Scope of Work for Communication Tower Installation at Smithfield Station.

Project: TEX Rail Commuter Rail Line

Subject: Communication Tower at Smithfield Station

Description of Work:

The TEX Rail Radio Subsystem is to provide voice communication between the Rail Control Centers to the trains and maintenance personal (within a 1 mile of the right of way) along the TEX Rail corridor. Portion of the Right of Way (ROW) is shared with Trinity Railway Express (TRE), another portion is shared with Fort Worth & Western Railroad (FWWR), and two portions of the ROW are under exclusive use of TEX Rail.

Communication tower install consist of a 60' tilt-down type tower installed on a 10' helical drill in foundation. This tower is to be installed on TEX Rail right-of-way at Smithfield Station. in conformance with all TEX Rail contract specifications, standards & safety requirements.

Objective:

The TEX Rail Radio Subsystem shall provide coverage for 98% of the alignment for 99% of the time. This is to be achieved by three 160MHz base stations located along the alignment with one of the base station locations at Smithfield Station. The other two locations are CP Grapevine West and Northside station. Each of the 3 towers are standalone towers, this is due to the coverage design, the specifications it must meet for installation, its shared usage with other class 1 railroads.

Tasks:

Installation consists of first installing 10' tower foundation that is drilled by augur motor attachment to a required torque value. The use of this type of foundation eliminates the need for open excavation and provides minimal impact to native soil.

Next, the 60' tilt-down type tower is installed onto foundation. The tower base has a hinge-type pivot that allows the tower to be mounted while laying horizontally on the ground then raised by telescoping fork-lift or back-hoe after base is attached to foundation. Use of tilt-down style towers allows for safe and efficient antenna installation and maintenance by using ratchet system to lower tilt portion of antenna while working.

Last, a trench is excavated approximately 30" in depth from tower location to house – approximately 30'. A 2" flexible, liquid tight conduit is installed into trench and backfilled.

Northside Station – The communication tower's proposed location is approximately at STA 30008+00. It shall be installed in a location that is at least 30' minimum to the east of the Communication Facility building.

Site #	Site Name	Latitude	Longitude	Deg	Min	Sec	Deg	Min	Sec	Ground Elev. (ft)	Tower type
1	North Side Station	32.795378	-97.337989	32	47	43.4	-97	20	16.8	559	60-foot, tilting
2	Smithfield Station	32.865278	-97.210694	32	51	55.0	-97	12	38.5	645	60-foot, tilting
3	Grapevine West	32.933398	-97.080472	32	55	58.9	-97	5	2.3	636	60-foot, tilting

1. PURPOSE

The purpose of this document is to provide the Fort Worth Transit Authority (FWTA) with an understanding of the system design, components, and integration approach being proposed for the 160 MHz Radio Subsystem. The ultimate goal is to provide a radio system which completely meets the specifications and intent for reliable voice radio service on and near the TEXRail right-of-way.

2. REFERENCE MATERIAL

Section 16870 Radio Subsystem (and the specifications/standards cited therein)

Section 16863 Control Center Integrated Voice Communication Subsystem (and the specifications/standards cited therein)

RF coverage analysis document: Appendix G - TEXRail 160 MHz Analysis v3 0 20170918.pdf

3. SYSTEM DESIGN

3.1. RF COVERAGE ANALYSIS

An RF coverage analysis was performed using EDX SignalPro to determine what hardware and configuration are needed to achieve a delivered audio quality (DAQ) of 3.4 on the entire right-of-way (ROW) and one mile in each direction from the ROW.[1] The analysis indicated that the coverage goal could be met by building radio base stations at: 1) North Side Station, 2) Smithfield station, and 3) Control Point (CP) Grapevine West. More detail is presented in the coverage analysis document "TEXRail 160 MHz Analysis v3 0 20170918.pdf", submitted in Appendix G.

3.2. FREQUENCY PLANNING

The frequencies needed to provision the base stations will be issued by the AAR frequency coordinator, Transportation Technology Center Inc. (TTCI). The channel plan will be evaluated by TTCI using their Planet prediction tool, and independently verified by Xorail using EDX SignalPro. The radios can be operated on carrier squelch for the sake of interoperability – though coded squelch should also be considered.

While an over-the-air repeater was originally envisioned to repeat a voice traffic on the entire right-of-way (ROW), such a repeater and its cavity duplexer system would not be quickly retuneable to operate on TRE channels on an emergency basis. As an alternative, two 160 MHz band voice channels will be requested from the frequency coordinator. Channel #1 would be used at North Side Station, and re-used at Grapevine West; channel #2 would be used at Smithfield.

3.3. SYSTEM OPERATION

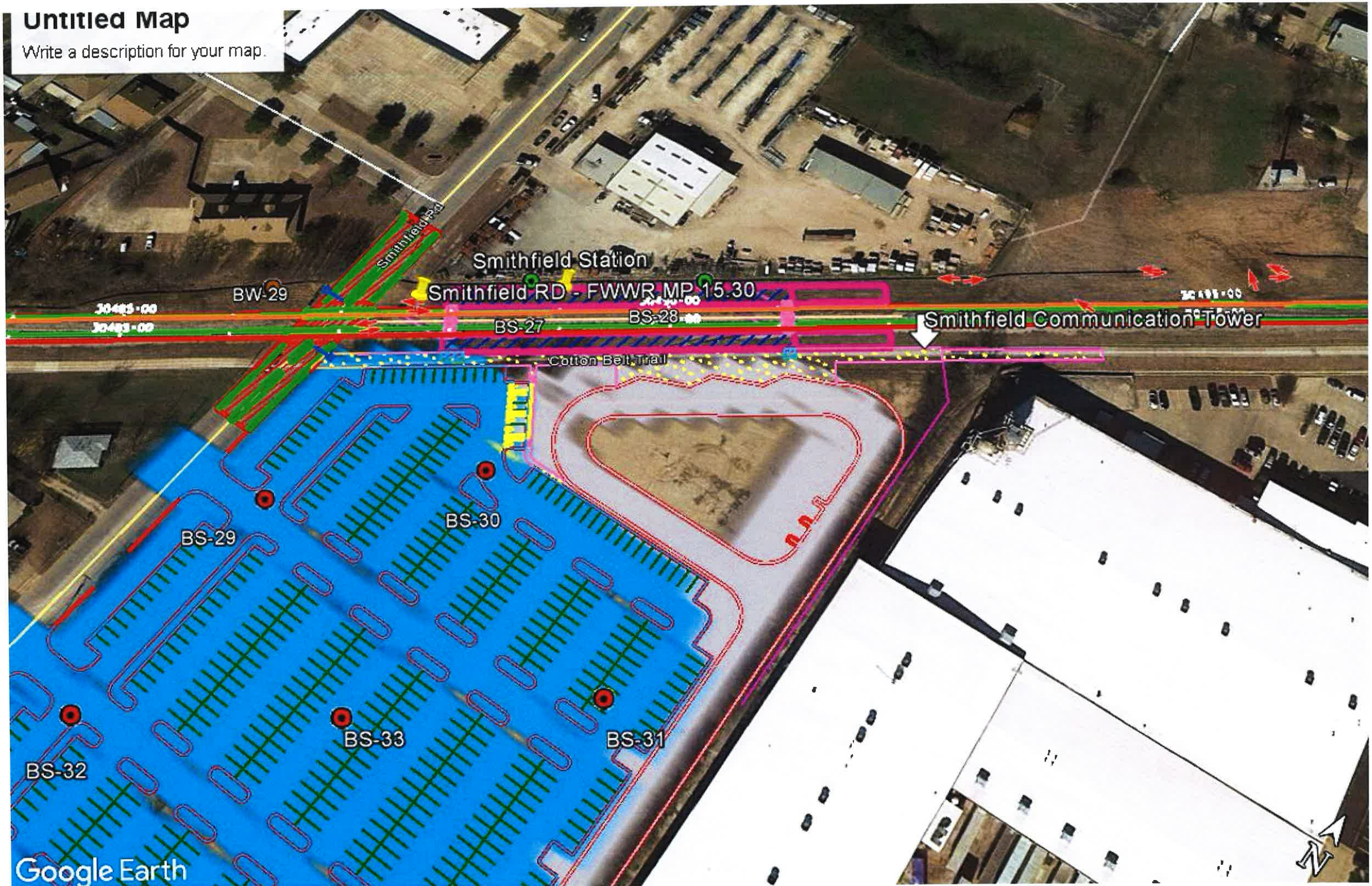
The radio subsystem would operate on 12.5 kHz-wide channels, using *analog* frequency modulation (FM) for the sake of interoperability with other railroads operating on the TEXRail right-of-way. To send audio to a train on the ROW, the dispatcher would typically transmit simultaneously (i.e. *multicast*) on all three base stations, causing each base station to transmit on its own assigned frequency. The locomotive (or vehicle) radio would hear the call anywhere on or near the ROW.

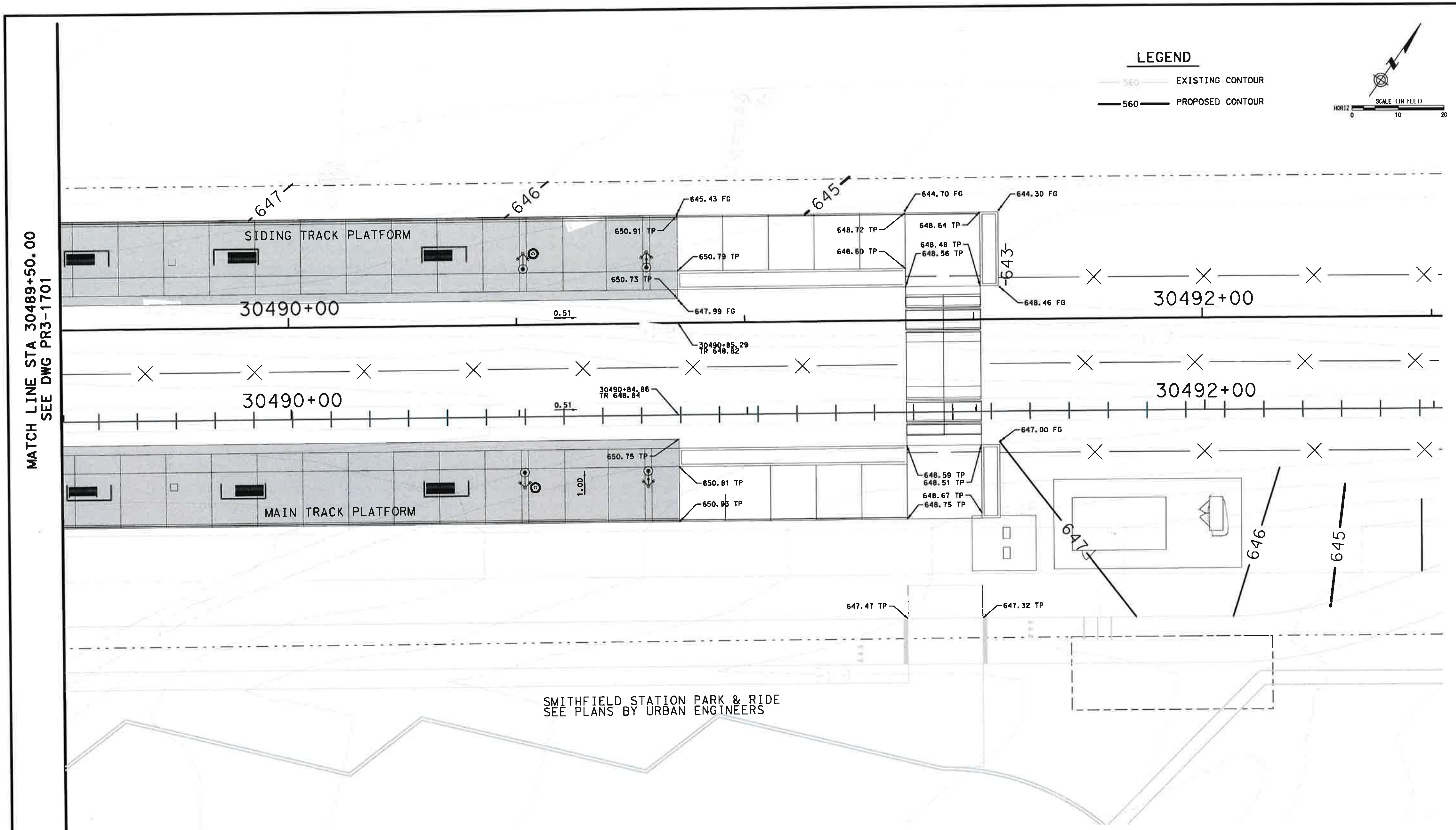
Transmitting from the train to the dispatcher can be more complicated. On a two-channel frequency plan (described in the paragraph above), the train engineer would have to manually switch the radio to

[1] Radio coverage past the right-of-way is subject to approval by the AAR frequency coordinator.

Untitled Map

Write a description for your map.





REV	DATE	DESCRIPTION	BY	ENG	CHK	APP
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STATE OF TEXAS
APRIL N. CAREY
105908
LICENSED
PROFESSIONAL ENGINEER

TBPE REGISTRATION NO. F-351

TBPE REGISTRATION NO. F-17385

PARSONS
TBPE REGISTRATION NO. F-1481

TranSystems
TBPE REGISTRATION NO. F-3557

MULTATECH
ARCHITECTS + ENGINEERS
TBPE Reg #F351
2821 WEST 7TH ST, SUITE 400
FORT WORTH, TEXAS 76107
(817) 877-5571

the T
FORT WORTH
TRANSPORTATION AUTHORITY

SCALE	AS SHOWN
DRAWN	G.SAULS
DESIGNED	G.SAULS
CHECKED	A.CAREY
IN CHARGE	V.O'REILLY
DATE	1/4/2016

ISSUED FOR CONSTRUCTION

TEX RAIL PROJECT
LINE SEGMENT 3
SMITHFIELD STATION PARK & RIDE
PLATFORM GRADING PLAN
SHEET 2 OF 2

SHEET No.	DWG No.	REV
2782	PR3-1702	

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1/4/2016
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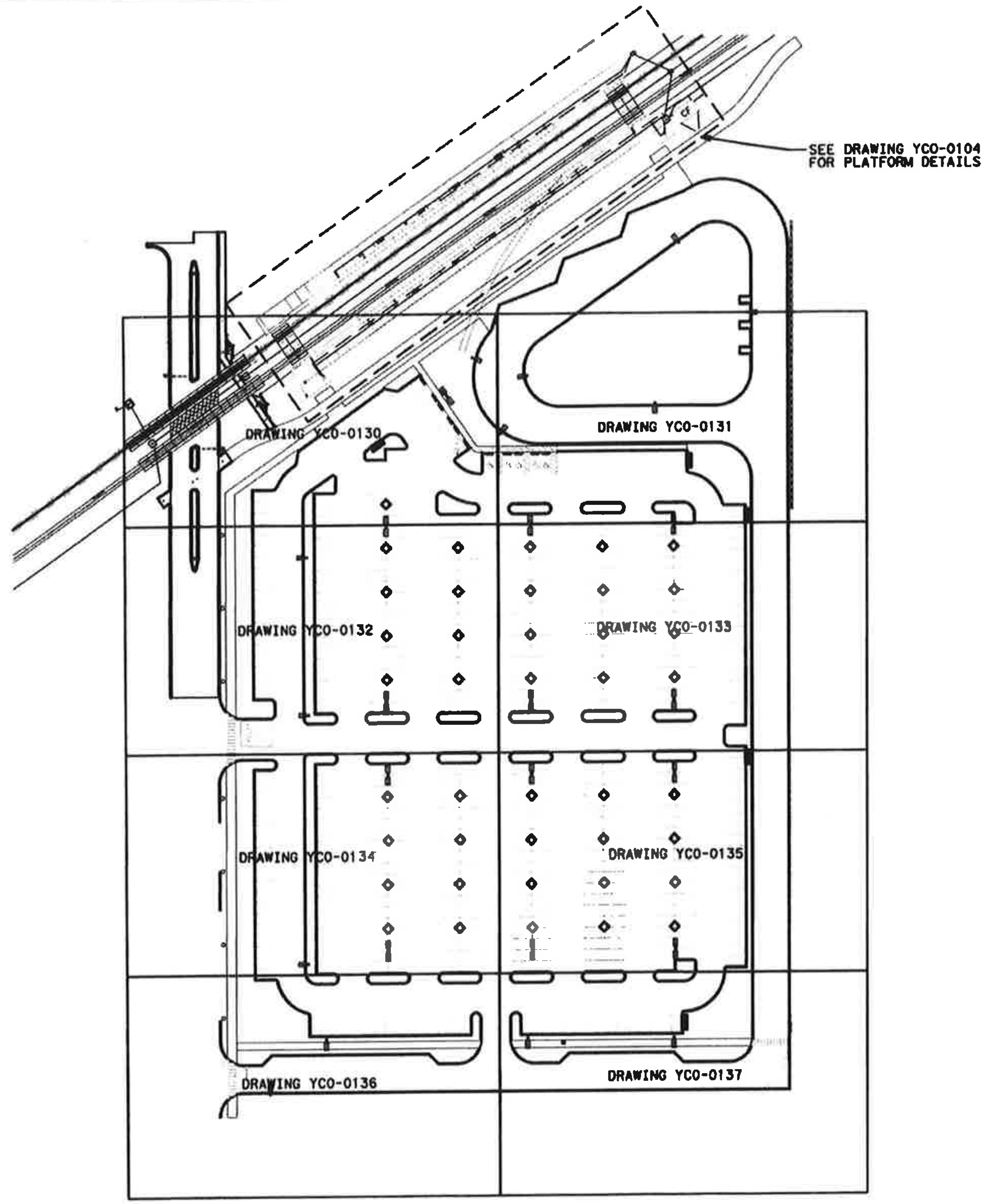
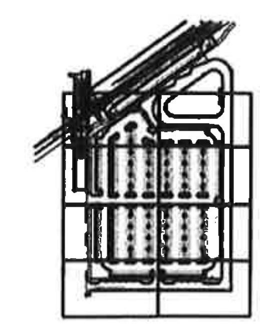


