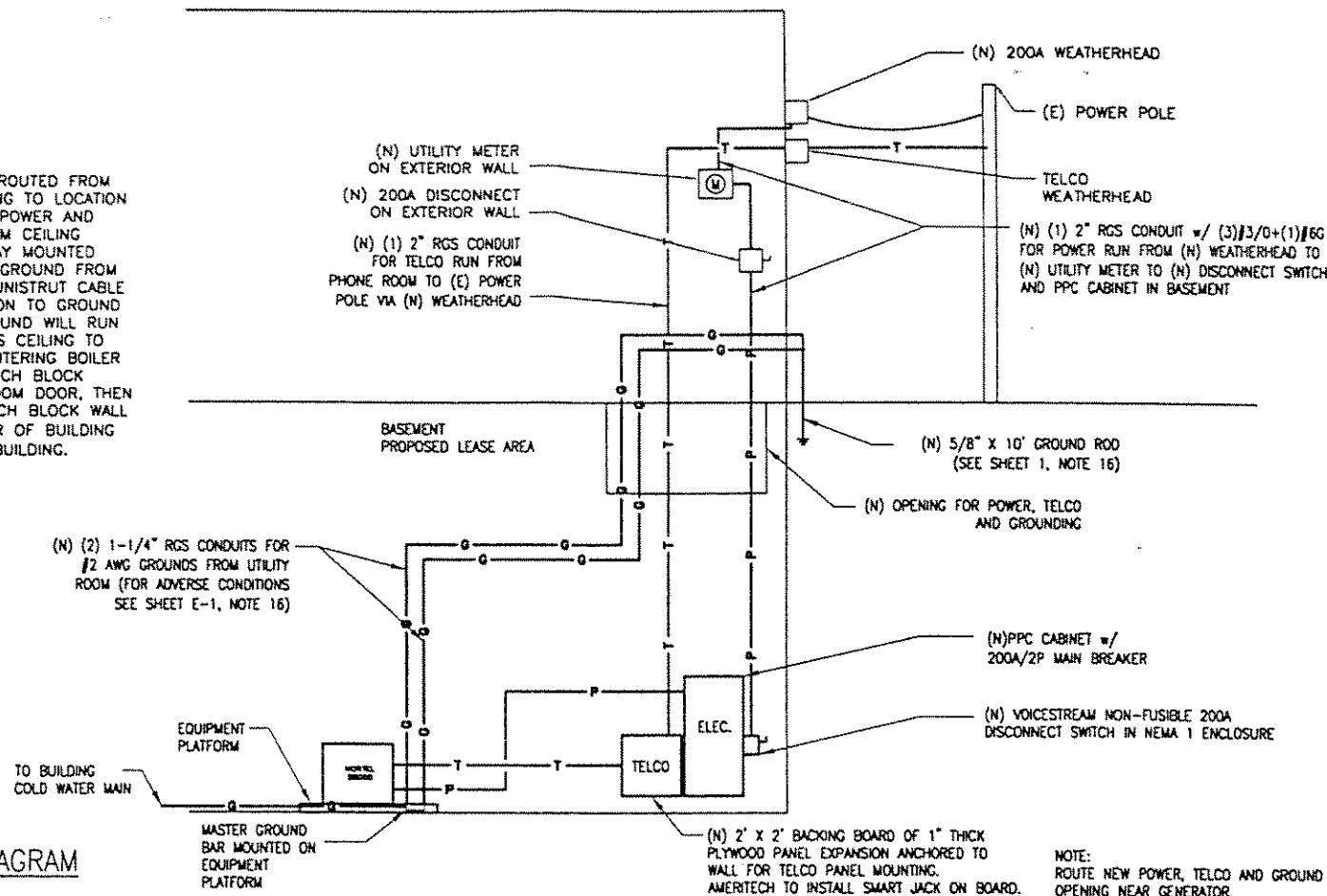
Voicestream WIRELESS

NOTES:

1. INSTALL IN ACCORDANCE WITH NEC AND LOCAL ELECTRICAL CODE.
2. ALL WORK MUST BE COORDINATED WITH BUILDING MANAGER.
3. ALL CONDUIT LENGTHS SHALL BE VERIFIED IN THE FIELD.
4. PENETRATIONS IN FIRE RATED WALLS SHALL BE FIRE-STOPPED IN ACCORDANCE WITH APPLICABLE LOCAL BUILDING CODES.
5. PROJECT MANAGER SHALL VERIFY LOCATION OF SOURCES FOR POWER AND TELEPHONE SERVICES.
6. CONTRACTOR SHALL TEST AVAILABLE SERVICE VOLTAGE/FAULT CURRENT AND COORDINATE WITH VOICESTREAM TO CONFIRM MINIMUM VOLTAGE/FAULT CURRENT REQUIREMENTS.
7. INSTALL LABEL ON BOTH DISCONNECTS (ON EXTERIOR "VOICESTREAM MAIN SERVICE DISCONNECT", ON INTERIOR "VOICESTREAM SAFETY DISCONNECT").

ROUTING:

POWER AND TELCO LINES ARE TO BE ROUTED FROM PPC AND TELCO BOARD ACROSS CEILING TO LOCATION IN FRONT OF EQUIPMENT PLATFORM. POWER AND TELCO CONDUITS WILL RUN DOWN FROM CEILING SUPPORTED BY UNISTRUT CONDUIT TRAY MOUNTED BETWEEN CEILING AND FLOOR. FIRST GROUND FROM MAIN GROUND BAR WILL BE RUN UP UNISTRUT CABLE TRAY TO EXISTING CONDUIT PENETRATION TO GROUND ROD OUTSIDE BUILDING. SECOND GROUND WILL RUN UP UNISTRUT CABLE TRAY AND ACROSS CEILING TO HALLWAY, ACROSS HALLWAY CEILING ENTERING BOILER ROOM BY PENETRATING THROUGH 8-INCH BLOCK ABOVE HALLWAY DOOR AND BOILER ROOM DOOR, THEN ACROSS BOILER ROOM THROUGH 6-INCH BLOCK WALL OF "STORAGE ROOM" TO WEST CORNER OF BUILDING WHERE 1-1/2" WATER MAIN ENTERS BUILDING.



1 ELECTRIC AND TELEPHONE RISER DIAGRAM
E-3 SCALE: N.T.S.

CIRCUIT PANEL		
BRANCH DESCRIPTION	W PER PHASE	BRANCH DESCRIPTION
BTS	1 4512	2 SURGE PROTECTOR
	3 4512	4 50
BTS *	5 4512	6 SPARE
	7 4512	8 SPARE
BATTERY CHARGER	9 1000	10 TELCO GF1
FAN	11 1000	12 PHOTOCELL
	13 960	14 PHOTOCELL
	15 150	

225A 120/240V 1φ 3W
MOUNT: SURFACE
WLD MCB 200A AC 100K 11,024 10,134 FEEDER SEE RISER
PANEL PPC (1) LOCATION ROOF 21,158 .95 PF 22.3 KVA 240V 92.8A

NEMA 3R ENCLOSURE
(1) PPC PANEL IS OWNER FURNISHED, CONTRACTOR INSTALLED
• NOTE: CONTRACTOR TO INSTALL 50A/2P BREAKER BELOW 100A/2P BREAKER IN PPC DISTRIBUTION PANEL

ELECTRIC LOAD SUMMARY					
SERVICE VOLTAGE 120/240V, 1φ, 3W					
	CONNECTED LOAD		DEMAND FACTOR		
	KW	AMPS	DEMAND FACTOR	KW	AMPS
• PHOTOCELL	0.15	1.25	1.0	0.15	1.25
• RECEPTACLES	1.00	8.33	1.0	1.00	8.33
• BTS #1	9.02	37.60	1.0	9.02	37.60
• BTS #2	9.02	37.60	1.0	9.02	37.60
• BATTERY CHARGERS	1.00	8.33	1.0	1.00	8.33
• FAN	1.00	8.33	1.0	1.00	8.33
CONNECTED LOAD				21.19	101.44
LIGHTING X 0.25				0.00	0.00
TOTAL LOAD				21.19	101.44
TOTAL SERVICE CAP.					200.0

• 120 VOLT CIRCUIT

2 PANELBOARD SCHEDULE AND LOAD SUMMARY
E-3 SCALE: N.T.S.

ABBREVIATIONS

- AC AMPS INTERRUPTING CAPACITY
- AWG AMERICAN WIRE GAUGE
- BTS BASE TRANSMISSION SYSTEM
- C CONDUIT
- DWG DRAWING
- ELEC ELECTRICAL
- EMT ELECTRICAL METALLIC TUBING
- G GROUND
- PCS PERSONAL COMMUNICATION SYSTEM
- PPC POWER PROTECTION CABINET
- RGS RIGID GALVANIZED STEEL
- SN SOLID NEUTRAL
- TYP TYPICAL
- AGB ANTENNA GROUND BAR
- MGB MASTER GROUND BAR

SYMBOLS

- METER BASE
- WATER MAIN
- DISCONNECT SWITCH
- TELCO LINE
- GROUND WIRE
- ELECTRICAL POWER
- TRANSFORMER
- CADWELD CONNECTION
- BURNDY CONNECTION
- GROUND

BY	FDS
DESCRIPTION	
REV	06/23/00

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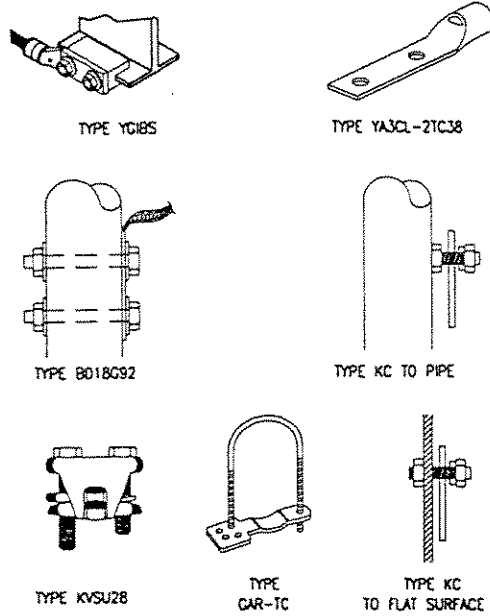
ELEC/TELCO WIRING
FIRE STATION ENGINE # 22
MW12105B
8814 W. LISBON AVENUE
MILWAUKEE, WI 53222

Voicestream WIRELESS

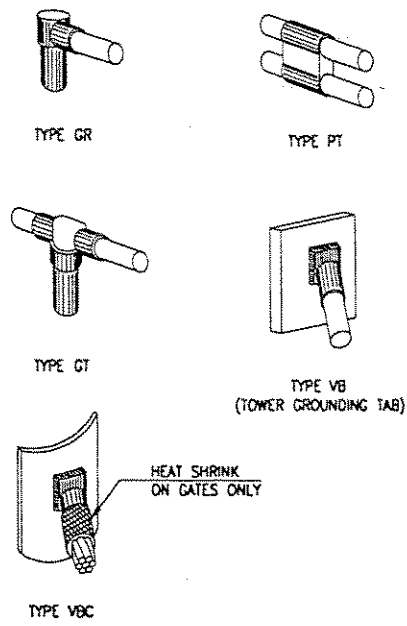
PROJECT NO:	52030-0-2198
DRAWN BY:	RLS
CHECKED BY:	FDS
DATE:	09 MAY 2000
PLOT SCALE:	1:1
DRAWING NAME:	12105-E3
SHEET NO.:	E-3

E-3

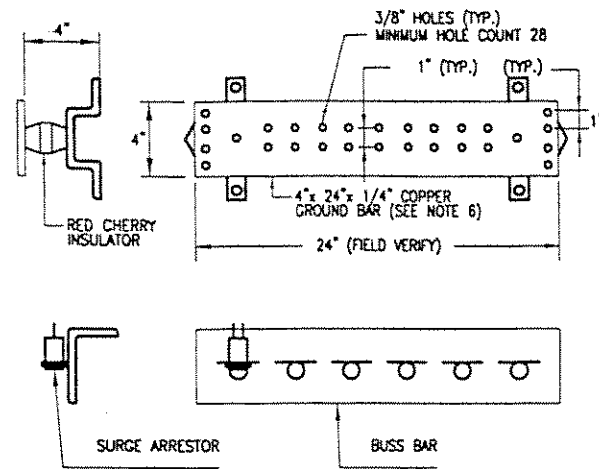
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1 BURNDY DETAILS
E-4 SCALE: N.T.S.

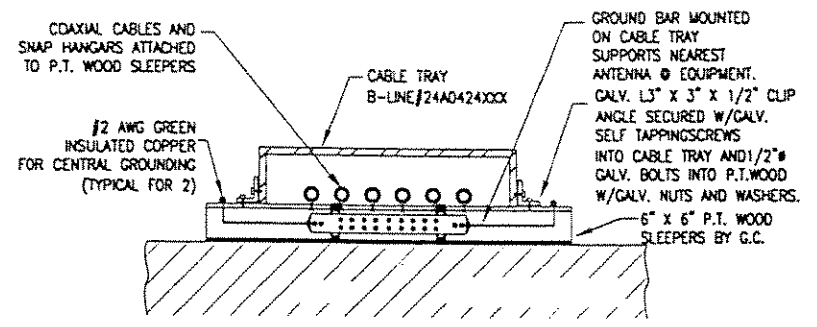


2 CAD WELD DETAILS
E-4 SCALE: N.T.S.

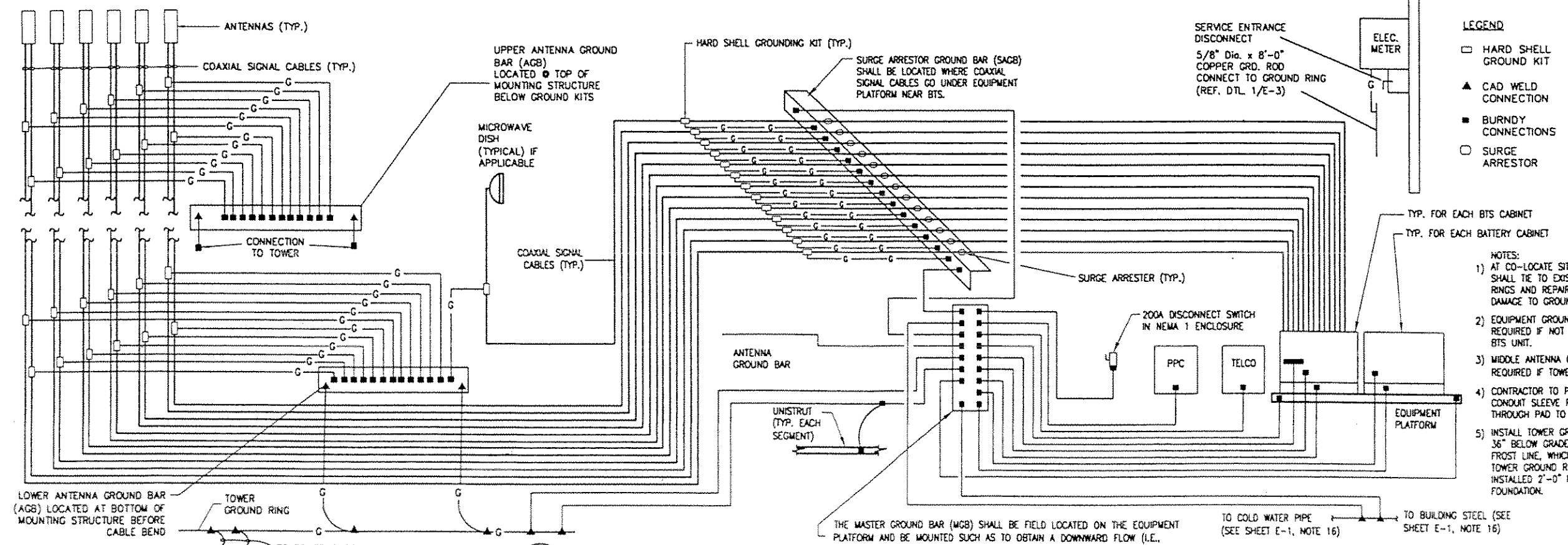


- NOTES:
1. ALL HARDWARE IS 8-88 STAINLESS STEEL INCLUDING BELLEVILLES. COAT ALL CONTACT SURFACES WITH NOALOX BEFORE MAKING CONNECTIONS.
 2. FOR GROUNDS BONDED TO STEEL ONLY; INSERT A TOOTHED WASHER BETWEEN LUG AND STEEL. COAT ALL SURFACES WITH NOALOX.
 3. BREAK ALL SHARP EDGES.
 4. CONTRACTOR TO USE NOALOX AT THESE CONNECTIONS.
 5. ALL FITTINGS, HARDWARE, GROUND BARS, AND CONDUCTORS TO BE SUPPLIED AND INSTALLED BY CONTRACTOR.
 6. SPECIFICATIONS FOR GROUND BARS ARE PROVIDED IN DIVISION 16, SECTION 3 OF THE GENERAL NOTES.