SMITHFIELD ST. SITE PARK AND RIDE SHEET MAP



KEYPLAN

SCALE (IN FEET) HORIZ 0 5 10 20

REV	DATE	DESCRIPTION	BY	ENG	CHK	APP

STATE OF TEXAS — MARK REYNOLDS 103246 LICENSED PROFESSIONAL ENGINEER

TBPE REGISTRATION NO. F-3557

TBPE REGISTRATION NO. F-17385

PARSONS — TBPE REGISTRATION NO. F-1481

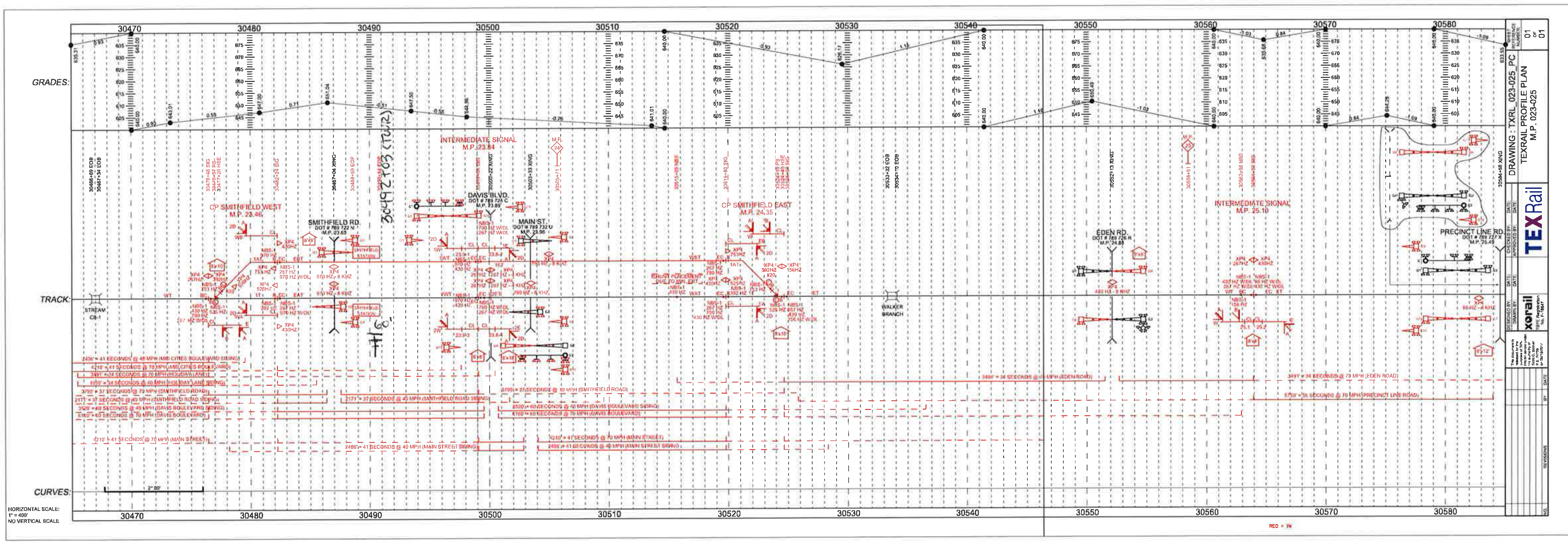
TranSystems — TBPE REGISTRATION NO. F-3557

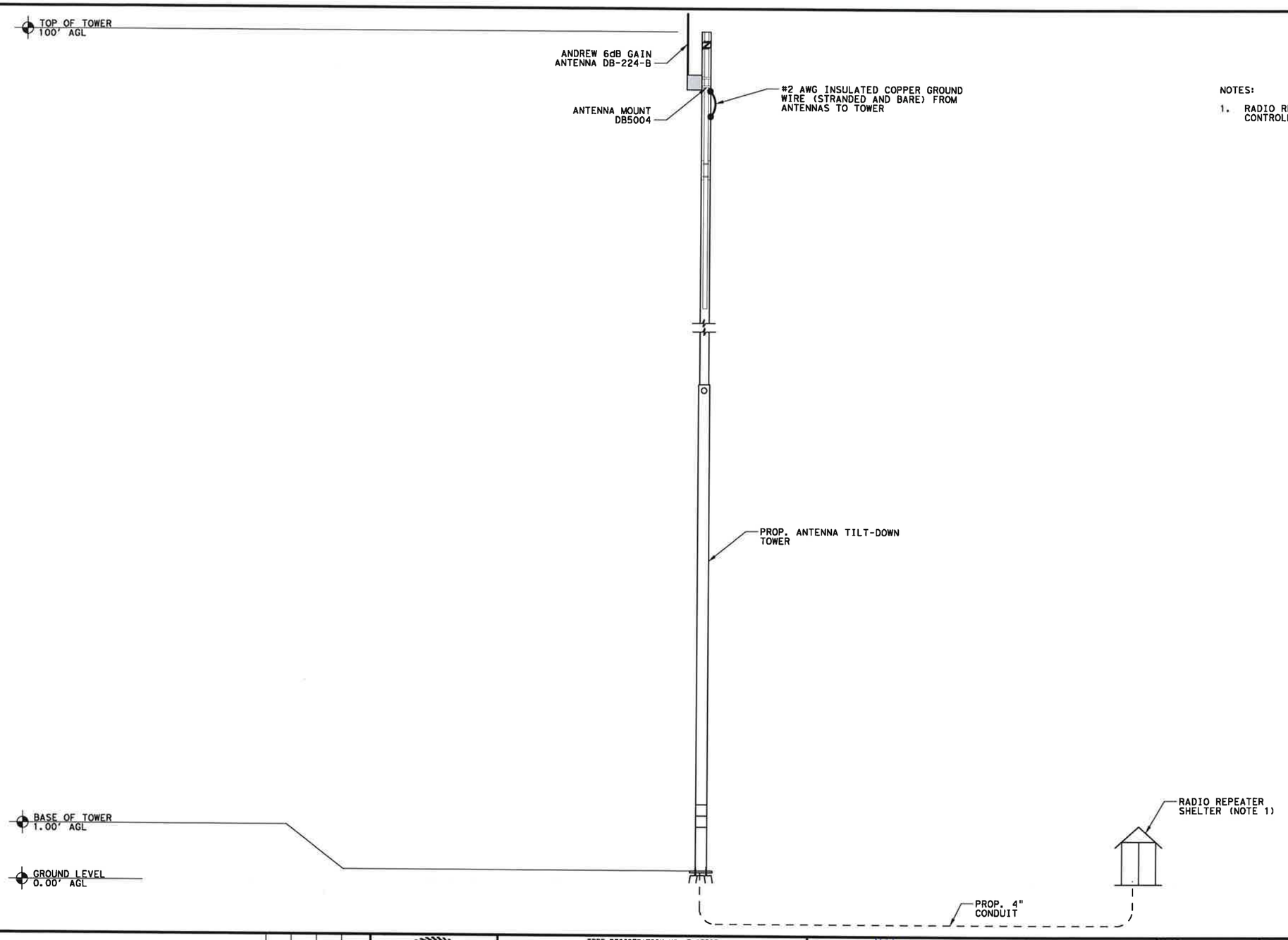
FORT WORTH TRANSPORTATION AUTHORITY

SCALE	1"=20'
DRAWN	H. SMITH
DESIGNED	T. LIBENGOOD
CHECKED	S. STARK
IN CHARGE	D. KEYES
DATE	1/8/2016

TEX RAIL PROJECT
LINE SEGMENT 3
SMITHFIELD ST
VIPS AND IDS LAYOUT
SHEET MAP

SHEET No.	DWG No.	REV
4909	YCO-0129	


GRADES:
TRACK:
CURVES:
30470
30480
30490
30500
30510
30520
30530
30540
30550
30560
30570
30580
INTERMEDIATE SIGNAL M.P. 23.84
CP SMITHFIELD WEST M.P. 23.46
SMITHFIELD RD.
DAVIS BLVD.
MAIN ST.
CP SMITHFIELD EAST M.P. 24.35
WALKER BRANCH
STREAM CB-1
EDEN RD.
INTERMEDIATE SIGNAL M.P. 25.10
PRECINCT LINE RD.
HORIZONTAL SCALE: 1" = 400'
NO VERTICAL SCALE
RED = IN
DRAWING : TXRL_023-025_PC
TEXRAIL PROFILE PLAN
M.P. 023-025
SHEET REFERENCE NUMBER
01 OF 01
TEXRail
xorail
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
DATE:
REVISIONS



NOTES:

1. RADIO REPEATER SHELTER SHALL BE A HVAC CONTROLLED 6'x6' SHELTER.

REV	DATE	DESCRIPTION	BY	ENG	CHK	APP
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△						
△						
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△						
△						

STATE OF TEXAS
KEVIN DARBE
104602
REGISTERED
PROFESSIONAL ENGINEER
TBPE REGISTRATION NO. F-1481

TBPE REGISTRATION NO. F-17385
PARSONS
TBPE REGISTRATION NO. F-1481
TranSystems
TBPE REGISTRATION NO. F-3557

the
FORT WORTH
TRANSPORTATION AUTHORITY

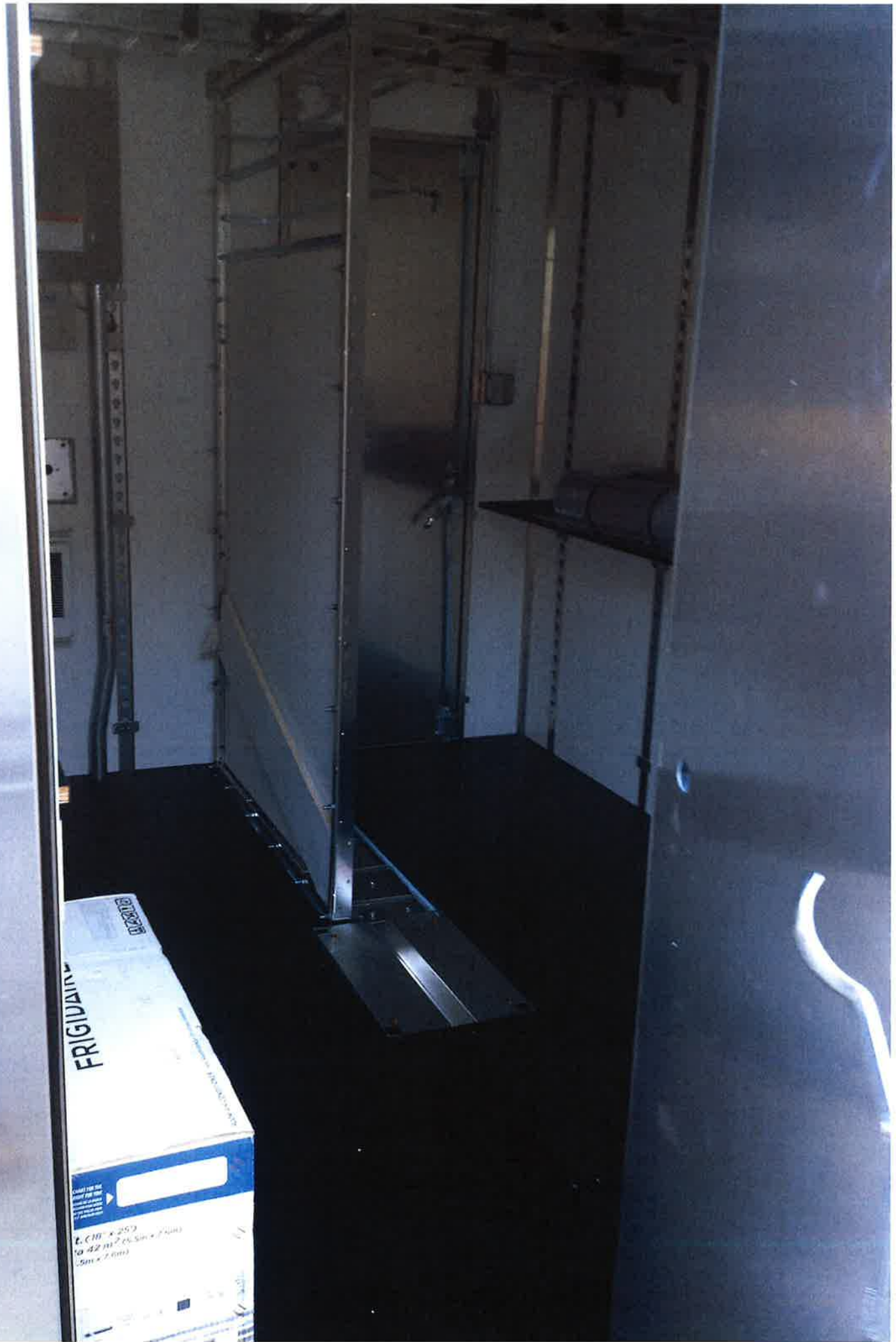
SCALE	NOT TO SCALE
DRAWN	C. QUICK
DESIGNED	K. DARBE
CHECKED	R. KARLINSKI
IN CHARGE	B. KEYES
DATE	1/4/2016

ISSUED FOR CONSTRUCTION

TEX RAIL PROJECT
ALL SEGMENTS
RADIO SYSTEM ANTENNA REPEATER TOWER

SHEET No. 4943 | DWG No. YRO-0011 | REV


PTMW INC.
5040 NW US HWY 24
TOPEKA, KS 66618
785-232-7792
SERIAL # 9 1 9 4 5


FRIGIDAIRE


PTMW INC.

NRH
NORTH RICHLAND HILLS

ZONING

SELECT APPLICATION TYPE

☐ Zoning Change ☒ Special Use Permit ☐ Planned Development ☐ Special Development Plan

DEVELOPMENT INFORMATION

Project Address: 6420 Smithfield Road

Project Name: Tex Rail

Legal Description: NA RR ROW Acreage:

Current Zoning: TOD Proposed Zoning: N/A

Current Use: RR ROW Proposed Use: Radio System Antenna Repeater Tower

OWNER INFORMATION

Name: Fort Worth Transportation Agency (FWTA)

Address: 801 Cherry Street, Suite 850

City: Fort Worth State: TX ZIP: 76102

Phone: 817-215-8600 Email: fwtaweb@fwta.org

For additional owners, please include additional copies of this page. The property owner must sign the application or submit a notarized letter of authorization.

REPRESENTATIVE/AGENT INFORMATION

Name: Archer Western/Herzog JV

Address: 6851 NE Loop 820, Suite 400

City: North Richland Hills State: TX ZIP: 76180

Phone: 254-760-5580 Email: bseverson@herzog.com

CERTIFICATION

I certify that the above information is correct and complete to the best of my knowledge and ability, and that I will be fully prepared to present the proposal at a Planning and Zoning Commission and City Council public hearing. I reserve the right to withdraw this proposal at any time by filing a written request with the Planning & Zoning Department.