3 GROUND & BUSS BARS
E-4 SCALE: N.T.S.



4 GROUND BAR ON CABLE TRAY
E-4 SCALE: N.T.S.



- LEGEND
- HARD SHELL GROUND KIT
 - ▲ CAD WELD CONNECTION
 - BURNDY CONNECTIONS
 - SURGE ARRESTOR

- NOTES:
- 1) AT CO-LOCATE SITES CONTRACTOR SHALL TIE TO EXISTING GROUND RINGS AND REPAIR ANY CUT OR DAMAGE TO GROUND RING.
 - 2) EQUIPMENT GROUND BAR ONLY REQUIRED IF NOT SUPPLIED WITH BITS UNIT.
 - 3) MIDDLE ANTENNA GROUND BAR REQUIRED IF TOWER IS OVER 200'.
 - 4) CONTRACTOR TO PROVIDE PVC CONDUIT SLEEVE FOR GROUND WIRES THROUGH PAD TO GROUND RING.
 - 5) INSTALL TOWER GROUND RING AT 36" BELOW GRADE OR 6" BELOW FROST LINE, WHICHEVER IS DEEPER. TOWER GROUND RING SHALL BE INSTALLED 2'-0" FROM TOWER FOUNDATION.

5 GROUNDING RISER DIAGRAM
E-4 SCALE: N.T.S.

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REV	DESCRIPTION	BY

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MILWAUKEE, WI 53102

GROUNDING DETAILS
FIRE STATION ENGINE # 22
MW12105B
6814 W. LISBON AVENUE
MILWAUKEE, WI 53222

Voicestream WIRELESS

PROJECT NO: 52030-0-2198
DRAWN BY: RLS
CHECKED BY: FDS
DATE: 09 MAY 2000
PLOT SCALE: 1:1
DRAWING NAME: 12105-E4
SHEET NO.:

E-4

DIVISION 1 - GENERAL REQUIREMENTS

1.0 GENERAL

1.1 INTENT

- A. THESE SPECIFICATIONS AND CONSTRUCTION DRAWINGS ACCOMPANYING THEM DESCRIBE THE WORK TO BE DONE AND THE MATERIALS TO BE FURNISHED FOR CONSTRUCTION.
- B. 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.
- C. 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.
- D. 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.
- E. 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

- A. 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 DIFFERENCES 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.
- B. 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.
- C. NO PLEAS 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

- A. EACH CONTRACTOR IS RESPONSIBLE FOR OBTAINING THE BUILDING PERMIT AT THE LOCAL JURISDICTION AS THE CONTRACTOR-OF-RECORD, AND PROVIDING JURISDICTION WITH ALL PROOF REQUIRED TO OPERATE AS A CONTRACTOR IN THAT JURISDICTION. THE CONTRACTOR SHALL BE REIMBURSED ONLY THE AMOUNT OF ANY FEE PAID AS FOLLOWS:

1. PLAN REVIEW FEE
 2. BUILDING PERMIT FEE
 3. CONNECTIONS AND INSPECTIONS FEE
- E. SEE MASTER CONTRACTOR SERVICES AGREEMENT FOR ADDITIONAL 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

- A. 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.
- B. EXTERIOR: VISUALLY INSPECT EXTERIOR SURFACES AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER. REMOVE ALL TRACES OF SPLASHED MATERIALS FROM ADJACENT SURFACES. IF NECESSARY TO ACHIEVE A UNIFORM DEGREE OF CLEANLINESS, HOSE DOWN THE EXTERIOR OF THE STRUCTURE.
- C. INTERIOR: VISUALLY INSPECT INTERIOR SURFACE AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES, AND OTHER FOREIGN MATTER FROM WALLS/FLOORS/CEILINGS.
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 HOURS 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 CARPENTRY, ELECTRICAL, AND ANTENNA DRAWINGS ARE INTERRELATED. IN PERFORMANCE OF THE WORK, THE CONTRACTOR MUST REFER TO ALL DRAWINGS. ALL COORDINATION IS 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 THREE COPIES OF EACH REQUEST FOR SUBSTITUTION. IN EACH REQUEST IDENTIFY THE PRODUCT OF FABRICATION OR INSTALLATION METHOD TO BE REPLACED BY THE SUBSTITUTION. INCLUDE RELATED SPECIFICATION SECTION, 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

- A. 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 - F

UNIFORM BUILDING CODE (UBC) 1994

BUILDING OFFICIALS AND CODE ADMINISTRATIONS (BOCA) 1996

NATIONAL ELECTRICAL CODE (NEC) WITH LOCAL AMENDMENTS 1999

UNDERWRITER LABORATORIES APPROVED ELECTRICAL PRODUCTS

AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATIONS (AISC)

LIFE SAFETY CODE NFPA - 101 - 1997

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, LANDOWNER REPRESENTATIVE, LOCAL TELEPHONE COMPANY, ELECTRIC COMPANY, AND 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 VOICESTREAM 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 PLACEMENT.

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 POLICES.
- C. CONTRACTOR MUST PROVIDE PROOF OF INSURANCE.

DIVISION 2 SITE WORK AND DRAINAGE 02000 - EARTHWORK, EXCAVATION, AND GRADING

1.0 GENERAL

1.1 WORK INCLUDED

REFER TO THE SURVEY AND SITE PLAN FOR WORK INCLUDED.

1.2 RELATED WORK

- A. CONSTRUCTION FOR EQUIPMENT FOUNDATION
- B. INSTALLATION OF ANTENNA SUPPORT SYSTEM
- C. ERECTION OF FENCE

1.3 DESCRIPTIONS

ACCESS ROAD, TURNAROUND AREAS, AND SITES ARE CONSTRUCTED TO PROVIDE A WELL DRAINED, EASILY MAINTAINED, EVEN SURFACE FOR MATERIAL AND EQUIPMENT DELIVERIES AND MAINTENANCE PERSONNEL ACCESS.

1.4 QUALITY ASSURANCE

VEGETATION AND LANDSCAPING, IF INCLUDED WITHIN THE CONTRACT, WILL BE PLACED AND MAINTAINED AS RECOMMENDED BY NURSERY INDUSTRY STANDARDS.

1.5 SEQUENCING

- A. CONFIRM SURVEY STAKES AND SET ELEVATION STAKES PRIOR TO ANY CONSTRUCTION.
- B. GRUB THE COMPLETE ROAD AND SITE AREA PRIOR TO FOUNDATION CONSTRUCTION OR PLACEMENT OF BACKFILL OR SUB-BASE MATERIAL.
- C. CONSTRUCT TEMPORARY CONSTRUCTION ZONE ALONG ACCESS DRIVE, IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL RULES.
- D. THE SITE AREA WILL BE BROUGHT TO SUB-BASE COURSE ELEVATION AND THE ACCESS ROAD TO BASE COURSE ELEVATION PRIOR TO FORMING FOUNDATIONS.
- E. IF REQUIRED, GRADE, SEED, FERTILIZE, AND MULCH DISTURBED AREAS IMMEDIATELY AFTER BRINGING THE SITE AND ACCESS ROAD TO BASE COURSE ELEVATION. WATER TO ENSURE GROWTH.
- F. REMOVE GRAVEL FROM TEMPORARY CONSTRUCTION ZONE.

1.6 SUBMITTALS

- A. BEFORE CONSTRUCTION
1. IF LANDSCAPING IS APPLICABLE TO THE SCOPE OF THE CONTRACT, REFER TO THE LANDSCAPING PLAN INCLUDED WITH COSTS UNDER NURSERYMAN'S LETTERHEAD (GENERAL REQUIREMENT).

2. SUBMIT FOR APPROVAL THE SPECIFICATIONS OF THE PROPOSED SURFACE COURSE MATERIAL.

B. AFTER CONSTRUCTION

1. PROVIDE FERTILIZER, IF REQUIRED.
2. PROVIDE LANDSCAPING WARRANTY STATEMENT, IF REQUIRED.

1.7 WARRANTY

- A. IN ADDITION TO THE WARRANTY ON ALL CONSTRUCTION COVERED IN THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL REPAIR ALL DAMAGE OF SURROUNDING PROPERTY CAUSED BY CONSTRUCTION.
- B. DISTURBED AREAS WILL REFLECT GROWTH OF NEW GRASS COVER PRIOR TO FINAL INSPECTION.
- C. LANDSCAPING, IF INCLUDED WITHIN THE SCOPE OF THE CONTRACT, WILL BE GUARANTEED FOR 1 YEAR FROM DATE OF FINAL INSPECTION.

2.0 PRODUCTS

2.1 MATERIALS

- A. ROAD AND SITE MATERIALS: FILL MATERIAL - ACCEPTABLE SELECT FILL SHALL BE IN ACCORDANCE WITH LOCAL DEPARTMENT OF HIGHWAY AND PUBLIC TRANSPORTATION STANDARD SPECIFICATION.
- B. SOIL STABILIZER FABRIC SHALL BE MIRA1 - 500X
- C. NON-STRUCTURAL SITE CONCRETE SHALL BE 3000 PSI BREAKING STRENGTH AT 28 DAYS.

2.2 EQUIPMENT

COMPACTING SHALL BE ACCOMPLISHED BY MECHANICAL MEANS. LARGER AREAS SHALL BE COMPACTED BY SHEEPS FOOT, VIBRATORY OR RUBBER TIED ROLLERS WEIGHING AT LEAST 5 TONS. WATER TREATMENT MAY BE REQUIRED TO OBTAIN COMPACTION. SMALLER AREAS SHALL BE COMPACTED BY POWER-DRIVER, HAND YIELD TAMPERS.

3.0 EXCAVATION

3.1 INSPECTIONS

LOCAL BUILDING INSPECTION SHALL BE NOTIFIED NO LESS THAN 48 HOURS IN ADVANCE OF CONCRETE POURS.

3.2 PREPARATION

- A. CLEAR TREES, BRUSH, AND DEBRIS FROM SITE AREA AND ACCESS ROAD RIGHT-OF-WAY AS REQUIRED.

- B. PRIOR TO OTHER EXCAVATION AND CONSTRUCTION EFFORTS, GRUB ORGANIC MATERIALS TO A MINIMUM OF 6 INCHES BELOW ORIGINAL GROUND LEVEL.

- C. UNLESS OTHERWISE INSTRUCTED BY THE OWNER, REMOVE TREES, BRUSH, AND DEBRIS FROM THE PROPERTY TO AN AUTHORIZED LANDFILL.

- D. PRIOR TO PLACEMENT OF FILL OR BASE MATERIALS, REMOVE SOFT SPOTS AND COMPACT TO 85 PERCENT STANDARD PROCTOR.

- E. WHERE UNSTABLE SOIL CONDITIONS ARE ENCOUNTERED, LINE THE GRUBBED AREAS WITH STABILIZER MAT PRIOR TO PLACEMENT OF FILL OR BASE MATERIAL.

3.3 INSTALLATION

- A. THE SITE AND TURNAROUND AREAS SHALL BE AT THE SUB-BASE COURSE ELEVATION PRIOR TO FORMING FOUNDATIONS. GRADE OR FILL THE SITE AND ACCESS ROAD AS REQUIRED WITH THE SOIL RESULTING FROM EXCAVATING THE FOUNDATIONS (PROVIDE EVEN DISTRIBUTION). THE ELEVATIONS ARE TO BE CALCULATED FROM THE RESULTING GRADE.

- B. CLEAR EXCESS SPOILS, IF ANY, FROM JOB SITE AND DO NOT SPREAD BEYOND THE LIMITS OF THE OWNER'S LEASE PROPERTY UNLESS AUTHORIZED BY PROJECT MANAGER, IN WRITING.

- C. THE ACCESS ROAD SHALL BE BROUGHT TO BASE COURSE ELEVATION PRIOR TO FOUNDATION CONSTRUCTION.

- D. AVOID CREATING DEPRESSIONS WHERE WATER MAY POND.

- E. THE CONTRACT INCLUDES ALL NECESSARY GRADING, BANKING, DITCHING, AND UNLESS OTHERWISE INDICATED, COVERING 2 INCHES OF SURFACE COURSE. ALL ROADS OR ROUTES UTILIZED FOR ACCESS TO THE SITE, COMMENCING AT THE POINT OF INTERSECTION WITH THE NEAREST PUBLIC THOROUGHFARE, ARE INCLUDED IN SCOPE UNLESS OTHERWISE NOTED.

- F. WHEN IMPROVING AN EXISTING ACCESS ROAD, GRADE THE EXISTING ROAD TO REMOVE ANY ORGANIC MATTER AND SMOOTH THE SURFACE BEFORE PLACING FILL OR STONE.

- G. PLACE FILL OR STONE IN 6-INCH MAXIMUM LIFTS AND COMPACT BEFORE PLACING NEXT LIFT.

- H. THE FINISH GRADE, INCLUDING TOP SURFACE COURSE, SHALL EXTEND A MINIMUM OF 1 FOOT BEYOND THE SITE FENCE AND SHALL COVER THE AREA AS INDICATED.

- I. RIPRAP SHALL BE APPLIED TO THE SIDE SLOPES OF ALL FENCED SITE AREAS, PARKING AREAS, AND TO ALL OTHER SLOPES GREATER THAN 2:1.

- J. RIPRAP SHALL BE APPLIED TO THE SIDES OF DITCHES OR DRAINAGE SWALES AS INDICATED ON PLANS.

- K. RIPRAP ENTIRE DITCH FOR 6 FEET IN ALL DIRECTIONS AT CULVERT OPENINGS.

- L. SEED, FERTILIZER, AND STRAW COVER SHALL BE APPLIED TO ALL OTHER DISTURBED AREAS AND DITCHES OR DRAINAGE SWALES, NOT OTHERWISE REPRAPPED.

- M. UNDER NO CIRCUMSTANCES WILL DITCHES, SWALES OR CULVERTS BE PLACED SO THEY DIRECT WATER TOWARDS, OR PERMIT STANDING WATER IMMEDIATELY ADJACENT TO THE SITE. IF OWNER DESIGNS OR ELEVATIONS CONFLICT WITH THIS GUIDANCE, ADVISE THE OWNER IMMEDIATELY, IN WRITING.

- N. IF THE DITCH LIES WITH SLOPES GREATER THAN 10 PERCENT, MOUND DIMENSIONARY HEADWALLS IN THE DITCH AT THE UPSTREAM SIDE OF THE HEADWALL AS WELL AS IN THE DITCH FOR 6 FEET ABOVE THE CULVERT ENTRANCE.

- O. SEED AND FERTILIZER SHALL BE APPLIED TO SURFACE CONDITIONS, WHICH WILL ENCOURAGE ROOTING. RAKE AREAS TO BE SEEDDED TO EVEN THE SURFACE AND LOOSEN THE SOIL.

- P. SOW SEED IN TWO DIRECTIONS IN TWICE THE QUANTITY RECOMMENDED BY THE SEED PRODUCER.

- Q. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE GROWTH OF SEEDDED AND LANDSCAPED AREAS BY WATERING UP TO THE POINT OF RELEASE FROM THE CONTRACT. CONTINUE TO REWORK BARE AREAS UNTIL COMPLETE COVERAGE IS OBTAINED.

3.4 FIELD QUALITY CONTROL

COMPACTION SHALL BE 90 PERCENT MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D-1557 FOR SITE WORK AND 95 PERCENT UNDER SLAB AREAS. AREAS OF SETTLEMENT WILL BE EXCAVATED AND REFILLED AT CONTRACTOR'S EXPENSE.

3.5 PROTECTION

- A. PROTECT SEEDDED AREAS FROM EROSION BY SPREADING STRAW TO A UNIFORM LOOSE DEPTH OF 1 TO 2 INCHES, STAKE AND TIE DOWN AS REQUIRED. USE OF EROSION CONTROL MESH OR MULCH NET WILL BE AN ACCEPTABLE ALTERNATE.

- B. ALL TREES PLACED IN CONJUNCTION WITH A LANDSCAPE CONTRACT WILL BE WRAPPED, TIED WITH HOSE PROTECTED WIRE AND SECURED TO 2 INCHES X 2 INCHES X 4 FEET STEEL ANGLE EXTENDING 2 FEET INTO THE GROUND ON FOUR SIDES OF THE TREE.

- C. ALL EXPOSED AREAS SHALL BE PROTECTED AGAINST WASHOUTS AND SOIL EROSION. 02830 FENCE (IF REQUIRED)

REV	DESCRIPTION	BY
1		
2		
3		

LAWGIBB GROUP
LAW ENGINEERING & ENVIRONMENTAL
SERVICES, INC. SUITE
111 E. WISCONSIN AVE.
MILWAUKEE, WI 53202

GENERAL NOTES
FIRE STATION ENGINE # 22
MW12105B
8614 W. LISBON AVENUE
MILWAUKEE, WI 53222

Voicestream
WIRELESS

PROJECT NO.:
52030-0-2196
DRAWN BY:
RIS
CHECKED BY:
FDS
DATE:
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PLOT SCALE:
1:1
DRAWING NAME:
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4.0 GENERAL

4.1 WORK INCLUDED

REFER TO THE SITE PLANS FOR SIZE AND LOCATION OF FENCE AND GATES TO BE INSTALLED.