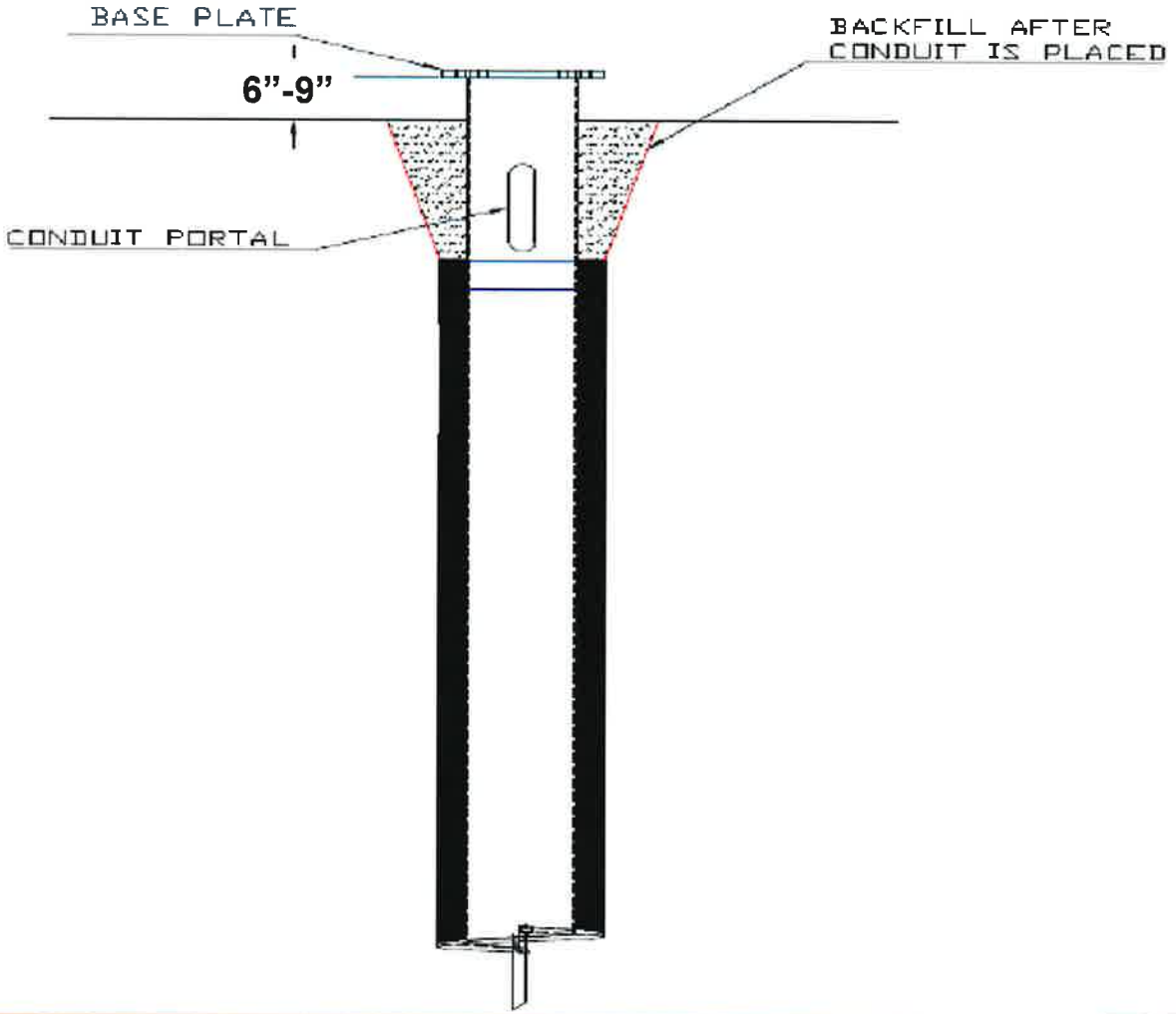
Owner Signature — 11-16-17 Date — REED LANHAM Owner Name (print)

Agent Signature — 11/14/2017 Date — CRAIG EBERSOLE Deputy PM Agent Name (print)

PTC Wayside Trench End Point

BNSF RAILWAY

EMI 10’ Pier Installation Drawing



BNSF RAILWAY

EMI 10' Helical Pier Installation

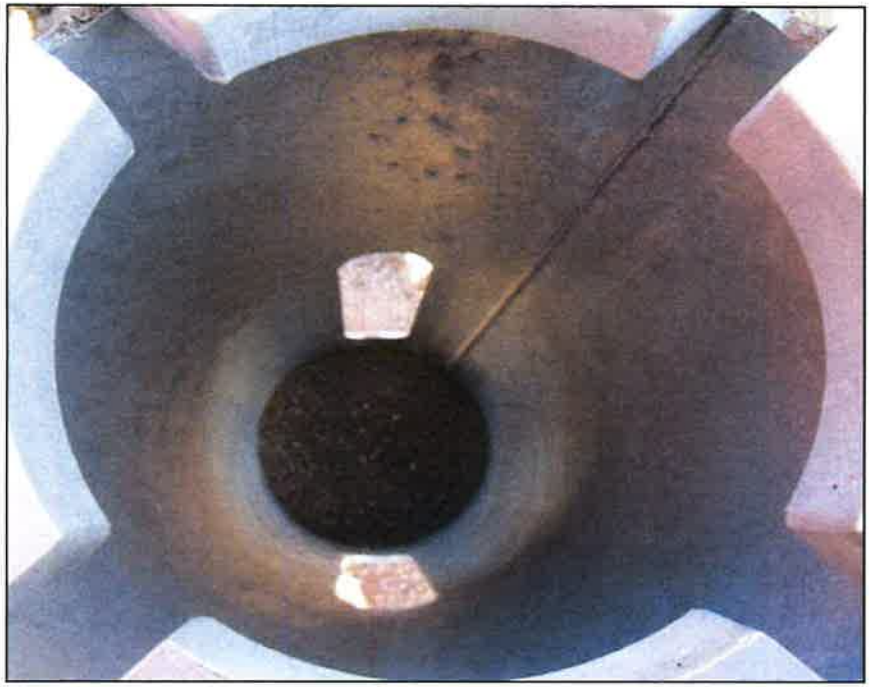
EMI 10' Helical Pier Installation

NOTE:

- Achieve a minimum torque value of 3,000 foot-pounds.
- A maximum torque value of 15,000 foot-pounds.
- Make sure you know the conversion from PSI to Foot Pounds for the machine you are operating.

BNSF RAILWAY

EMI Helical Pier Backfilled



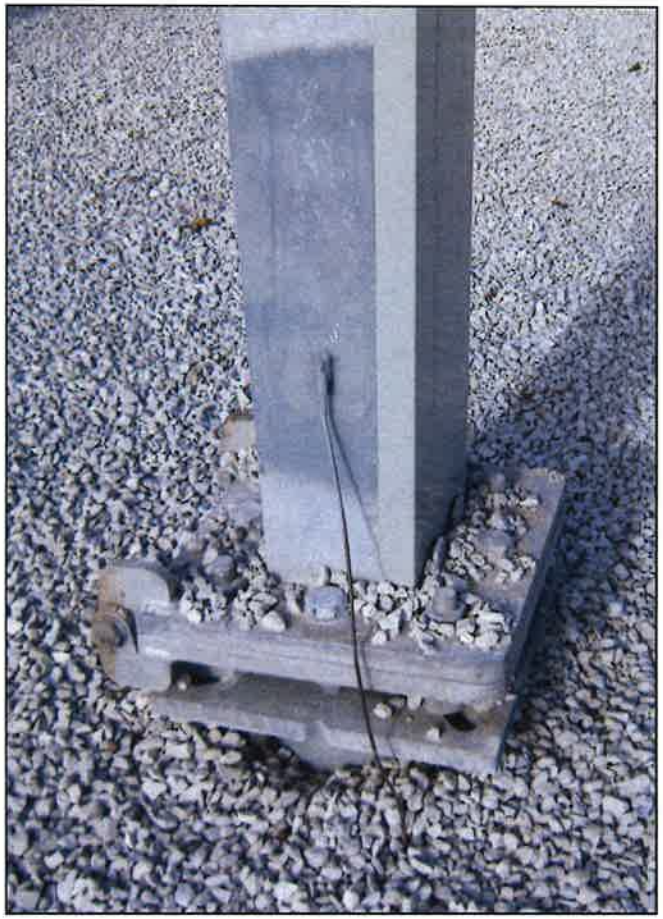
Properly backfilled pier where fill comes up to bottom of ports.

BNSF RAILWAY

Add with torque value

EMI Helical Pier Complete

Pier plate to soil should be NO more than 6 to 9 inches



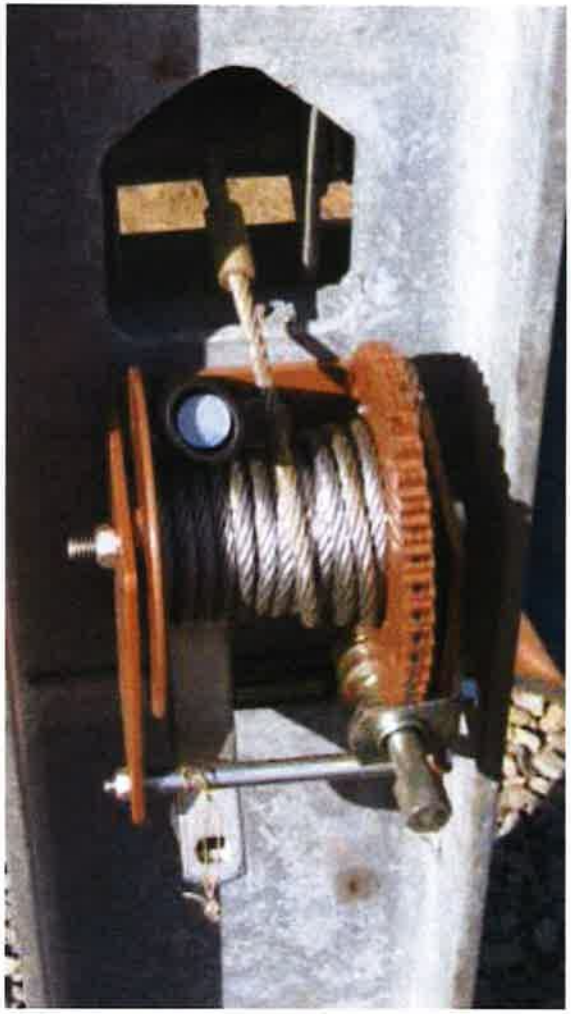
Rock dressed around tower base after pier plate was screwed within 6 to 9 inches of undisturbed soil.

BNSF RAILWAY

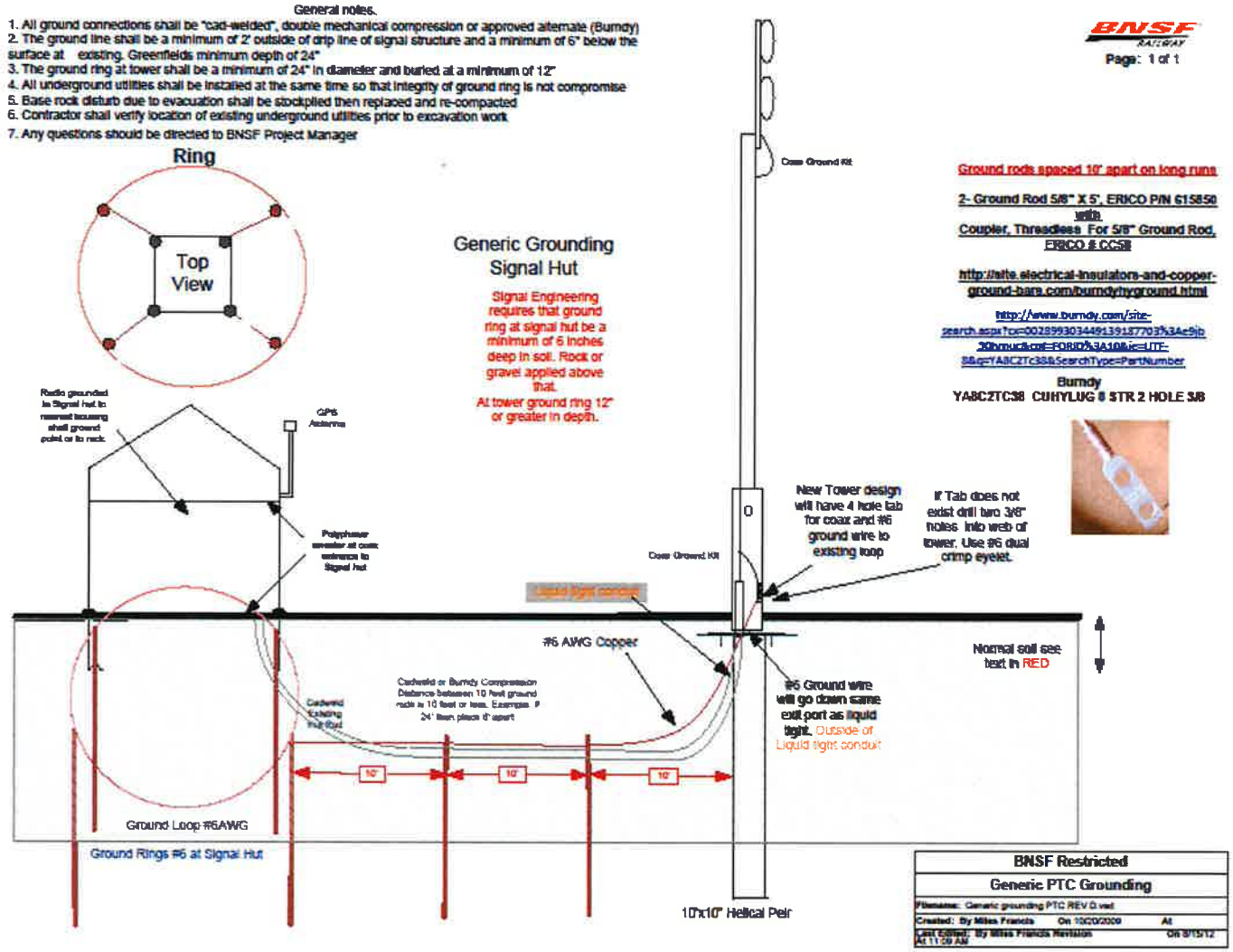
Winch Bolt Orientation

Top bolt comes out of I-beam so bolt won't get into winch cable.

Bottom two bolts go through I-beam towards winch so knuckles won't catch the bolts while weatherproofing ground clamps.



Generic Grounding Drawing



Pier Grounding

Do not install ground rods by pier

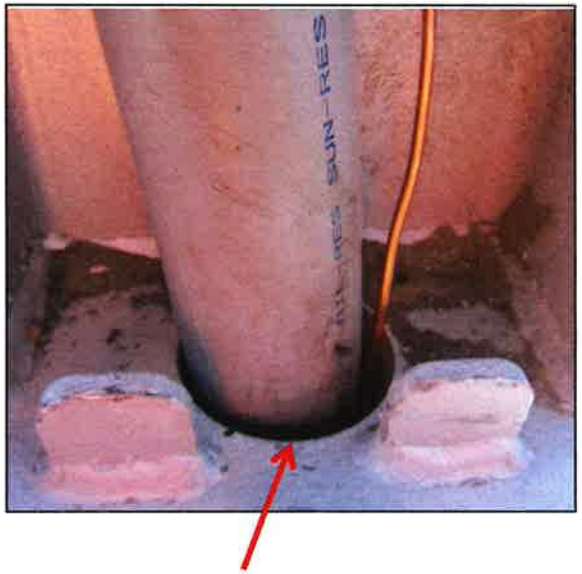
Do not install Halo around pier

Do not bond to I-Beam unless Signal approves.

Run one #6 ground wire from building halo/ground rod to tower.

Follow path of conduit and make sure you leave slack in the pier.

If distance between tower and signal ground is over 10ft add ground rod(s) per standard.



Fill in area with plaster to prevent mice from entering.

Ground on I-Beam

Mark ground lug on web of I-beam 21inches up and 2 inches off right side of I-beam.

Drill holes and only grind area where lug is contacting I-beam.

Do not use heat shrink on bare #6 solid wire.

Spray cold galvanize when complete.

New Mechanical Ground Tab

Install ground wire on bottom two holes and use the top two for antenna grounds.

PTC Bottom of Tower

Grounding route should be gradual bend to the dual mechanical tab. No sharp bends.
Locknut must be used on liquid tight connector.
Grommet cap must be installed.

Galvanized coating must be removed prior to attaching ground.
Bolts, Flats, Locks, and Nuts must be used for fastening lug to tab.
After ground lug is attached, use galvanized spray to protect the area.