4.2 RELATED WORK

COORDINATE FENCE GROUNDING WITH ELECTRICAL SUBCONTRACTOR.

4.3 QUALITY ASSURANCE

ALL STEEL MATERIALS UTILIZED IN CONJUNCTION WITH THIS SPECIFICATION WILL BE GALVANIZED OR STAINLESS STEEL. WEIGHT OF ZINC COATING ON THE FABRIC SHALL BE NOT LESS THAN 12 OUNCES PER SQUARE FOOT. POSTS SHALL BE HOT-DIPPED IN GRADE E ZINC, 1.8 OUNCES PER SQUARE FOOT.

4.4 SEQUENCING

IF THE SITE AREA HAS BEEN BROUGHT UP TO SURFACE COURSE ELEVATION PRIOR TO FENCE CONSTRUCTION, FENCE POST EXCAVATION SPOILS MUST BE CONTROLLED TO PRECLUDE CONTAMINATION OF SAID SURFACE COURSE.

4.5 SUBMITTALS

- A. MANUFACTURER'S DESCRIPTIVE LITERATURE.
B. CERTIFICATE OF COMPLIANCE THAT SPECIFICATIONS HAVE BEEN MET.

4.6 APPLICABLE STANDARDS

- ASTM-A120 SPECIFICATION FOR PIPE, STEEL BLACK AND HOT-DIPPED ZINC COATED (GALVANIZED) WELDED AND SEAMLESS FOR ORDINARY USES.
ASTM-A123 ZINC (HOT-DIP GALVANIZED) COATING ON IRON AND STEEL PRODUCTS.
ASTM-A153 STANDARD SPECIFICATION FOR ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE.
ASTM-A392 SPECIFICATION FOR ZINC-COATED STEEL CHAIN LINK FENCE FABRIC.
ASTM-A491 SPECIFICATION FOR ALUMINUM-COATED STEEL CHAIN LINK FENCE FABRIC.
ASTM-A525 STANDARD SPECIFICATION FOR STEEL SHEET ZINC COATED (GALVANIZED) BY THE HOT-DIPPED PROCESS.
ASTM-A570 SPECIFICATION FOR HOT-ROLLED CARBON STEEL SHEET AND STRIP STRUCTURAL QUALITY.
ASTM-A585 SPECIFICATION FOR ALUMINUM COATED STEEL BARBED WIRE.
FEDERAL SPECIFICATION RR-F-191-FENCING, WIRE, POST METAL (AND GATES, CHAIN LINK FENCE FABRIC AND ACCESSORIES).

5.0 PRODUCTS

5.1 FENCE MATERIAL

- A. ALL FABRIC WIRE, RAILS, POLES, HARDWARE, AND OTHER STEEL MATERIALS SHALL BE HOT-DIPPED GALVANIZED.
B. FABRIC SHALL BE 6-FOOT HIGH (VERIFY WITH PRODUCT MANAGER) 2-INCH CHAIN LINK MESH OF NO. 9 GAUGE (0.148 INCH) WIRE. THE FABRIC SHALL HAVE A KNOCKLED FINISH FOR THE TOP AND BOTTOM EDGES; FABRIC SHALL CONFORM TO THE SPECIFICATIONS OF ASTM A-392 CLASS 1.
C. ALL POSTS SHALL BE SCHEDULE 40 GALVANIZED STEEL PIPE AND SHALL BE TYPE 1 ASTM A-128 AND OF THE FOLLOWING DIAMETER (OO PER FENCE INDUSTRY STANDARD).
1. LINE 1 7/8 INCHES
2. CORNER 3 INCHES
3. GATE 3 INCHES
D. ALL TOP AND BRACE RAILS SHALL BE 1 1/4-INCH DIAMETER SCHEDULE 40 MECHANICAL-SERVICE PIPE. FRAMES SHALL HAVE WELDED CORNERS.
E. GATE FRAMES SHALL HAVE A FULL-HEIGHT VERTICAL BRACE AND A FULL-WIDTH HORIZONTAL BRACE. SECURED IN PLACE BY USE OF GATE BRACE CLAMPS.
F. GATE HINGES SHALL BE MERCHANTS METAL MODEL 64386 HINGE ADAPTOR WITH MODEL 6409, 188-DEGREE ATTACHMENT, OR EQUAL.
G. THE GUIDE (LATCH ASSEMBLY) SHALL BE MERCHANTS METAL MODEL 2083, OR EQUAL.
H. LATCHES, STOPS, AND KEEPERS SHALL BE PROVIDED FOR ALL GATES.
I. ALL STOPS SHALL HAVE KEEPERS CAPABLE OF HOLDING THE GATE LEAF IN THE OPEN POSITION.
J. DOUBLE GATES SHALL HAVE A FULL HEIGHT PLUNGER BAR WITH DOME CAP.
K. A NO. 9 GAUGE ZINC COATED TENSION WIRE SHALL BE USED AT THE BOTTOM OF THE FABRIC, TERMINATED WITH BAND CLIPS AT CORNER AND GATE POSTS.
L. PLACE A 6-INCH BY 1/2 INCH DIAMETER EYE-BOLT TO HOLD TENSION WIRE AT LINE POSTS.
M. STRETCHER BARS SHALL BE 3/16 INCH BY 3/4 INCH OR HAVE EQUIVALENT CROSS SECTIONAL AREA.
N. ALL CORNER, GATE, AND END PANELS SHALL HAVE A 3/8 INCH TRUSS ROD WITH TURNBUCKLES.
O. ALL POSTS, EXCEPT GATE POSTS, SHALL HAVE A COMBINATION CAP AND BARBED

- WIRE SUPPORTING ARM. GATE POSTS SHALL HAVE A DOME CAP.
P. OTHER HARDWARE INCLUDES BUT MAY NOT BE LIMITED TO THE CLIPS, BAND CLIPS, AND TENSION BAND CLIPS.
Q. BARBED WIRE GATE GUARDS SHALL BE FITTED WITH DOME CLIPS.
R. BARBED WIRE SUPPORT ARMS SHALL BE CAST IRON WITH SET BOLD AND LOCK WIRE IN THE ARM.

- S. ALL CAPS SHALL BE CAST STEEL.

6.0 EXECUTION

6.1 EQUIPMENT

EXCAVATE POSTHOLES WITH MECHANICAL AUGER EQUIPMENT.

6.2 INSPECTION

EXCAVATE POSTHOLES PER CONSTRUCTION DOCUMENTS. CONFIRM PROPER DEPTH AND DIAMETER OF POSTHOLE EXCAVATIONS.

6.3 INSTALLATION

- A. POST FOUNDATIONS SHALL HAVE A MINIMUM 6-INCH CONCRETE COVER UNDER POST.
B. ALL FENCE POSTS SHALL BE VERTICALLY PLUMB WITHIN 1 INCH IN 8 FEET.
C. AT CORNER POSTS, GATE POSTS, AND SIDES OF GATE FRAME, FABRIC SHALL BE REATTACHED WITH STRETCHER AND TENSION BAND CLIPS AT 15-INCH INTERVALS.
D. AT LINE POSTS, FABRIC SHALL BE ATTACHED WITH BAND CLIPS AT 15-INCH INTERVALS.
E. ATTACH FABRIC TO BRACE RAILS, TENSION WIRE, AND TRUSS RODS WITH TIE CLIPS AT 2-FOOT INTERVALS.
F. A MAXIMUM GAP OF 2 INCHES WILL BE PERMITTED BETWEEN THE CHAIN LINK FABRIC AND THE FINAL GRADE.
G. GATES SHALL BE INSTALLED SO LOCKS ARE ACCESSIBLE FROM BOTH SIDES.
H. CONCRETE FOR FENCE POSTS SHALL HAVE A MINIMUM OF 2,500 PSI BREAKING STRENGTH AT 28 DAYS.

6.4 PROTECTION

UPON COMPLETION OF ERECTION, INSPECT FENCE MATERIAL AND PAINT FIELD CUTS OR GALVANIZING BREAKS WITH ZINC-BASED PAINT COLOR TO MATCH THE GALVANIZING PROCESS.

DIVISION 13 - SPECIAL CONSTRUCTION

13100 TOWER AND ANTENNA INSTALLATION

7.0 GENERAL

7.1 WORK INCLUDED

- A. IF REQUIRED, ERECT FURNISHED TOWER.
B. GROUND TOWER TEMPORARILY DURING ERECTION. GROUNDING SHALL INCLUDE BASE(S) AND ANCHORS.
C. IF REQUIRED, INSTALL THREE (3) SIDE ARMS, CONSISTING OF THREE (3) 6 FEET AS INDICATED ON DRAWINGS - CONFIRM WITH OWNER REPRESENTATIVE.
D. INSTALL ANTENNAS AS INDICATED ON DRAWINGS AND OWNER SPECIFICATIONS.
E. INSTALL GALVANIZED STEEL ANTENNA MOUNTS AS INDICATED ON DRAWINGS.
F. INSTALL FURNISHED GALVANIZED STEEL WAVEGUIDE LADDER.
G. INSTALL WAVEGUIDE BRIDGE AS INDICATED ON DRAWING.
H. SUPPLY AND INSTALL ONE INSULATED GROUND BAR AT EQUIPMENT CABINET.
I. SUPPLY AND INSTALL GROUNDING STRAP KITS WITH LONG BARREL COMPRESSION LUGS (SIMILAR TO ANDREW-2237007ED OR APPROVED EQUAL) ATOP TOWER BASE BEFORE ENTERING THE EQUIPMENT. GROUNDING STRAPS TO BE CONNECTED TO INSULATED GROUND BAR.
J. ASSIST OWNER TECHNICIANS IN PERFORMING SWEEP TEST OF INSTALLED COAX.
K. CONCRETE PIERS FOR FOUNDATIONS SHALL BE DRILLED AND POURED ON THE SAME DAY.

8.0 RELATED WORK

8.1 REQUIREMENTS OF REGULATORY AGENCIES

- A. FURNISH UL LISTED EQUIPMENT WHERE SUCH LABEL IS AVAILABLE, INSTALL IN CONFORMANCE WITH UL STANDARDS WHERE APPLICABLE.
B. INSTALL ANTENNA, ANTENNA CABLES, AND GROUNDING SYSTEM IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS 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. EIA - ELECTRONIC INDUSTRIES ASSOCIATION EIA22F. STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES.
2. FAA - FEDERAL AVIATION ADMINISTRATION ADVISORY CIRCULAR AC 70/7460-1H, OBSTRUCTION MARKING AND LIGHTING.
3. 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.

- 4. AISC - AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS.
5. NEC - NATIONAL ELECTRICAL CODE (LATEST EDITION) - ON TOWER LIGHTING KITS.
6. UL - UNDERWRITER'S LABORATORIES APPROVED ELECTRICAL PRODUCTS.
7. IN ALL CASES, PART 77 OF 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.
8. LIFE SAFETY CODE NFPA - 101 (LATEST EDITION)

DIVISION 16 - GENERAL ELECTRIC PROVISION

- A. SUBMITTAL OF BID INDICATES CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.
B. CONTRACTOR SHALL PERFORM ALL VERIFICATIONS TO INCLUDE FIELD MEASUREMENTS, OBSERVATION TESTS, UTILITIES/SERVICE REQUIREMENTS, AND EXAMINATION OF WORK SITE PRIOR TO ORDERING THE ELECTRICAL EQUIPMENT AND THE ACTUAL CONSTRUCTION. CONTRACTOR SHALL ISSUE A NOTICE OF ALL FINDINGS TO THE ENGINEER LISTING ALL MALFUNCTIONS, FAULTY EQUIPMENT, AND DISCREPANCIES.
C. ALL EQUIPMENT AND MATERIAL FURNISHED AND INSTALLED UNDER THIS CONTRACT SHALL BE UNDERWRITERS LABORATORIES (UL) LISTED, NEW, FREE FROM DEFECTS, AND SHALL BE GUARANTEED FOR A PERIOD OF 1 YEAR FROM DATE OF FINAL ACCEPTANCE BY THE OWNER OR HIS REPRESENTATIVE. SHOULD ANY TROUBLE DEVELOP DURING THIS PERIOD DUE TO FAULTY WORKMANSHIP, MATERIAL, OR EQUIPMENT, THE CONTRACTOR SHALL FURNISH ALL NECESSARY MATERIALS AND LABOR TO CORRECT THE TROUBLE WITHOUT COST TO THE OWNER.
D. THESE PLANS ARE DIAGRAMMATIC ONLY, FOLLOW AS CLOSELY AS POSSIBLE.
E. ALL WORK IS TO COMPLY WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE (NEC) AND ANY LOCAL ORDINANCES, CODES, AND ALL OTHER ADMINISTRATIVE AUTHORITIES HAVING JURISDICTION. THE CONTRACTOR SHALL FURNISH AND PAY FOR ALL PERMITS AND RELATED FEES.
F. ALL MATERIAL AND EQUIPMENT 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 NEMA.
G. 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.
H. ALL WORK SHALL BE EXECUTED IN A WORKMAN LIKE MANNER AND SHALL PRESENT A NEAT MECHANICAL APPEARANCE WHEN COMPLETED. CONTRACTOR SHOULD AVOID DAMAGE TO EXISTING UTILITIES WHEREVER POSSIBLE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING RELATED TO ELECTRICAL WORK, AND SHALL RESTORE ALL EXISTING LANDSCAPING, SPRINKLER SYSTEMS, CONDUIT, WIRING, PIPING, ETC., DAMAGED BY THE ELECTRICAL WORK TO MATCH EXISTING CONDITIONS.
I. CONTRACTOR TO PROVIDE POWER AND TELEPHONE TO SERVICE POINTS PER UTILITY COMPANY REQUIREMENTS. CONTRACTOR SHALL CONTACT UTILITY SERVICE PLANNERS AND OBTAIN ALL SERVICE REQUIREMENTS AND INCLUDE COST FOR SUCH IN BID. COORDINATE DAILY WITH THE PROJECT MANAGER UNTIL FINAL ELECTRICAL SERVICE IS IN EFFECT.
J. ALL WIRING SHALL BE STRANDED COPPER WITH THIN/THIN 600 VOLTS INSULATION AND NO SMALLER THAN NO. 12 AWG UNLESS OTHERWISE SPECIFIED. ALL GROUND CONDUCTORS SHALL BE PROPERLY SIZED COPPER OR OTHER CORROSION RESISTANT CONDUCTIVE MATERIAL (STRANDED OR SOLID). 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 (OSHA).
K. SERVICE EQUIPMENT SHALL HAVE A SHORT CIRCUIT WITHSTAND RATING EQUAL TO OR EXCEEDING THE MAXIMUM AVAILABLE FAULT CURRENT AT THE SUPPLY TERMINAL ON THE UTILITY TRANSFORMER SECONDARY. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES. THE INSTALLATION SHALL BE FREE FROM ANY SHORT CIRCUITS.
P. CONDUIT:
1. ALL CONDUIT INSTALLED SHALL BE SURFACE MOUNTED OR DIRECT BURIAL UNLESS OTHERWISE NOTED.
2. RIGID CONDUIT (INSTALLED IN OR UNDER CONCRETE SLABS IN CONTACT WITH

- EARTH, UNDER PUBLIC ROADWAYS, SHALL BE UL LABELED GALVANIZED ZINC COATED WITH ZINC INTERIOR. RIGID CONDUIT IN CONTACT WITH EARTH SHALL BE 1/2 LAPPED WRAPPED WITH HUNTS PROCESS NO. 3.
3. ABOVE GROUND CONDUIT SHALL BE PVC SCHEDULE 80, BELOW GROUND PVC SCHEDULE 40, UNLESS OTHERWISE NOTED.
4. FLEXIBLE METALLIC CONDUIT SHALL HAVE A UL 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.
5. PARALLEL UNDERGROUND CONDUIT SHALL BE BURIED AT A MINIMUM DEPTH OF 30 INCHES BELOW GRADE - STACKED UNDERGROUND CONDUIT SHALL BE BURIED AT A MINIMUM DEPTH OF 24 TO 30 INCHES BELOW GRADE.
6. SERVICE CONDUITS SHALL HAVE NO MORE THAN TWO (2) 90-DEGREE BENDS IN ANY SINGLE RUN. THE CONTRACTOR SHALL PROVIDE PULL BOXES AS NEEDED WHERE CONDUIT REQUIREMENTS EXCEED THESE CONDITIONS. PULL WIRES AND CAPS SHALL BE PROVIDED AT ALL SPARE CONDUIT FOR FUTURE USE.
7. ALL COAX, POWER, AND TELEPHONE SYSTEMS CONDUITS SHALL HAVE A MINIMUM 24-INCH RADIUS SWEEP TO EQUIPMENT, PULLBOXES, MONOPOLE, ETC., UNLESS OTHERWISE NOTED, OR AS REQUIRED BY UTILITY COMPANIES.
M. UPON COMPLETION OF WORK, CONDUCT CONTINUITY, SHORT CIRCUIT, AND FALL OF POTENTIAL GROUND TESTS FOR APPROVAL. SUBMIT TEST REPORTS TO PROJECT MANAGER. PROVIDE AS BUILT, ALL BROCHURES, OPERATING MANUALS, CATALOGS, ETC., TO THE OWNER. CLEAR PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION.
N. METER SOCKET AMPERES, VOLTAGE, NUMBER OF PHASES, SHALL BE NOTED ON THE DRAWINGS, MANUFACTURED BY "SQUARE D COMPANY," OR APPROVED EQUAL.
O. ELECTRICAL SERVICE WILL BE 120/240 VAC, SINGLE PHASE, 3 WIRE, 200 AMP SERVICE.
P. ALL ELECTRICAL EQUIPMENT SHALL BE LABELED WITH PERMANENT ENGRAVED PLASTIC LABELS.
Q. USE T-TAP CONNECTIONS ON ALL MULTI-CIRCUITS WITH COMMON NEUTRAL CONDUCTOR FOR LIGHTING FIXTURES.
R. FUSE TYPE SHALL BE BUSMAN RK1 LOW PEAK FUSE (LP-RK-100).
S. ALL ELECTRICAL EQUIPMENT SHALL BE ANCHORED TO WITHSTAND 100 MPH WIND SPEED AND DESIGNED FOR OUTDOOR EXPOSURE.
T. CONTRACTOR TO COLOR PHASE CONDUCTORS RED (A PHASE), BLACK (B PHASE), WHITE (NEUTRAL), AND GREEN (GROUND).
U. BACKUP BATTERIES ARE SEALED CELL BATTERIE