BNSF RAILWAY

Dual Mechanical Ground Tab

Dual Mechanical Ground Tab

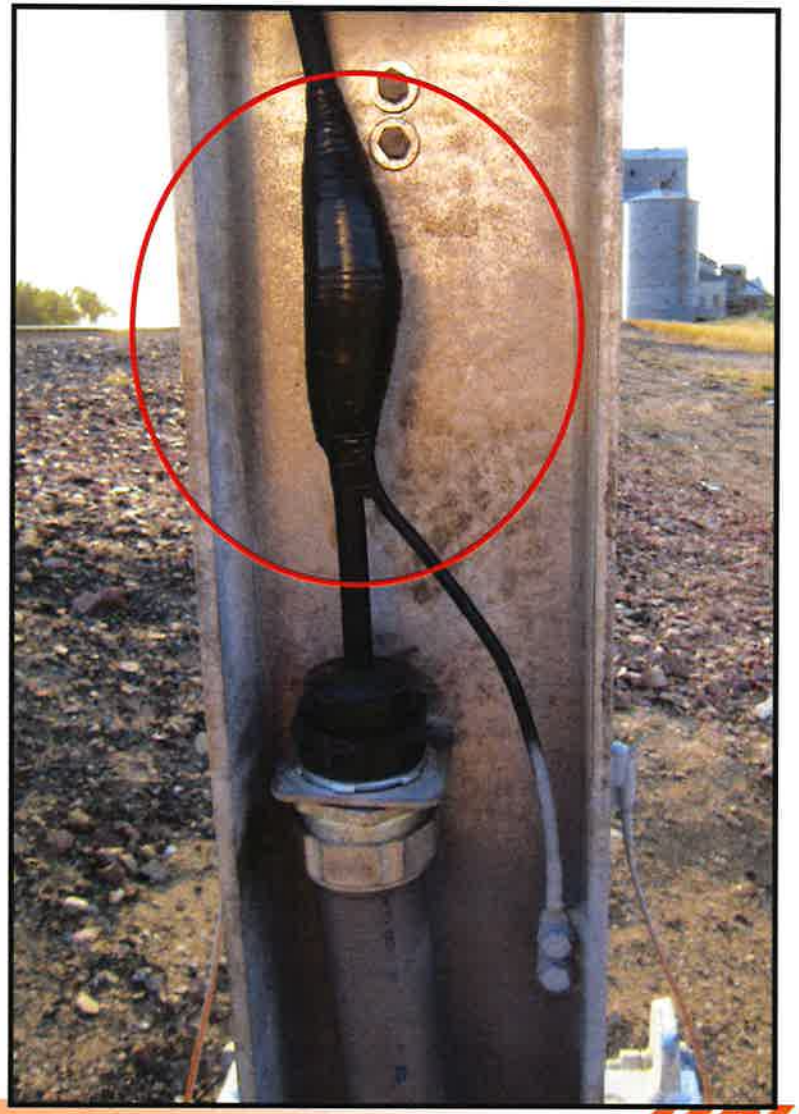
Grind galvanize off tab for ground connection. NOTE: The grinder will fit behind the tab if you grind the back side before you install the conduit and ground wire. You only need to grind or file the backside of the tab when you are connecting two lugs.

Flat washer should go between bolt head and lug
Lock washer goes between nut and dual mechanical connection

LMR600 Ground Clamp Completed

Ground Clamp

- Strip sheathing off LMR600 coax using the GST-600A.
- Attach ground kit with pigtail to right side of coax
- Courtesy wrap ground clamp with vinyl tape.
- Apply mastic by wrapping from bottom of ground clamp to top
- Wrap with 2" vinyl tape; start wrap at bottom of clamp, wrap to top then down, then last wrap should be bottom to top to create shingle effect. Same procedure for the top of the tower.



BNSF RAILWAY

LMR600 Ground Lug Completed

Dual Mechanical Ground Tab

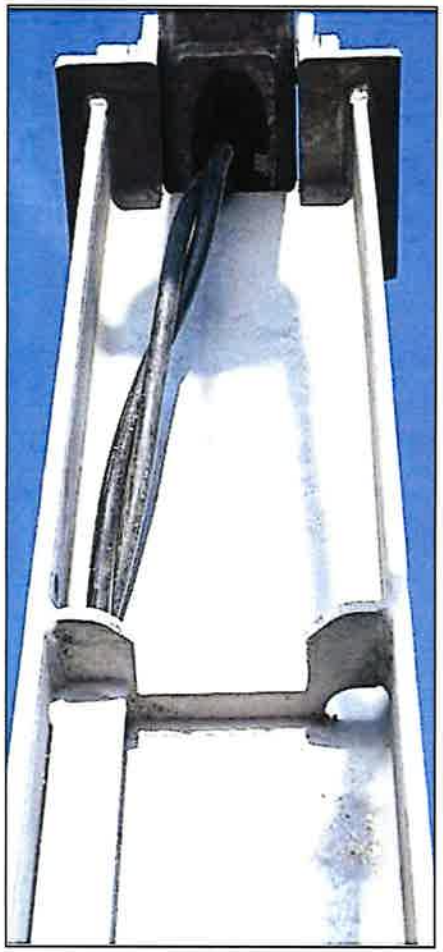
- Grind galvanize off tab for ground connection.
- Measure ground wire; gradual curve to tab.
- Slide heat shrink on wire, crimp on ground lug. Heat the heat shrink after you crimp on the lug or after lug is attached to the ground tab.
- Put oxidation grease on ground tab then attach lug to tab.
- Spray cold galvanize on lug and tab
- DO NOT USE SIGNAL GRAY SPRAY PAINT!!!

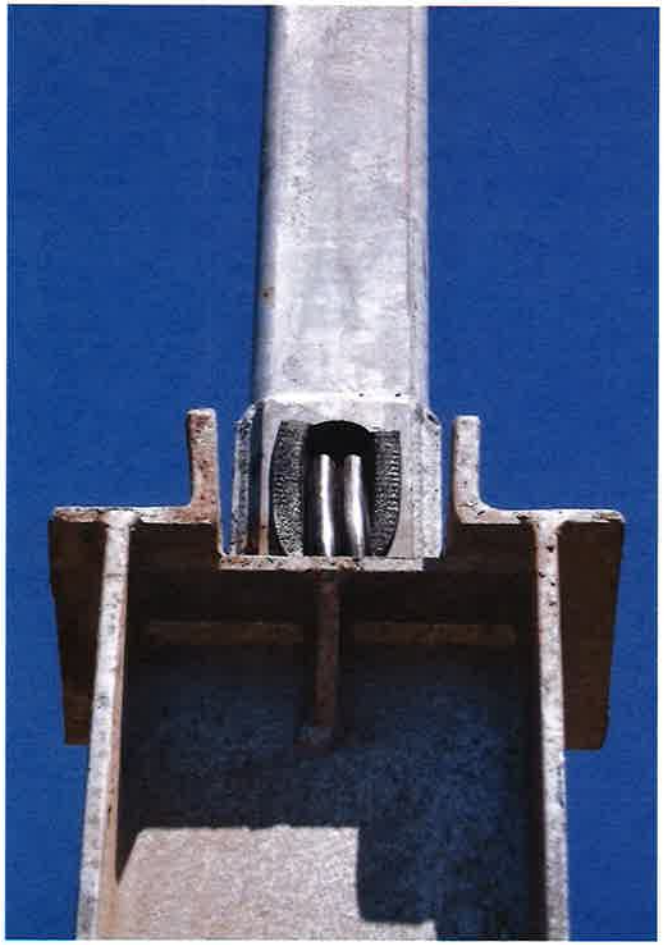
BNSF RAILWAY

Completed Base w/ Ground on I-Beam

BNSF RAILWAY

Coax Routing in Tilt Over Tower





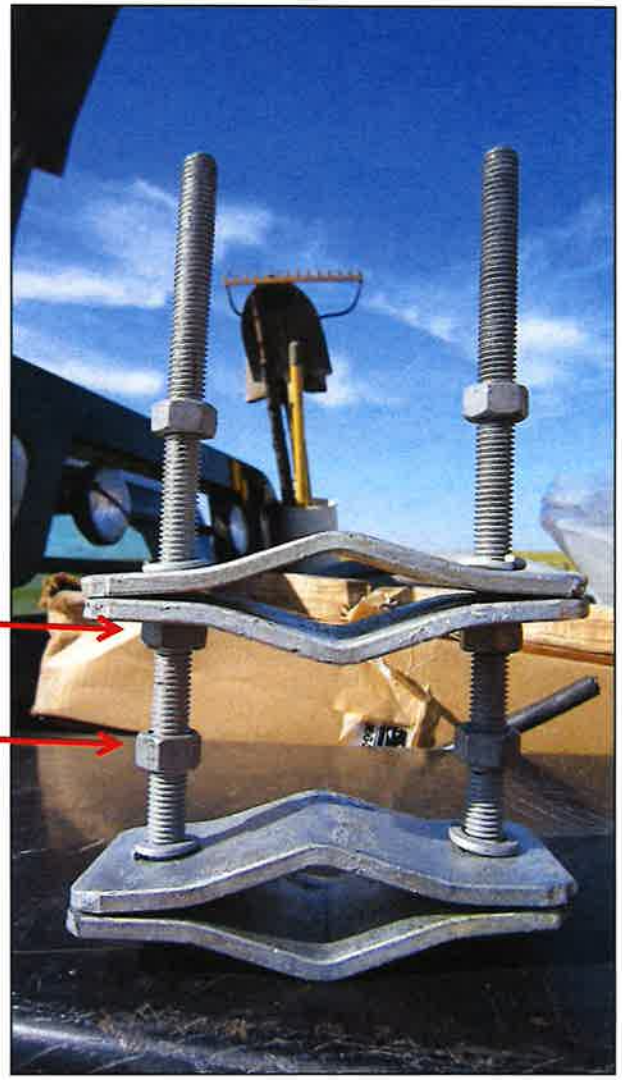
Crossing the coax at the hinge point as shown in the first picture will cause crushing and a failed test requiring the coax to be replaced. Make sure the coax stays parallel as shown in picture two and three.

BNSF RAILWAY

Antenna Bracket Spacing

To maintain proper spacing between the pipe and antenna once installed. Install the two nuts on the threaded bolt as shown.

Top nut 6” down
Bottom nut 7 ½” down



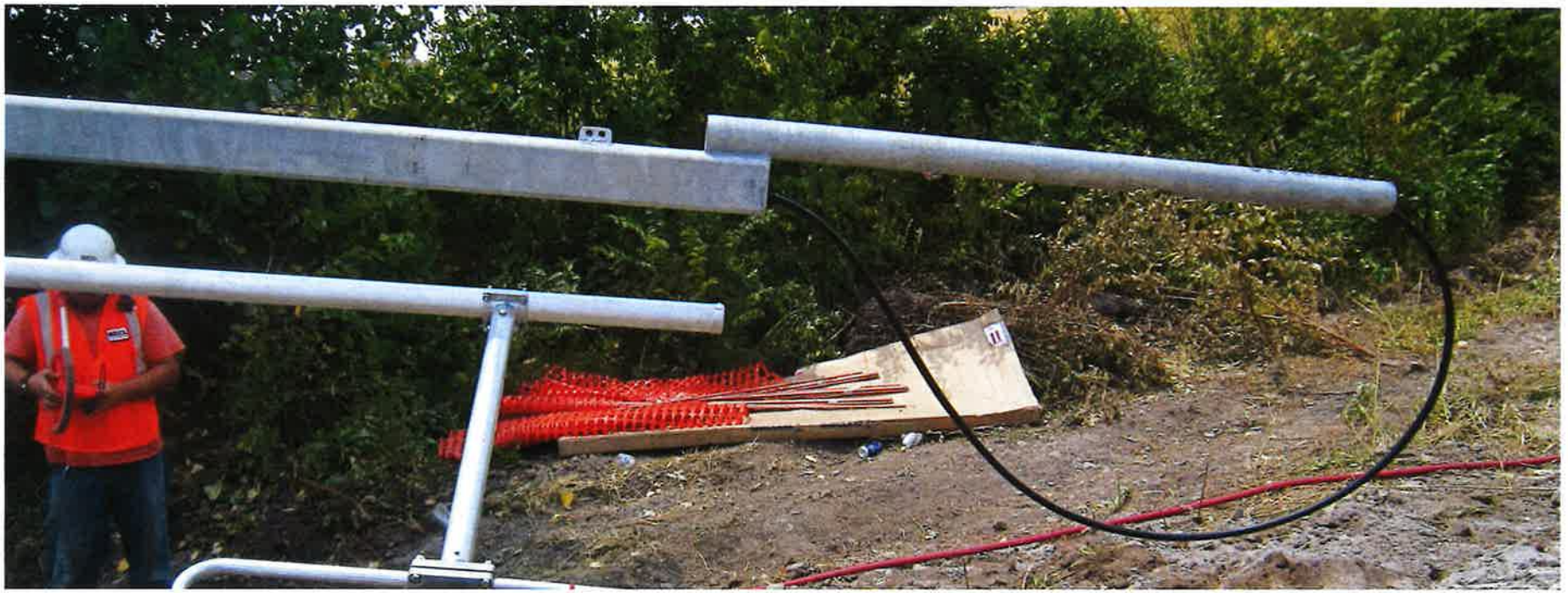
BNSF RAILWAY

Antenna Installation

PTC and ARES antennas are ***Required*** to be installed per azimuth.

If you do not have the coordinates please contact Signal Engineering or the Telecom PTC Implementer for that sub-division.

Top Antenna - ATCS



7ft (84 inches) of coax

End of coax is stuck in pipe so connector was not laying in the dirt

BNSF RAILWAY

ATCS Antenna- Protect Connector Before Attaching to Pipe.

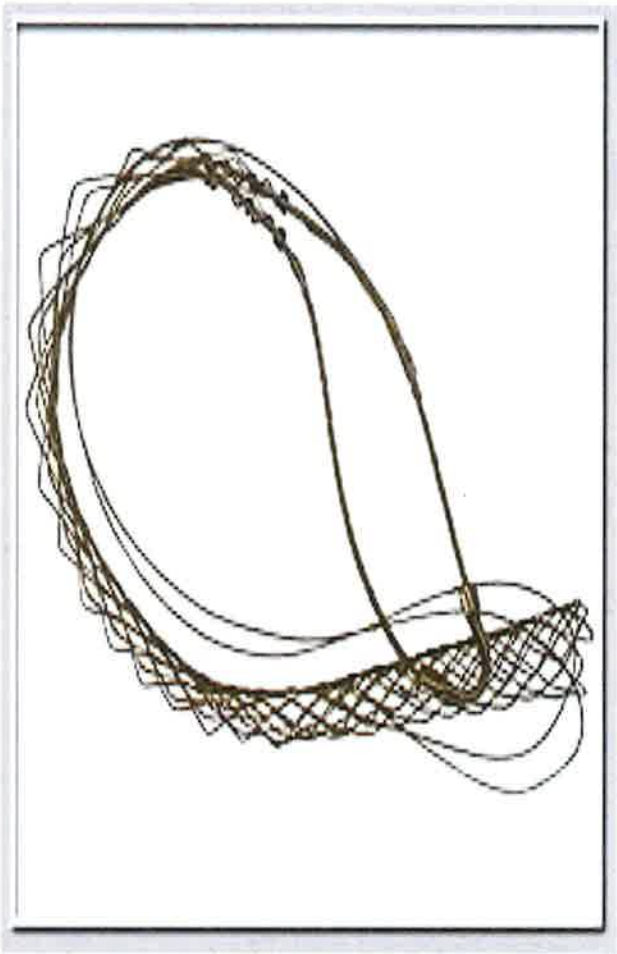
BNSF RAILWAY

PTC Hoisting Grip

There are two types of grips, one of which must be laced.
If no hook is provided, attach the grip to the bottom U-bolt or bolt, depending on the mount provided, of the antenna mast.
Hoisting grips feature a closed-mesh design, will either be a lace up style or slip on style. The hoisting grip allows strain relief on the coax.
Proper installation is necessary to prohibit damage to the coax.