GROUNDING STANDARDS

1.0 DEFINITIONS

- AGB: ANTENNA GROUND BAR
AWG: AMERICAN WIRE GAUGE
BTS: BASE TRANSCIVER STATION
CAD WELDING: AN EXOTHERMIC WELDING PROCESS, WHICH CREATES POSITIVE CONTACT OF GROUNDING CONDUCTORS
EMT: ELECTRICAL METAL TUBING (LIGHT GAUGE METAL CONDUIT)
MGB: MASTER GROUND BAR
PCV: POLYVINYL CHLORIDE CONDUIT
RFI: RADIO FREQUENCY INTERFERENCE
SAGB: SURGE ARRESTOR GROUND BAR

2.0 GENERAL GROUNDING CRITERIA

- A. TEST GROUNDING RESISTANCE TO WITHIN 1 TO 5 OHMS OVERALL GROUND RESISTANCE. WHERE THE EFFECTIVE RESISTANCE DOES NOT MEET THIS CRITERIA, PROVIDE SUPPLEMENTAL GROUNDING AND RETEST UNTIL GROUND RESISTANCE FALLS BELOW THIS LEVEL. SUPPLEMENTAL GROUND MAY CONSIST OF ONE OR MORE OF THE FOLLOWING:
1. COUNTERPOISE
2. UFER GROUND
3. GROUND ROD AND/OR GROUND WELL IN EXTREMELY ADVERSE SOIL CONDITIONS (MONOPOLE INSTALLATIONS)
FOR INSTALLATIONS WHERE WOODEN STRUCTURES, TOWERS, CONCRETE SILOS, ETC., ARE ENCOUNTERED, A SEPARATE DOWNLOAD SHALL BE PROVIDED FROM THE ANTENNAS SEPARATED BY A MINIMUM OF 12 INCHES FROM THE COAXIAL CABLES. THE GROUND CONDUCTOR SHALL BE SECURELY FASTENED TO THE EXTERIOR OF OUTSIDE STRUCTURES WITH NON-METALLIC GROUND STRAPS EVERY 10 FEET.

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3.0 STATION GROUNDING SYSTEM

3.1 MATERIALS

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

NO. 2 AWG, INSULATED STRANDED COPPER CABLE IS ACCEPTABLE FOR INTERIOR GROUND BAR CONDUCTORS.

5/8 INCH X 8 FEET-0 INCH GROUND RODS OF SOLID COPPER, STAINLESS STEEL OR COPPER CLAD HIGH STRENGTH STEEL.

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

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

SOLID COPPER PLATES OF MINIMUM 3 FEET X 3 FEET X 1/4 INCH SIZE AS SPECIFIED.

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

NO. 6 AWG STRANDED INSULATED (GREEN) FOR ALL INTERNAL EQUIPMENT GROUNDING.

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.

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

ALL LUG TYPE 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 BITS AND ANY OTHER METALLIC OBJECTS AROUND THE BITS.

IF A MGB IS NOT PROVIDED WITH THE BITS, THE MGB SHALL BE AS FOLLOWS: THE MGB IS A COPPER BAR MEASURING 4 INCHES WIDE X 24 INCHES LONG X 1/4 INCH LOCATED AS CLOSE TO THE BITS AS POSSIBLE. THE MGB SHALL HAVE A MINIMUM NUMBER OF 28 HOLES MEASURING 3/8 INCH. GROUND BAR SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS.

TWO NO. 2 TINNED SHALL BE MECHANICALLY ATTACHED (2-HOLE COMPRESSION LUG 3/8 INCH HOLES, 1 INCH 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 GROUND 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 INCHES WIDE X 24 INCHES LONG X 1/4 INCH ON WHICH THE COAXIAL CABLE FROM THE ANTENNAS ARE PRIMARILY GROUND TO. 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 FEET THERE SHALL BE A THIRD AGB LOCATED AT THE MIDDLE OF THE TOWER.) THE AGB SHALL HAVE A MINIMUM OF 28 HOLES MEASURING 3/8 INCH. GROUND BARS SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. USE NO. 2 AWG SOLID TINNED WIRE WITH 2-HOLE SHORT BARREL COMPRESSION LUGS 3/8 INCH HOLES, 1 INCH 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 (SAGB)

THE PURPOSE OF THE SURGE ARRESTOR GROUND BAR IS FOR LIGHTNING PROTECTION.

THE SURGE ARRESTOR GROUND BAR IS A 3 INCHES WIDE X 24 INCHES LONG X 1/4 INCH COPPER BAR. IT IS LOCATED IN THE WAVE GUIDE BRIDGE CLOSE TO THE EQUIPMENT. THE SAGB SHALL HAVE A MINIMUM OF 28 HOLES MEASURING 3/8 INCH. HOLES SHALL BE IN PAIRS THAT ARE 1 INCH CENTER TO CENTER. THE GROUND BAR SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS.

3.5 GROUND ROD AND GROUND RING PLACEMENT

THE OUTSIDE GROUND RING SHALL BE PLACED AROUND THE BITS AT A DISTANCE OF 2 FEET FROM THE BITS AT A DEPTH OF 2 FEET 6 INCHES OR 6 INCHES 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 MINIMALLY ALONG THE RING AT THE FOLLOWING LOCATIONS:

- BELOW THE AREA OF THE INTERNAL MASTER GROUND BAR (MGB) FOR CONNECTION TO THE MGB.
- BELOW THE UTILITY RACK FOR CONNECTION TO THE MAIN BUILDING COMMERCIAL POWER DISCONNECT.
- BELOW THE CORNERS OF THE BITS.
- AS REQUIRED TO ACHIEVE A MAXIMUM SPACING OF 8 FEET BETWEEN GROUND RODS ALONG THE RING PERIMETER.
- AS REQUIRED ALONG THE RING PERIMETER TO ACHIEVE 5 OHMS OR LESS RESISTANCE WHEN TESTED.
- TWO RODS LOCATED ON OPPOSITE SIDES AT EACH TOWER LEG OR MONOPOLE.
- ONE ROD LOCATED BENEATH EACH END OF THE WAVE-GUIDE BRIDGE OR CABLE TRAY.
- ONE ROD LOCATED ADJACENT TO THE STANDBY GENERATOR, AND IF SEPARATED BY MORE THAN 8 FEET.

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

3.6 TOWER GROUNDING

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 NO. 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 GROUND AT TWO POINTS USING A HARD-SHELL COAXIAL CABLE KIT FROM THE MANUFACTURER OF THE ANTENNA CABLE. A TYPICAL INSTALLATION SHALL BE AS FOLLOWS:

- 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.
- 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 BITS. THIS GROUND SHALL BE TERMINATED AT THE AGB. THE AGB SHALL HAVE TWO (2) LEADS OF NO. 2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE INCASED IN PVC PIPE.
- THE THIRD GROUND SHALL BE ON THE SURGE ARRESTOR GROUND, BE ATTACHED TO THE CABLE ON STRAIGHT RUNS (NOT WITHIN BENDS), AND BE WEATHER PROOFED PER THE MANUFACTURER'S SPECIFICATIONS. THE SURGE ARRESTORS SHALL BE GROUND TO THE GROUND BAR. THE SAGB SHALL HAVE TWO LEADS OF NO. 2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE INCASED IN PVC PIPE.

3.8 PERIMETER FENCE GROUNDING

A. CORNER AND END POSTS
ALL FENCE CORNER AND END POSTS (MINIMUM OF TWO) SHALL HAVE ONE NO. 2 SOLID TINNED COPPER GROUND WIRE CONNECTED TO A 5/8 INCH X 8 FEET SOLID COPPER CLAD GROUND ROD NEXT TO THE POST. THESE POSTS SHALL BE CONNECTED TO THE GROUND RING WITH A NO. 2 SOLID TINNED COPPER GROUND WIRE AND INTERMEDIATE GROUND RODS IF THE DISTANCE FROM THE POST TO THE GROUND RING EXCEEDS 8 FEET. IN NO CASE SHALL ANY PORTION OF THE SAME FENCE REMAIN DISCONNECTED FROM THE GROUND RING.

B. GATE POSTS
GATE POSTS SHALL BE GROUND TO EACH OTHER TO ENSURE THE ENTIRE FENCE HAS ELECTRICAL CONTINUITY. CONNECTIONS SHALL BE DRILLED AND TAPPED WITH BURNDY TYPE KC22 TO THE POST WITH A NO. 2 AWG BARE SOLID TINNED COPPER WIRE BETWEEN BURNDY CONNECTIONS. CONNECT POST GROUND TO GROUND RING USING CAD WELD CONNECTIONS AND INTERMEDIATE GROUND RODS, IF DISTANCE FROM GATE TO GROUND RING EXCEEDS 8 FEET. IN NO CASE SHALL ANY PART OF THE GATE REMAIN DISCONNECTED FROM THE GROUND RING.

C. GATES
GATES SHALL BE BONDED TO GATE POSTS WITH AN 18 INCH BRAIDED STRAP TYPE 8018032. THE CONNECTIONS SHALL BE BURNDY 2-HOLE LUGS (3/8 INCH HOLES, 1 INCH CENTER-TO-CENTER) BOLTED THROUGH EACH POST.

D. ALL DOWN LEADS TO EARTH WILL BE INCASED IN 3/4 INCH PVC, NON-METALLIC AND SEALED WITH SILICONE.

3.9 GENERATOR FUEL TANK GROUNDING (IF REQUIRED)

THE GENERATOR FUEL TANK, IF REQUIRED, SHALL BE CONNECTED IN AT LEAST ONE PLACE TO THE MAIN EXTERIOR GROUND RING. NO. 2 AWG BARE SOLID TINNED COPPER WIRE SHALL BE BURNDY CONNECTED TO ONE SUPPORT LEG OF THE FUEL TANK AND CAD WELD TO THE NEAREST EXTERIOR GROUND RING GROUND ROD.

3.10 A/C COMMERCIAL POWER GROUNDING CONNECTIONS

AT THE ON-SITE RISER POLE LOCATION OR UNDERGROUND SERVICE ENTRANCE LOCATION, THE A/C SERVICE SHALL BE MECHANICALLY BONDED TO THE A/C SERVICE ENTRANCE GROUND AS SPECIFIED BY THE NATIONAL ELECTRIC CODE, ARTICLE 250, AND/OR APPROPRIATE LOCAL CODES. A SEPARATE GROUND ROD SHALL BE PROVIDED AT THIS POINT, AND SHALL BE CONNECTED TO THE EXTERIOR GROUND RING. A SEPARATE A/C SERVICE GROUND AND NEUTRAL SHALL THEN BE ROUTED TO AND CONNECTED TO THE MAIN DISCONNECT INSIDE THE BUILDING (WHERE APPLICABLE) OR AS REQUIRED BY LOCAL AUTHORITY.

3.11 GENERATOR RECEPTACLE GROUNDING

THE GENERATOR RECEPTACLE (HUBBELL PLUG), SHALL BE GROUND TO THE EXTERIOR GROUNDING RING (EGR).

3.12 COAX BRIDGE/CABLE TRAY GROUNDING

BOND THE COAX BRIDGE OR CABLE TRAY TO THE AGB WITH NO. 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 NO. 2 SOLID WITH COMPRESSION LUGS.

3.13 CAD WELD AND BURNDY CONNECTION

CAD WELLS (EXOTHERMIC WELDS) AND BURNDY CONNECTIONS SHALL BOND ALL UNDERGROUND AND DAMP LOCATION CONNECTIONS, SHELTER SKID GROUNDS, TOWER OR MONOPOLE GROUNDS, FENCING CORNER AND GATE POSTS, ANTENNA GROUND BARS (AGB), SURGE ARRESTOR GROUND BAR (SAGB), 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 CONNECTIONS 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.

3.14 CHEMICAL GROUND RODS

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.

3.15 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 A 1-FOOT RADIUS WITH A 3-FOOT RADIUS PREFERRED. NO RIGHT ANGLE OR SHARP BENDS SHALL BE ALLOWED.

3.16 BONDING PREPARATION AND 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 PROVIDED 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.

3.17 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.

3.18 SPECIAL CONDITIONS

WHEN SOIL CONDITIONS EXIST (I.E., NON-COMPACTABLE ROCK, GRAVEL, SHALE, ETC.) THAT PREVENTS THE INSTALLATION OF THE STANDARD GROUNDING SYSTEM AND PROCEDURES, THEN VERBAL PROCEDURES SHALL BE REQUESTED BY THE PROJECT MANAGER.

3.19 EXTERNAL GROUND RING

THE EXTERNAL GROUND RING SHALL EXTEND TO THE MAXIMUM ALLOWABLE DEPTH IN 95 PERCENT COMPACTABLE SOIL.

3.20 GROUND RODS (REPLACEMENT)

WHEN GROUND RODS CANNOT BE DRIVEN INTO THE SOIL VERTICALLY TO A DEPTH DESCRIBED IN PARAGRAPH 3.5, AND REMAIN IN 95 PERCENT COMPACTABLE SOIL, THEN THE FOLLOWING METHODS OF SUBSTITUTION MAY BE USED. THESE ARE SUGGESTED METHODS ONLY, AND EACH CASE SHOULD BE REVIEWED BY THE VOICESTREAM PCS PROJECT MANAGER. THE PURPOSE IS TO ACHIEVE THE LOWEST IMPEDANCE TO GROUND, IN ANY CASE, EQUAL TO OR LESS THAN 5 OHMS.

3.21 ROCK WITH SOME OR NO SOIL COVER

R. FOR SITES WHICH HAVE SOIL CONDITIONS WHICH CONSIST OF SOLID OR SEMI-SOLID ROCK BELOW ABOUT 3 FEET OF COMPACTABLE SOIL, A COMBINATION OF METHODS MAY BE USED:

- A COMBINATION OF SHORT GROUND RODS MAY BE USED WITH 3 FEET SQUARE 1/4 INCH COPPER PLATES. A MINIMUM OF TWO PLATES SHOULD BE USED AND SHOULD REPLACE GROUND RODS ON AN EQUIVALENCY OF TWO GROUND ROD LENGTHS PER COPPER PLATE. THE COPPER PLATE SHOULD BE PLACED IN A MINIMUM 3 INCH BENTONITE BASE AND COVERED WITH 3 INCH OF BENTONITE FILL PRIOR TO BACKFILL.
- AN ACTIVE TYPE CHEMICAL RODE SYSTEM MAY BE USED. THIS IS AN ENGINEERING JUDGMENT AND SHOULD BE USED ONLY WHERE NECESSARY, DUE TO EXPENSE. IN ALL CASES, THE STANDARD PRACTICES OUTLINED IN THIS DOCUMENT SHOULD BE FOLLOWED TO THE EXTENT THAT IS APPLICABLE, AND SHOULD BE MODIFIED AS TO THE QUANTITY OF GROUND RODS AND CONDUCTOR SIZE ONLY AS RECOMMENDED BY THE MANUFACTURER OF THE GROUND ROD SYSTEM.
- A SYSTEM UTILIZING CORED SHAFTS, STANDARD GROUND RODS ON A TYPICAL LAYOUT, WITH A BENTONITE (CLAY) BACKFILL. IN THIS CASE EACH GROUND ROD SHOULD BE TESTED INDIVIDUALLY, AND EACH ROD SHOULD HAVE AN ACCESS BOX PLACED FOR FUTURE TESTING.

REV	DESCRIPTION	BY

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