Pre Laced

Lace Up



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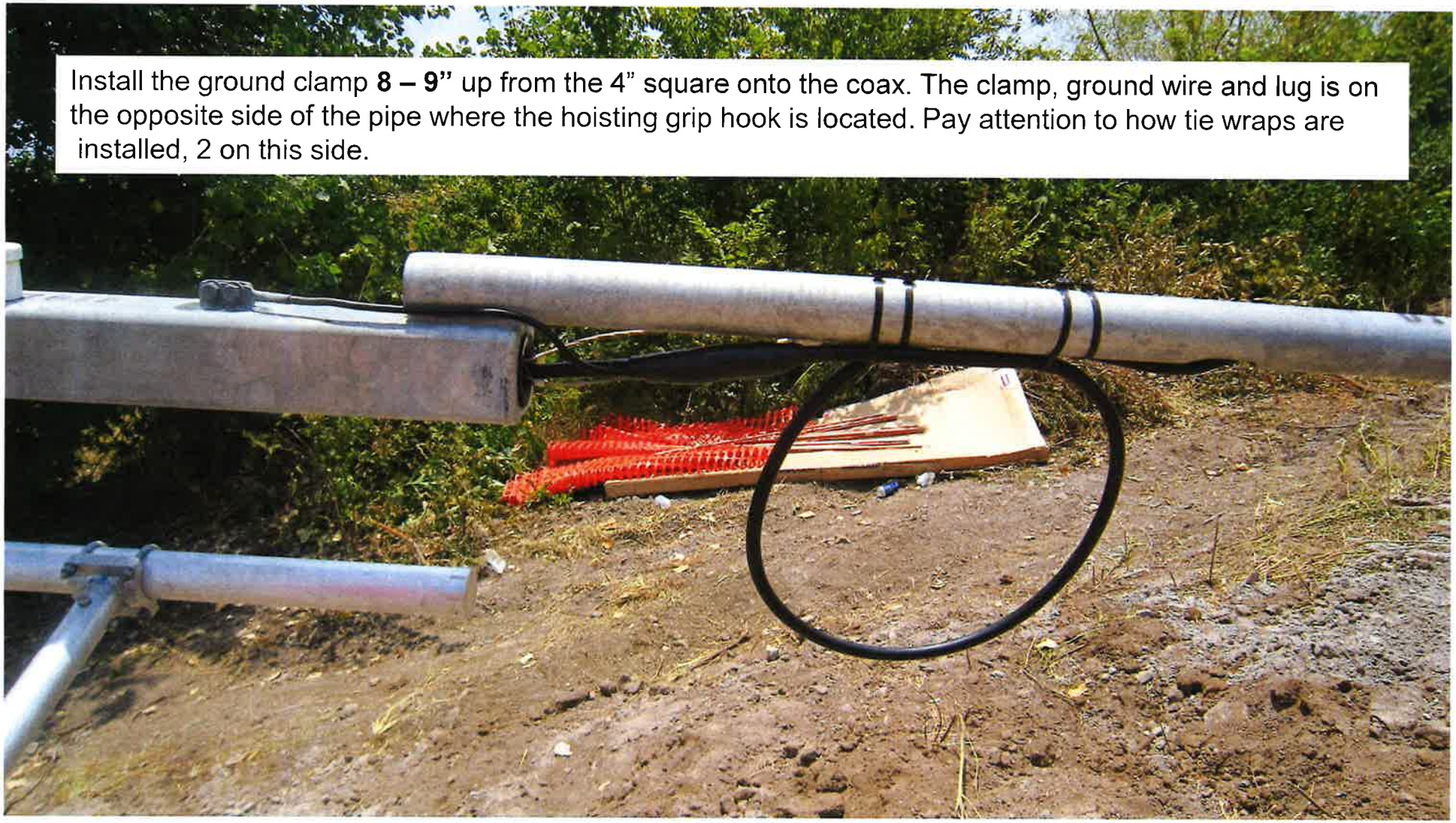
Top Antenna–Hoisting Grip ATCS or PTC

BNSF RAILWAY

Top Antenna – ATCS and PTC



BNSF RAILWAY

Ty-Wrap Installation
THOMAS & BETTS TY527MX

Top Antenna - PTC

Measurement starting at the top of the tower (4" square) to the bottom bracket is 19".

Top bracket is about 1/2" from top of pipe

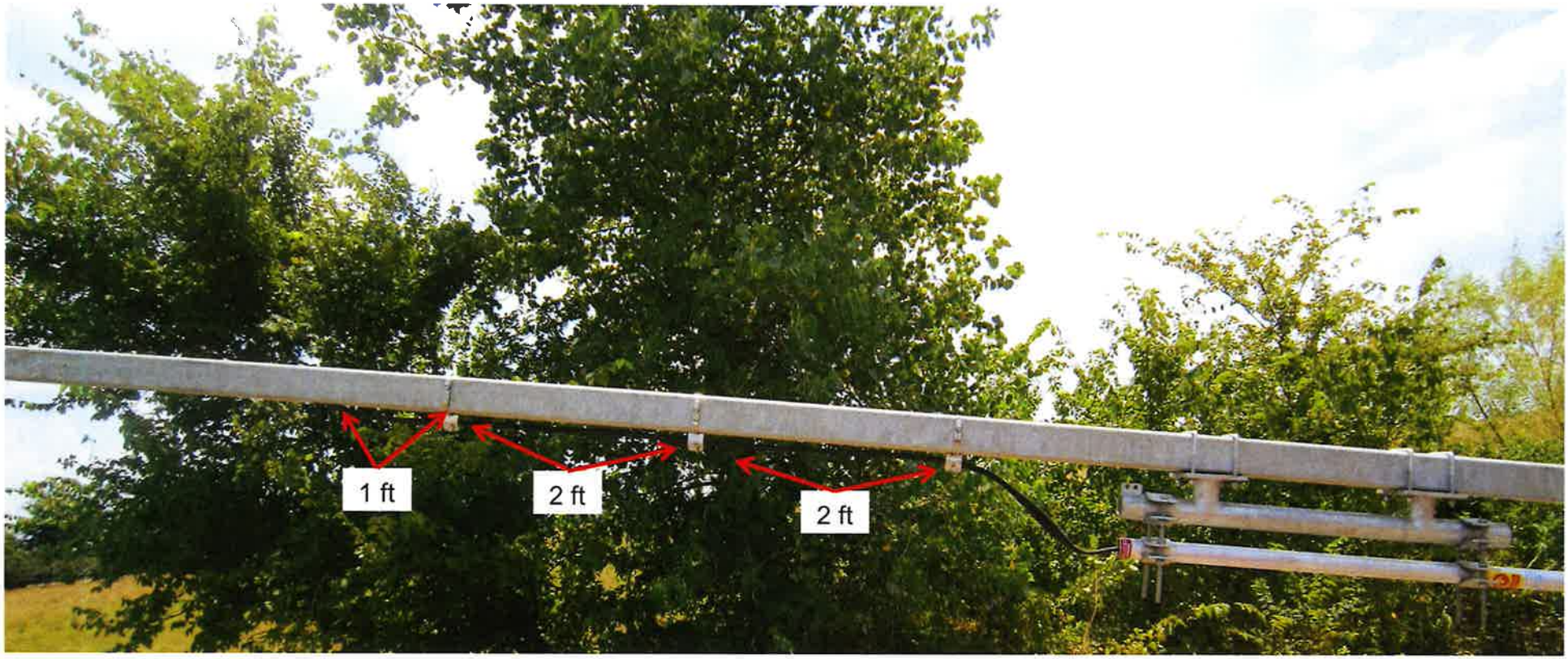
BNSF RAILWAY

Top Antenna - PTC

5ft (60 inches) of Coax
Courtesy wrap connector and ground clamp before applying mastic.
After applying mastic you are required to use 2" vinyl tape.
DO NOT USE COLD SHRINK

BNSF RAILWAY

Mid Span Antenna - PTC



6 feet of coax from entry point. Use 3 hose clamps.

BNSF RAILWAY

Twist off Excess Tie Wraps

RAILWAY

For Dual Mount Antennas: Mid Mast Antenna Mount

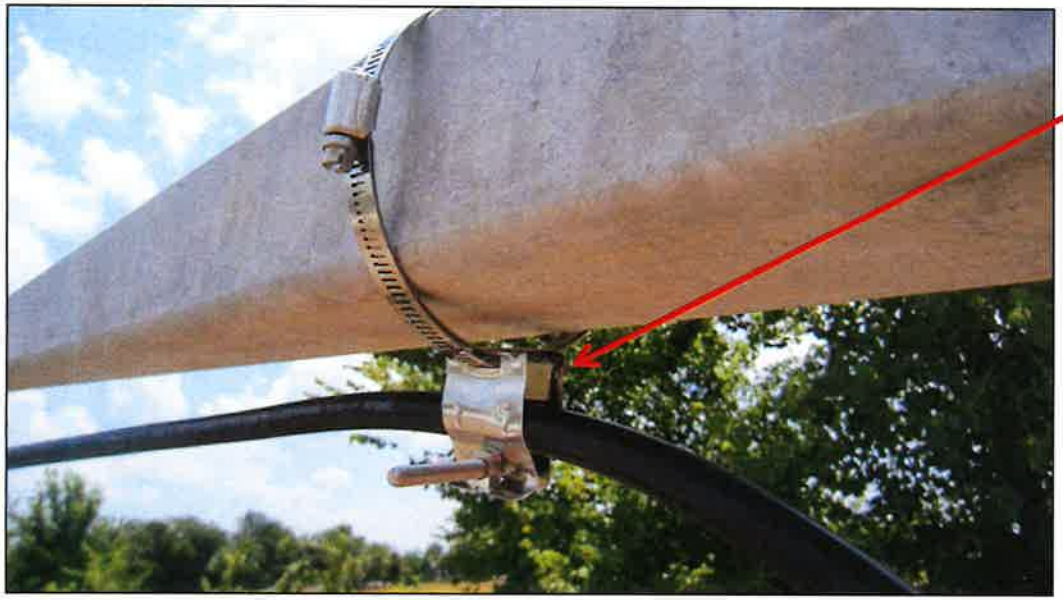
A. Mount bracket up against ground tab.

B. Line antenna up with end of pipe, there will be 2” of antenna from edge of bracket.

C. Mount bracket on pipe 2” from end of pipe.

BNSF RAILWAY

For Dual Mount Antennas: Round Member Adapter Installation

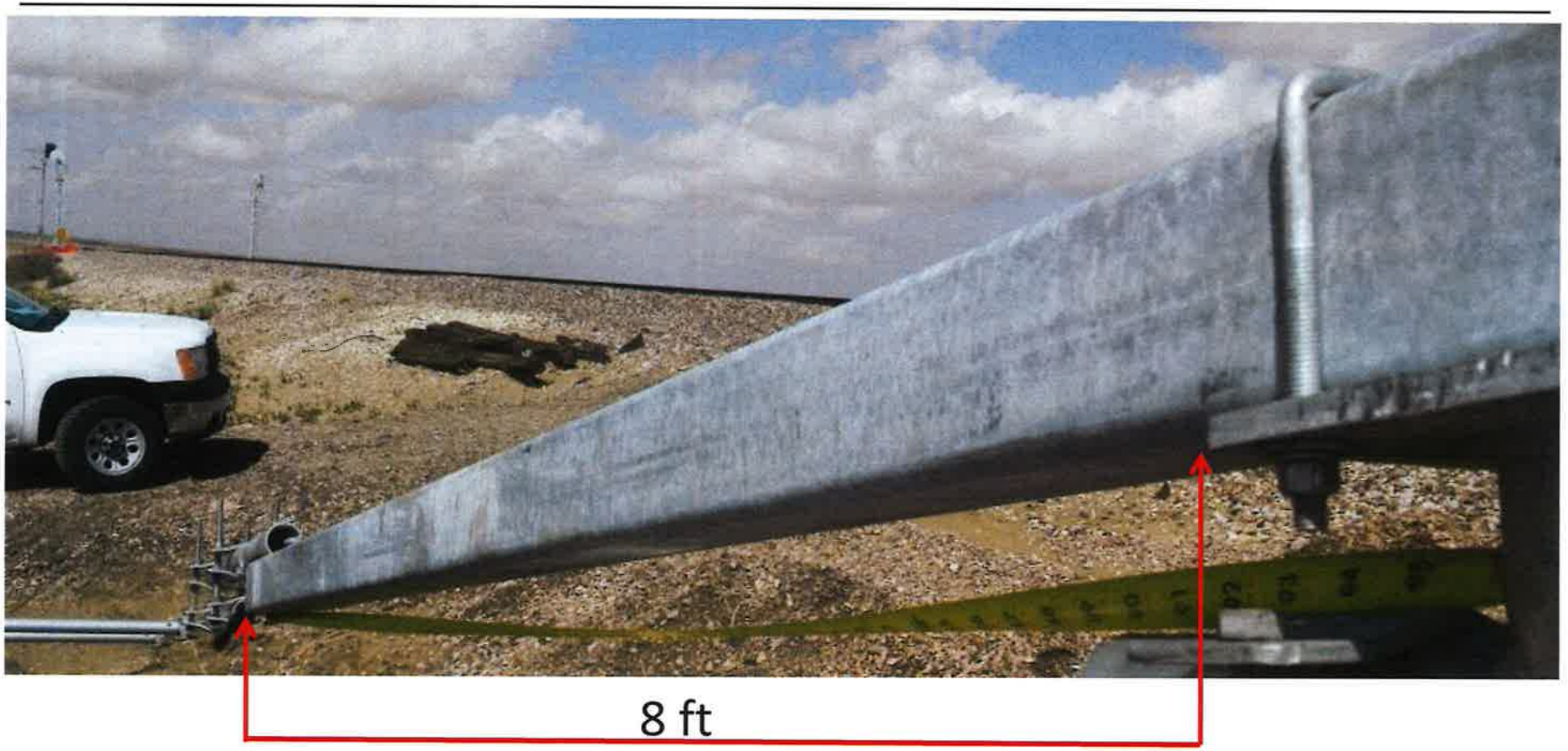


Coax tab support must be inserted inside butterfly clamp.

Place hose clamp so that the excess strap will route in under butterfly clamp when tightening clamp.

BNSF RAILWAY

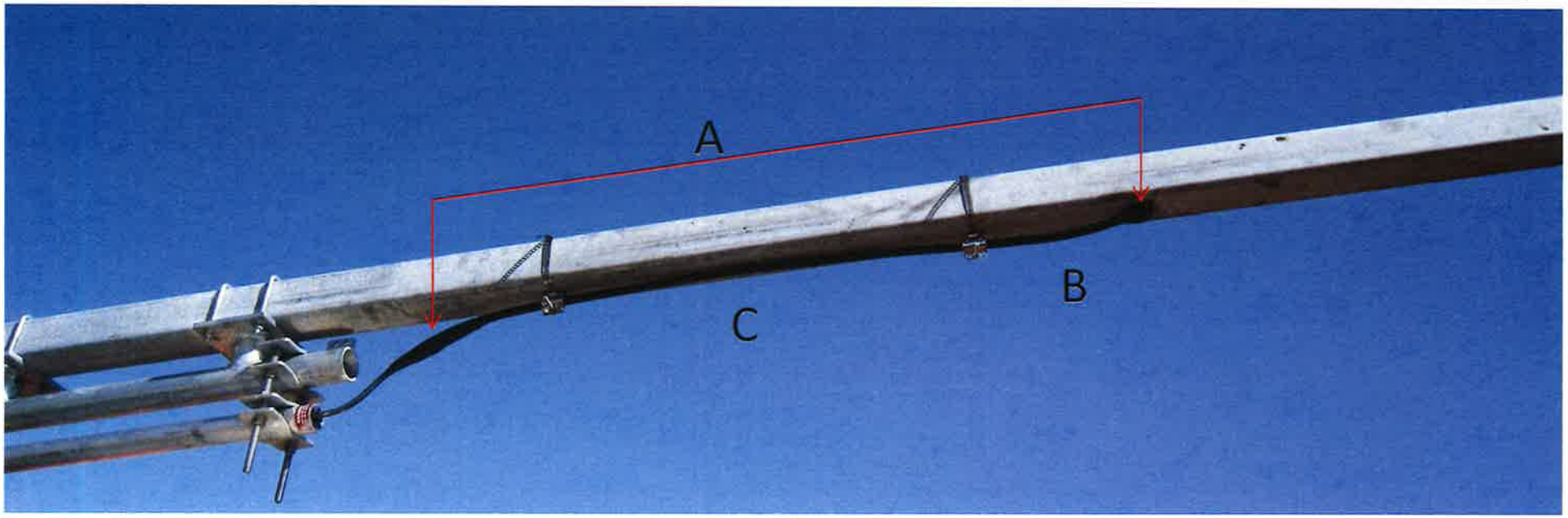
Mid Span Mast Mount – ARES Antenna



Measurement starting at the top of the tower (4" square) down to the top edge of the mid span mount is 8 feet.

BNSF RAILWAY

Mid Span – ARES Antenna



A. 4 feet of coax from center of entry point

B. The bottom clamp will be approximately 12" up from center line of coax entry point.

C. The clamps will be spaced approximately 28'' apart. The clamps take the place of the hoisting grip and zip ties. Clamps may be less than 28" if connector to antenna pig tail is to tight.

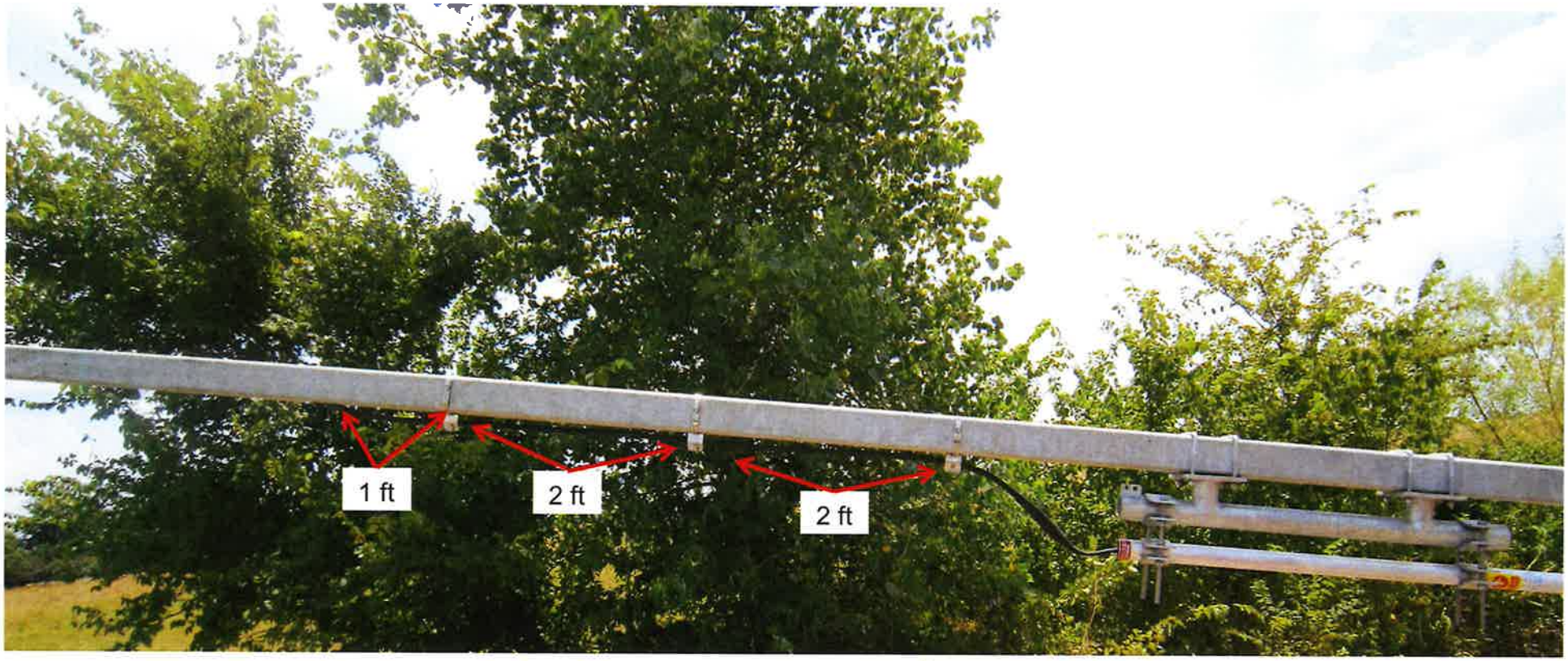
Mid Span ARES Antenna Completed

Mid Span Mast Mount – PTC Antenna

Measurement starting at the top of the tower (4” square) down to the top edge of the mid span mount base is 6 feet.

BNSF RAILWAY

Mid Span Antenna - PTC



6 feet of coax from entry point. Use 3 hose clamps.

BNSF RAILWAY

a secondary channel if the train is within approximately five miles of the Smithfield base station in order to maintain call quality.[2] This channel switching could be performed automatically by the user radio itself if the radio subsystem were to be operated using digital modulation, but this mode is not currently an option for interoperability.[3]

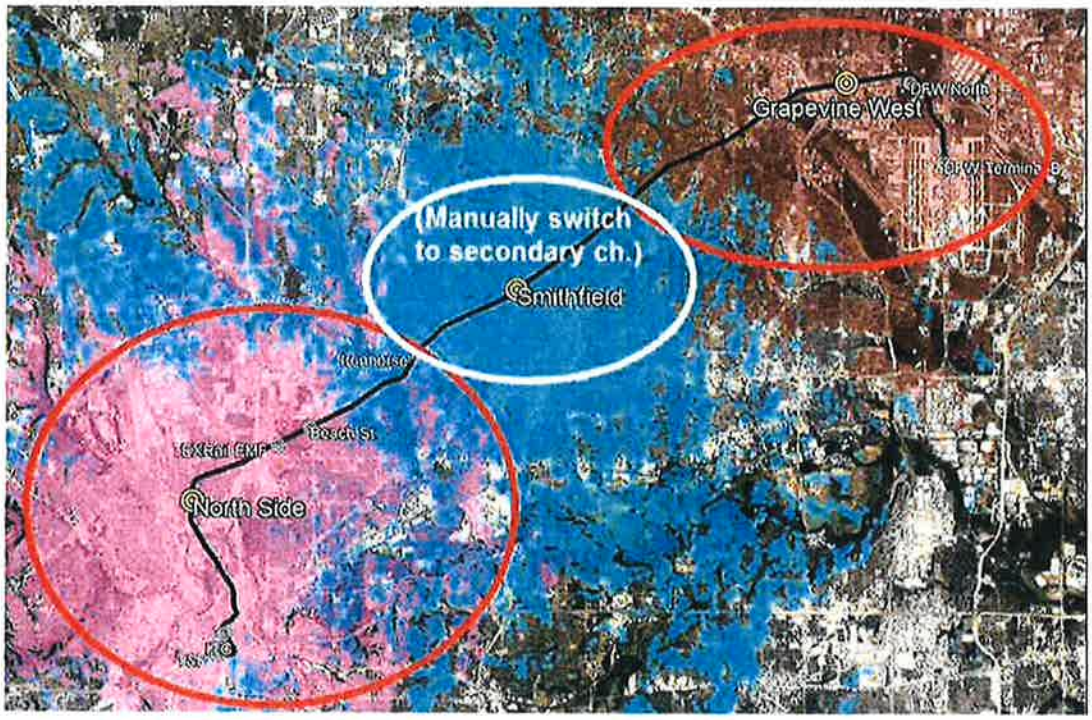


Figure 1: System Operation

[2] Even if the radio subsystem were designed as a single base station and a repeater, it would still be necessary for the radio in the field to manually switch channels between the base station frequency and the repeater's translated frequency.
[3] The assumption is that the TEXRail ROW is shared by other railroads whose radios operate in analog mode using carrier squelch.

4. RADIO HARDWARE

4.1. BASE STATION RADIO

The base station radio and its ancillary hardware was selected for the TEXRail 160 MHz radio subsystem using rationale in the table below.

Hardware	Mfr/Model	Selection Rationale
Base radio	Icom FR-5000	Reliability, mfr. support, integration with consoles
Tilt-up tower	EMI	Durability and serviceability (no need to disconnect coax)
Antenna	Sinclair SD214	Reliability, high gain, low tower loading
RF Switch	Icom IAS 1RU	Consolidation to single antenna, low insertion loss
Filter	Sti-co FILT-NB-VHF	Unsurpassed frequency response, low insertion loss
Network card	Icom UCFR5000	Needed to connect multiple sites to network
Power Supply	Icom ICT 22012-20AR	Compatibility, chassis mountable [4]
DC Converter	Wilmore 1675	Reliability, compatibility with battery plant [5]

Table 1: Base Radio Rationale

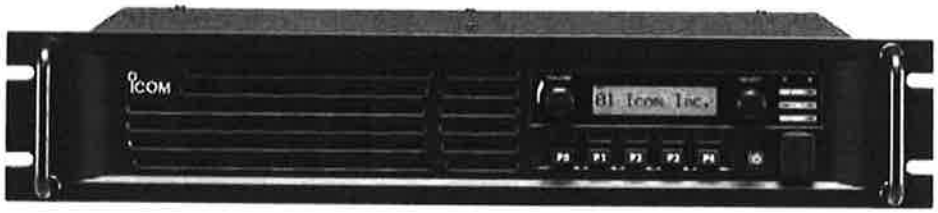


Figure 2: Icom Base Station Radio

Drawings of base station hardware and their ancillary equipment are depicted in drawings submitted in Appendix B.

[4] The power supply is used in communications facilities where 120 VAC is the supply voltage.
[5] The DC-DC converter is used only at CP Grapevine West, where it will interface with the 12 VDC signal shelter battery plant.

4.2. USER RADIOS

The table below identifies the user radios to be provided for the TEXRail 160 MHz radio subsystem, as well as rationale for their selection.

Hardware	Mfr/Model	Selection Rationale
Loco radio	Ritron Clean Cab	Durability, AAR-certification
Vehicle radio	Icom IC-F5400DS	Durability, ease of use, manufacturer support
Portable radio	Icom IC-F3400DT	Durability, ease of use, manufacturer support
Loco antenna	Sinclair ST221	Durability, omni-directional pattern
Vehicle antenna	Larsen Phantom	Low profile, omni-directional pattern
Portable antenna	Icom quarter	Low profile, omni-directional pattern

Table 2: User Radio Rationale

Figure 3: User Radios

Figure 4: Locomotive and Mobile Antennas

5. SYSTEM INTEGRATION

5.1. CONNECTION TO DISPATCH CONSOLES

The radio base stations at the North Side, Smithfield, and CP Grapevine West will be will be connected to the Penta dispatch consoles located at the RCC, B-RCC, and the ITC via an Ethernet network. At each base station, a Barix A1000 radio Internet Protocol (IP) controller will make the translations from IP-based console commands to Electronic Industries Association (EIA)-standard radio tone control.

5.2. END-TO-END FIELD TESTS

End-to-end field tests will be performed along the entire TEXRail ROW to evaluate the functionality and quality of the radio links to the locomotive, vehicle, and portable radios.

6. EQUIPMENT LIST/ PRODUCT DATASHEETS

Equipment lists and product datasheets are presented in Appendix D.

7. CALCULATIONS

The calculations which determined the design details for the base stations were included in the RF coverage analysis submitted as "TEXRail 160 MHz Analysis v3 0 20170619.pdf". The sample graphic below from that document shows predicted composite radio coverage from the three radio base stations for portable radios, mobile radios, and locomotives radios. The receive antenna height for the coverage prediction is 5 feet above ground level, the approximate the height of a handheld portable radio, or of a roof-mounted antenna on a hi-rail vehicle.

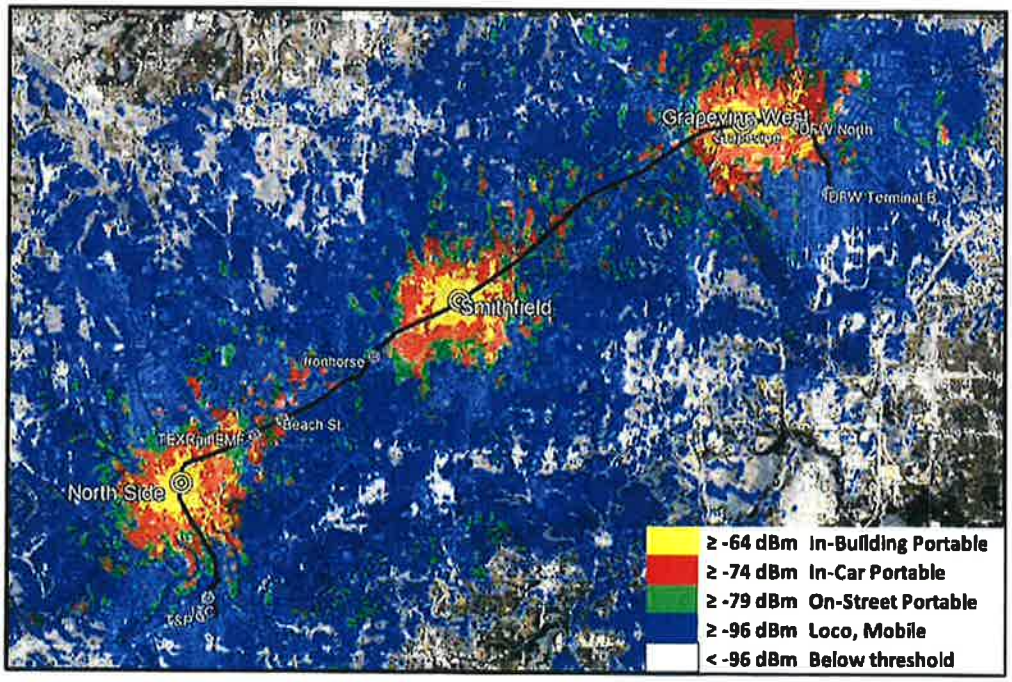


Figure 5: Composite 160 MHz Coverage

8. PHASING AND CUTOVERS

Per Section 16870 of the TEXRail communication system specification (section 1.4.D), an installation plan will be submitted 30 days prior to installation. The plan will contain drawings showing locations of each instrument, installation procedures, and configuration and provisioning information.

DOCUMENT STRUCTURE:

File Description:	RADIO SUBSYSTEM DESIGN NARRATIVE
Parent document(s):	None
Integral documents:	None
Offspring documents:	None
References:	None

Template Version 1.5

Submittal Data Form

CONTRACT:	TEX Rail 15-004
AGENCY:	Fort Worth Transportation Authority
GENERAL CONTRACTOR:	Archer Western Herzog a Joint Venture 6851 NE Loop 820 North Richland Hills, TX 76180
DATE:	September 18, 2017
SPECIFICATION SECTION:	16870.1.4.D.1
DESCRIPTION:	RADIO SUBSYSTEM Installation Drawings: Stamped EMI 60ft Tower
SUBCONTRACTOR/SUPPLIER:	Wabtec
SUBMITTAL NUMBER:	16870-004
CONTRACT DRAWINGS REFERENCED:	NA
SUBMITTED FOR:	Approval

CONTRACTOR'S STAMP

CONTRACTOR'S CERTIFICATION

"Having checked this submission, we certify that it conforms to the requirements of the Contract in all respects, except as otherwise indicated."

Company Name: Archer Western Herzog JV

Signature: [signature]

Print Name: Joel Bales

Title: Project Manager - Systems

Date: 9-18-17

ENGINEER'S STAMP

REVIEW/DISPOSITION STAMP

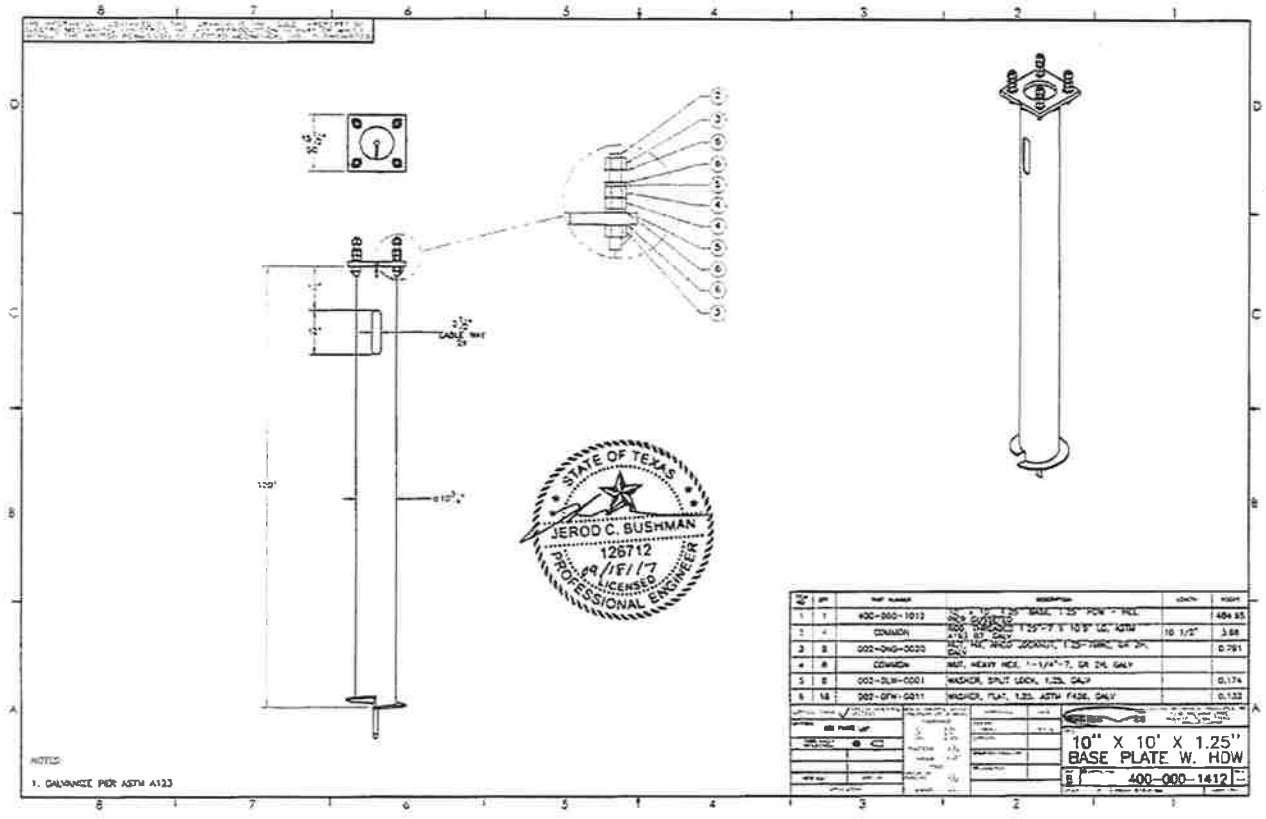
- X APPROVED
- ___APPROVED, AS NOTED
- ☐CORRECT AND RESUBMIT
- ☐CONFIRM
- ___DISAPPROVED
- ___RECEIVED FOR RECORD

Approval does not relieve the Contractor from responsibility for any errors or omissions in these submittals and/or shop drawings or from the responsibility for complying with the requirements of this Contract (except as otherwise provided under the General Provisions of this Contract).

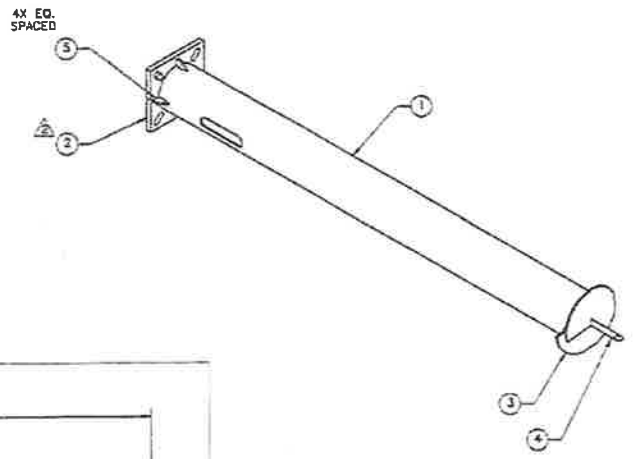
Date: 10/17/2017

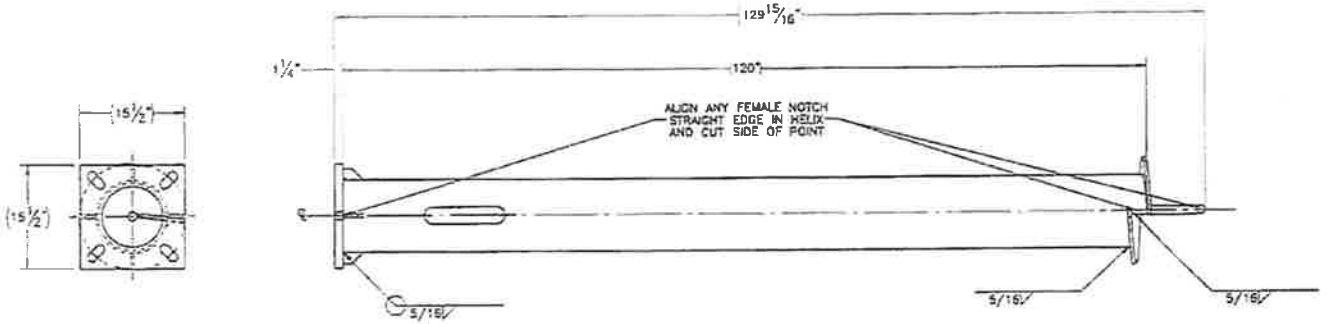
By: Kidus Yohannes [signature]

Reviewed by Greg Likness of PMC


STATE OF TEXAS
JEROD C. BUSHMAN
126712
09/15/17
LICENSED
PROFESSIONAL ENGINEER
NOTES:
1. GALVANIZE PER ASTM A123
10" X 10" X 1.25"
BASE PLATE W. HDW
400-000-1412

REVISIONS					
REV.	DCN #	DESCRIPTION	DATE	BY	APPROVED
2	DCN00284	UPDATED COMPONENT	7.12.17	JGC	





ITEM NO.	QTY	PART NUMBER	DESCRIPTION	LENGTH	WEIGHT
1	1	P-000-708	SHAFT	120"	394.17
2	1	P-000-702	TOP PLATE	15 1/2"	57.08
3	1	P-000-185	10" HELICAL FLIGHT		27.55
4	1	P-000-187	HELICAL PIER POINT		3.74
5	4	P-000-703	HELICAL PIER GUSSET	3"	0.5

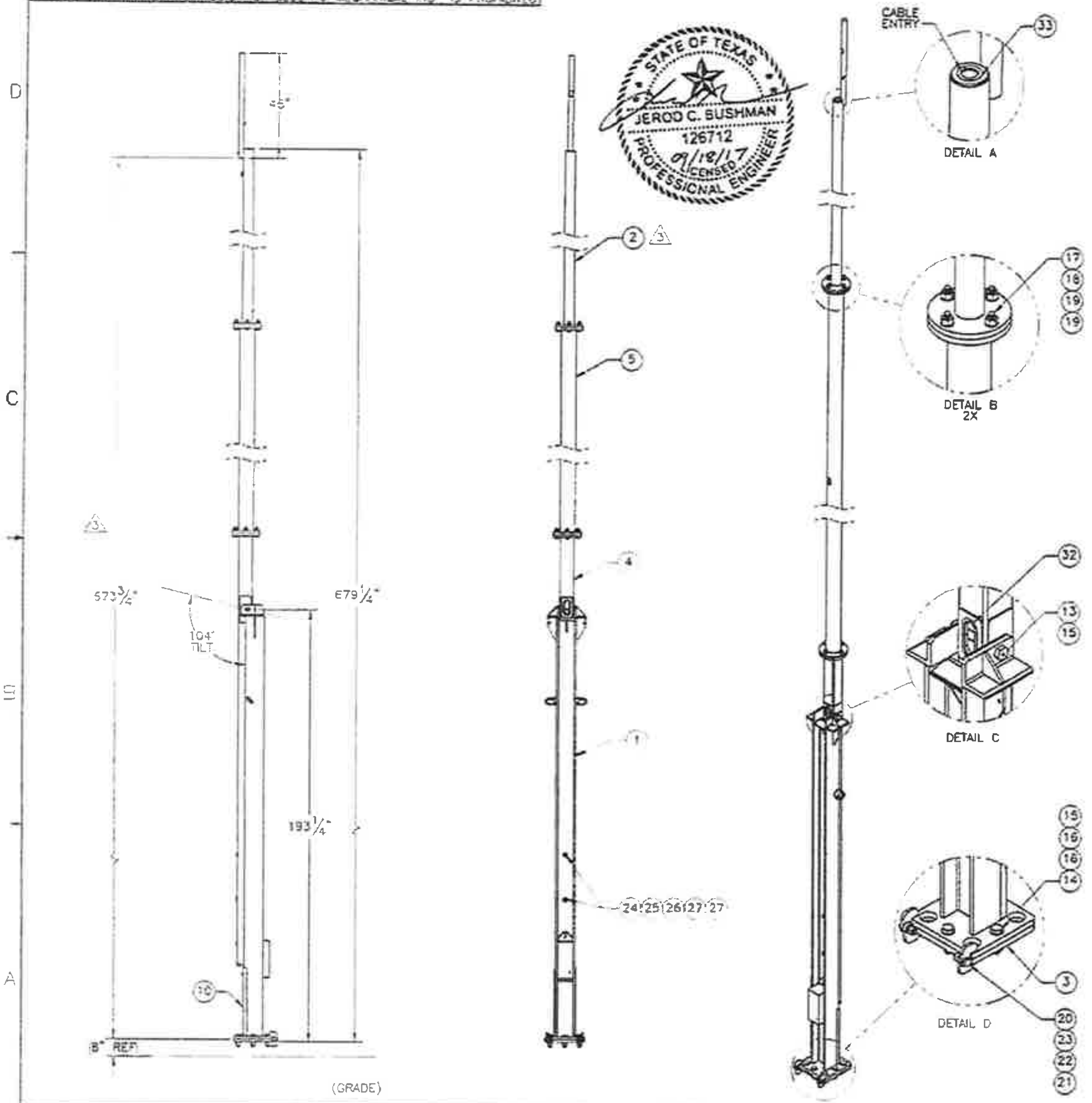
NOTES:
UNLESS OTHERWISE SPECIFIED.
1. ALL WELDING PER AWS D1.1, FCAW, E7XT-1 AND GMAW, ER70S-6 ELECTRODES.
2. SQUARENESS OF WELDED COMPONENTS TO BE WITHIN +/- 1/16".
3. ALL WELDS 3/16" FILLET OR SEAM WELDS ALL AROUND AS APPLICABLE PER JOINT.
4. ALL CAPTIVE TUBES MUST HAVE MIN. TWO WEEP HOLES (ONE UPPER, ONE LOWER) 7/16" DIA.
5. GALVANIZE PER ASTM A123.

STATE OF TEXAS
JEROD C. BUSHMAN
126712
09/11
LICENSED
PROFESSIONAL ENGINEER

SEE PARTS LIST

10" x 10', 1.25" BASE, 1.25" HDW - HEL. PIER GUSSETED

SIZE B | DRAWING NO. 400-000-1012 | 2



REVISIONS

REV.	DCN #	DESCRIPTION	DATE	BY	APPROVED
3	DCN00001	UPDATE SUPPORT BASE ASS'Y & UPPER ROUND MAST ASS'Y TO CONVERGE WITH 400-004-5015	4.24.15	CS	

120 MPH EIA/TIA REV G
PATENT PENDING #[illegible]

ITEM NO.	QTY REQD	PART NUMBER	DESCRIPTION
1	1	400-004-5010-0100	SUPPORT BASE ASSEMBLY
2	1	400-004-5010-0320	UPPER ROUND MAST ASSEMBLY
3	1	400-004-5000-0130	LOWER BASE PLATE ASSEMBLY
4	1	400-004-5000-0210	LOWER SQUARE MAST ASSEMBLY
5	1	400-004-5000-0310	MIDDLE ROUND MAST ASSEMBLY
6	1	400-004-3050-0612	WINCH COVER
7	1	400-004-5000-0071	.875 DIA. X 6.75 LG. PIN
8	1	400-004-5000-0072	.875 DIA. X 2.25 LG. PIN
9	1	400-004-5000-0080	4" PULLEY ASSEMBLY
10	1	400-004-5010-0135	FRONT COVER
11	1	400-904-3003	WINCH KIT, 2000 LB (1/4" X 47' WIRE ROPE)
12	4	002-00C-0002	COTTER PIN, .187 X 1.50 LG, GALV
13	1	002-0BG-0035	BOLT, 1.25-7UNC X 10.00 LG, ASTM A325, GALV
14	4	002-0BG-0031	BOLT, HX HD, 1.25-7UNC X 5.00 LG, GR B7, GALV
15	5	002-0NG-0020	NUT, HX, ANCO LOCKNUT, 1.25-7UNC, GR 2H, GALV
16	8	002-0FW-G011	WASHER, FLAT, 1.25, ASTM F436, GALV
17	8	002-0BG-0210	BOLT, HX HD, 1.00-8UNC X 4.00 LG, ASTM A193 GR B7, GALV
18	8	002-0NG-0000	NUT, HX, ANCO LOCK, 1.00-8UNC, GR 2H, GALV
19	16	002-0FW-G009	WASHER, FLAT, 1.00", F436, GALV
20	2	002-0BG-0040	BOLT, HX HD, .875-9UNC X 3.00 LG, ASTM A325, GALV
21	2	002-0NG-0009	NUT, HX, .875-9UNC, GR 2H, GALV
22	2	002-0LW-G007	WASHER, SPLIT LOCK, .875, GALV
23	4	002-0FW-G008	WASHER, FLAT, .875, ASTM F436, GALV
24	3	002-0BG-0029	BOLT, HX HD, .75-10UNC X 9.00 LG, ASTM A325, GALV
25	3	002-0NG-0019	NUT, HX, .75-10UNC, GR 2H, GALV
26	3	002-0LW-G003	WASHER, SPLIT LOCK, .75", GALV
27	6	002-0FW-G000	WASHER, FLAT, .75 INCH, USS, GALV
28	3	002-0BG-0008	BOLT, HX HD, .375-16UNC X 1.50 LG, GR 5, GALV
29	3	002-0NG-0003	NUT, HEX, .375-16UNC, GR 2H, GALV
30	3	002-0LW-G005	WASHER, SPLIT LOCK, .375 INCH, GALV
31	3	002-0FW-G005	WASHER, FLAT, .375, USS, GALV
32	1	(MCM) 24175K18	EDGE GUARD, 1/2", CUT AT 15-1/4" LG.
33	1	(MCM) 24175K15	EDGE GUARD, 3/16", CUT AT 7-1/2" LG.
34	1	(MCM) 24175K16	EDGE GUARD, 1/4", CUT AT 10-1/2" LG.

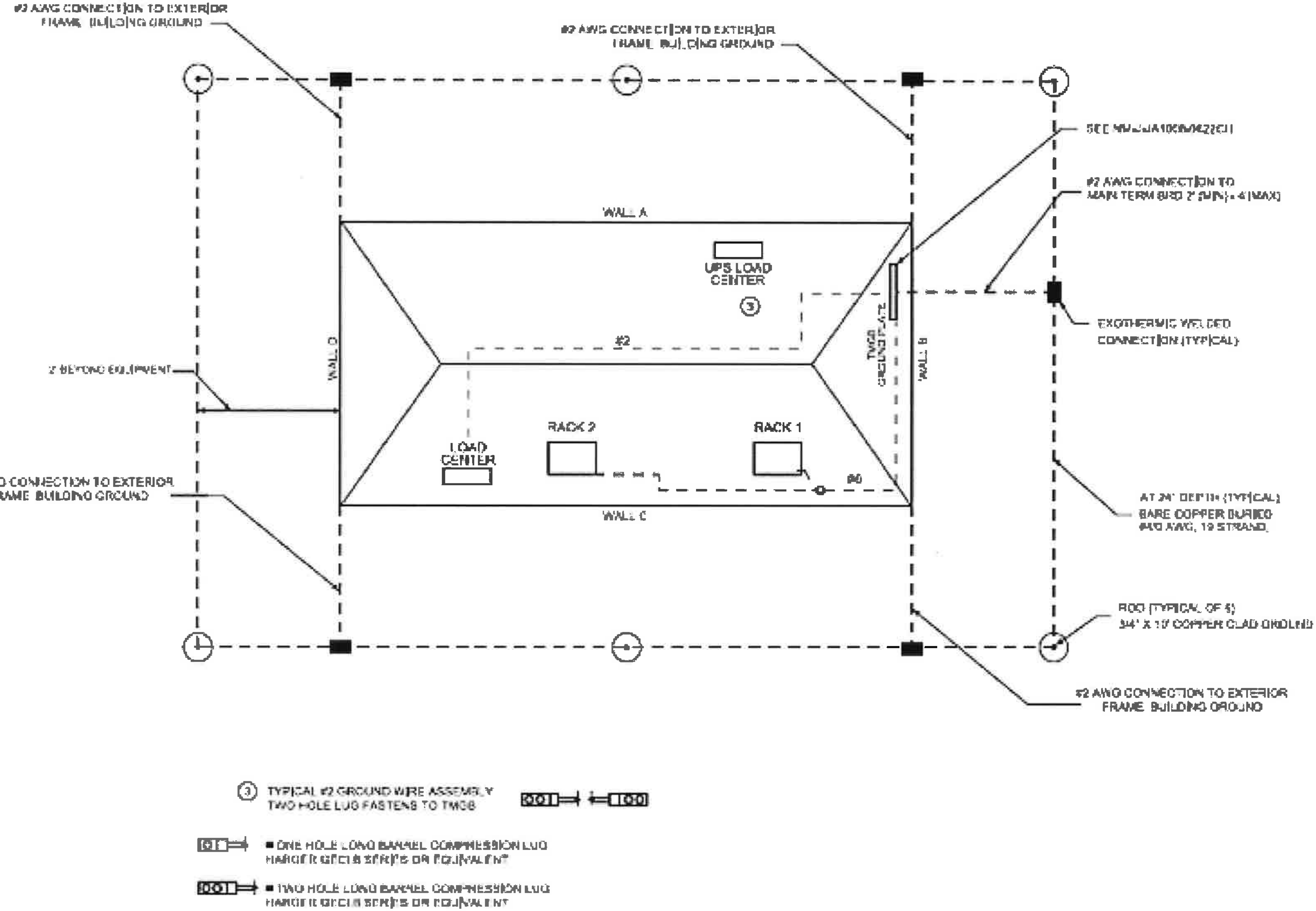
SURFACE FINISH
MATERIAL: SEE PARTS LIST
THIRD ANGLE PROJECTION
NEXT ASSY | USED ON
APPLICATIONS

TOLERANCES
.0 ± .06
.00 ± .01
.000 ± .005

APPROVALS	DATE
DRAWN	9.21.10
CHECKED	9.21.10
ENGINEER/DESIGNER	8.14.14
PRODUCTION	9.21.10

TITLE: 60' TILT-UP TOWER

SIZE: B   DRAWING NO: 400-004-5010   REV: 3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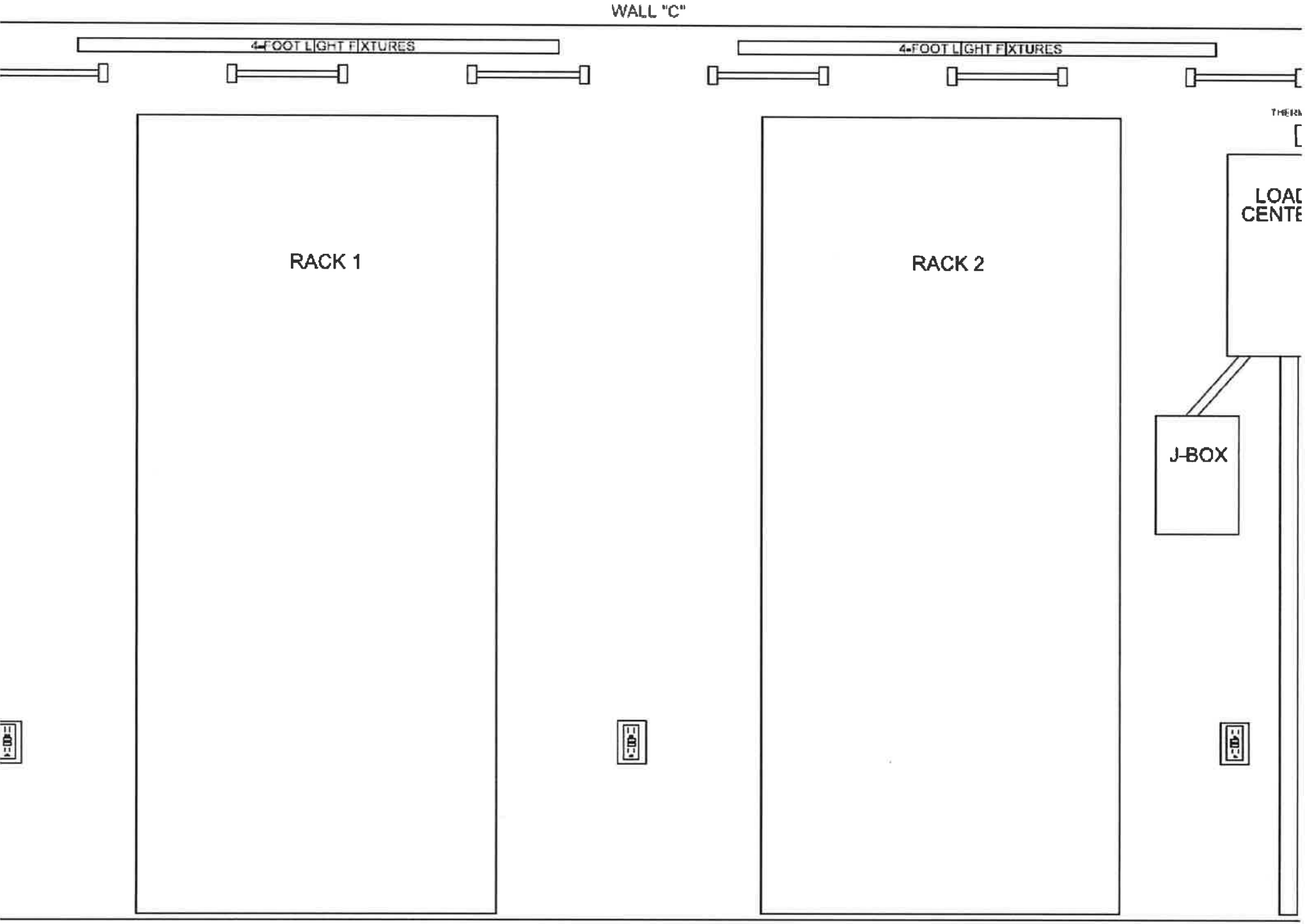
#2 AWG CONNECTION TO EXTERIOR FRAME BUILDING GROUND
#2 AWG CONNECTION TO MAIN TERM BRD 2' (MIN) - 4' (MAX)
EXOTHERMIC WELDED CONNECTION (TYPICAL)
WALL A
UPS LOAD CENTER
3
#2
WALL D
TMGB GROUND PLATE
WALL B
2' BEYOND EQUIPMENT
RACK 2
RACK 1
LOAD CENTER
#6
WALL C
AT 24" DEPTH (TYPICAL)
BARE COPPER BURIED #4/0 AWG, 19 STRAND
ROD (TYPICAL OF 8)
3/4" X 10' COPPER CLAD GROUND
#2 AWG CONNECTION TO EXTERIOR FRAME BUILDING GROUND
TYPICAL #2 GROUND WIRE ASSEMBLY
TWO HOLE LUG FASTENS TO TMGB
■ ONE HOLE LONG BARREL COMPRESSION LUG
HARGER GECLS SERIES OR EQUIVALENT
■ TWO HOLE LONG BARREL COMPRESSION LUG
HARGER GECLS SERIES OR EQUIVALENT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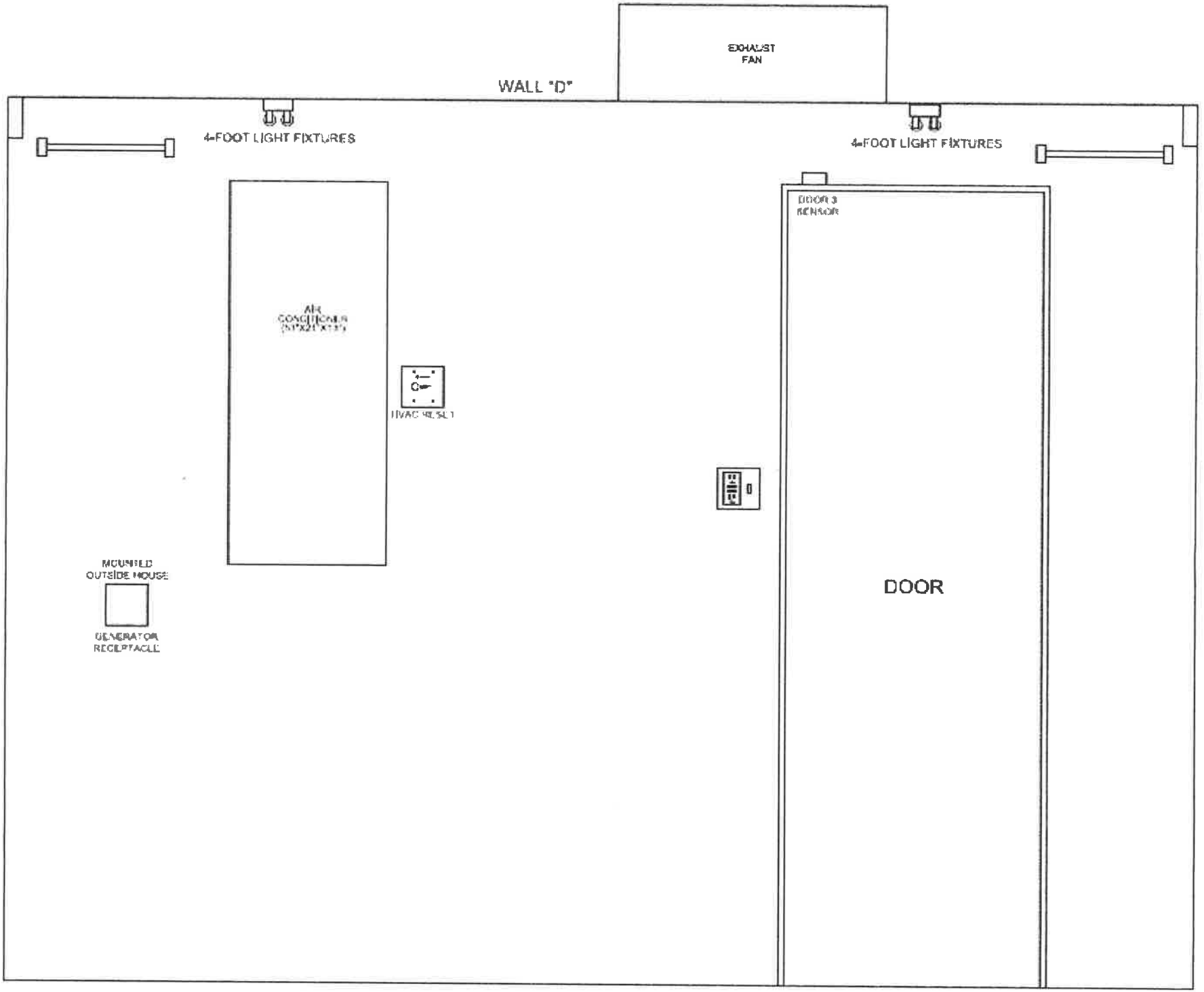
J-BOX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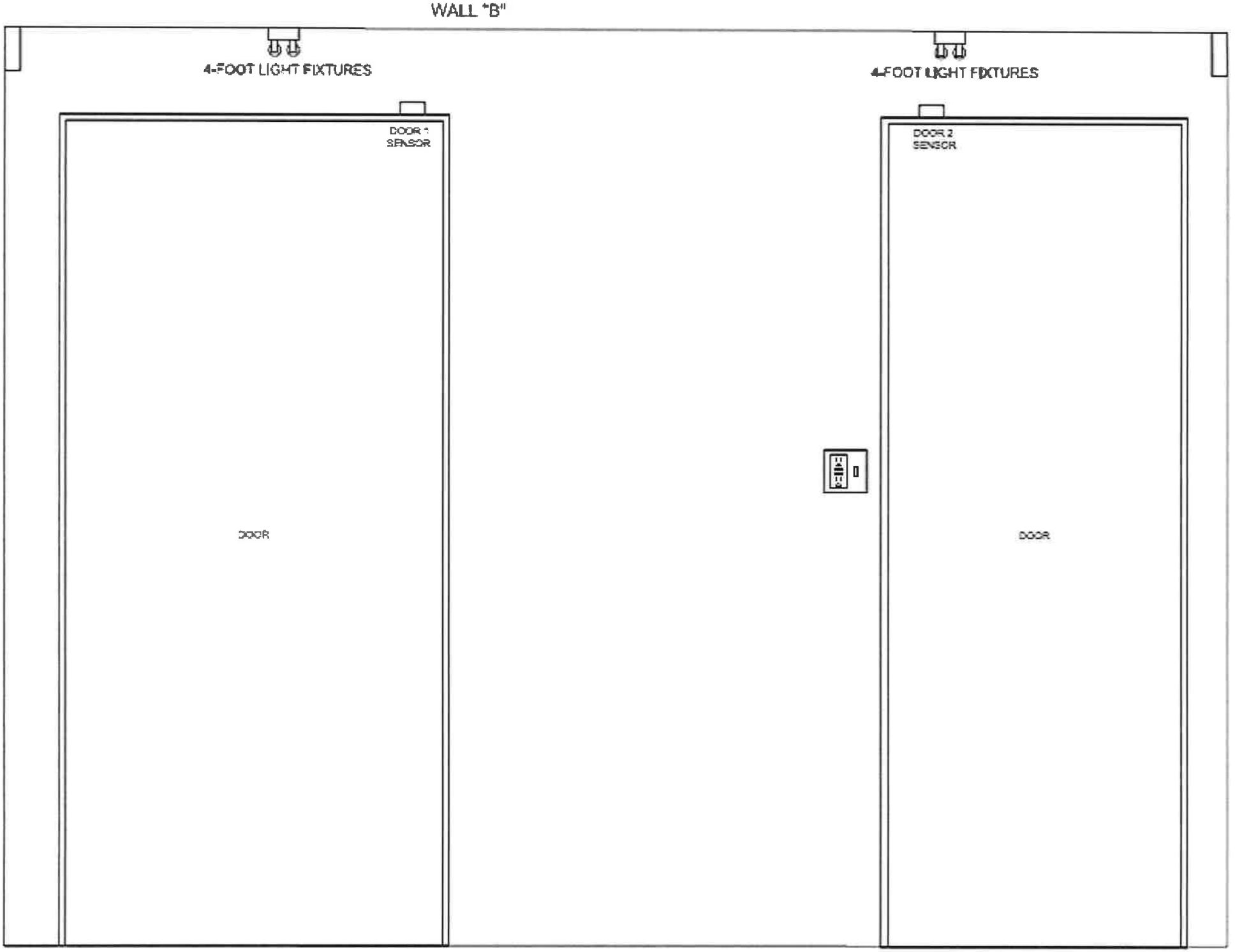
DOOR
DOOR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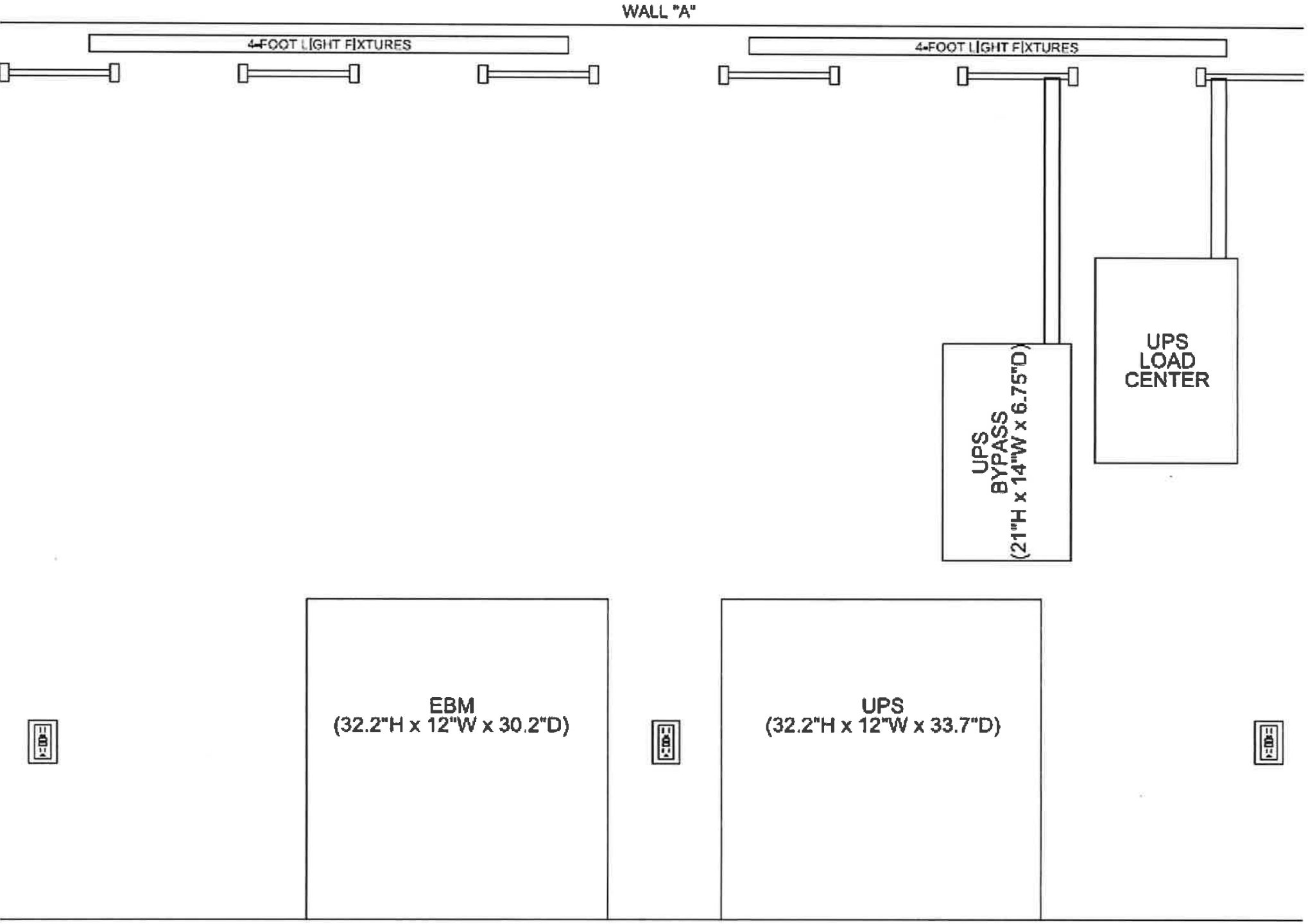
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4-FOOT LIGHT FIXTURES
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UPS
LOAD
CENTER
EBM
(32.2"H x 12"W x 30.2"D)
UPS
(32.2"H x 12"W x 33.7"D)

COMM HOUSE LAYOUT