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***WILLIAMS***

**COMMUNICATIONS INC.**

SINCE 1979

**WILLIAMS COMMUNICATIONS INC. - 512. 328. 2461**

**5524 BEE CAVE RD. SUITE C1 - AUSTIN, TX 78746**

**800. 844. 2461 - FAX - 512. 328. 3009**

## Providing Services in:

- Construction Project Management – (p3-p11)
- Fiber Splicing and Testing – (p12-13)
- System Due Diligence
- Strand/Asbuilt Mapping & Pole Loading – (p14-p20)
- Permitting – (p21-p24)
- HFC Design and Drafting – (p25-p31)
- Optical Network Engineering – (p32-p41)
- Headend and Optical Design Engineering – (p42-p47)
- Digital Video Engineering – (p48-49)
- IP Engineering Support
- Consulting – (p50-53)

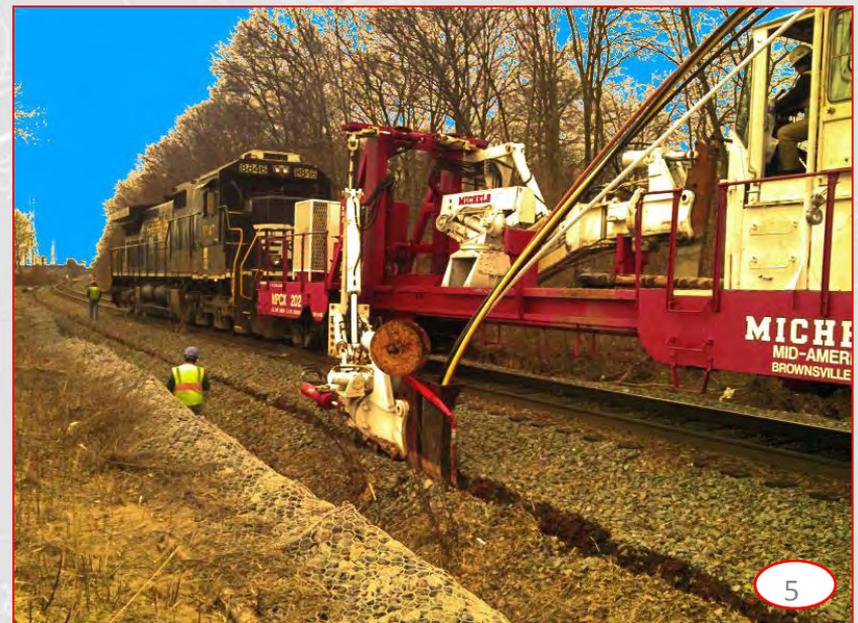
# Project Management

- We have personnel available for all types of projects
- Aerial Construction Management
- Underground Construction Management
- Fiber Construction Management
- Site buildings
- Headend, CO, Data Center, Amplification and Regeneration Sites

# Project Examples

- Long Haul Fiber Build Along the Railroad, Highway and Private ROW
- All Types of Aerial and Underground Construction – QA Inspection
- ROW and Site Acquisition, Permitting
- FTTH Fiber builds – Fiber Splice Management
- Amp Site buildings and Data Centers
- Inside Plant Layout

# Plowing Duct in Along Railroad ROW



# Cat Plowing Duct



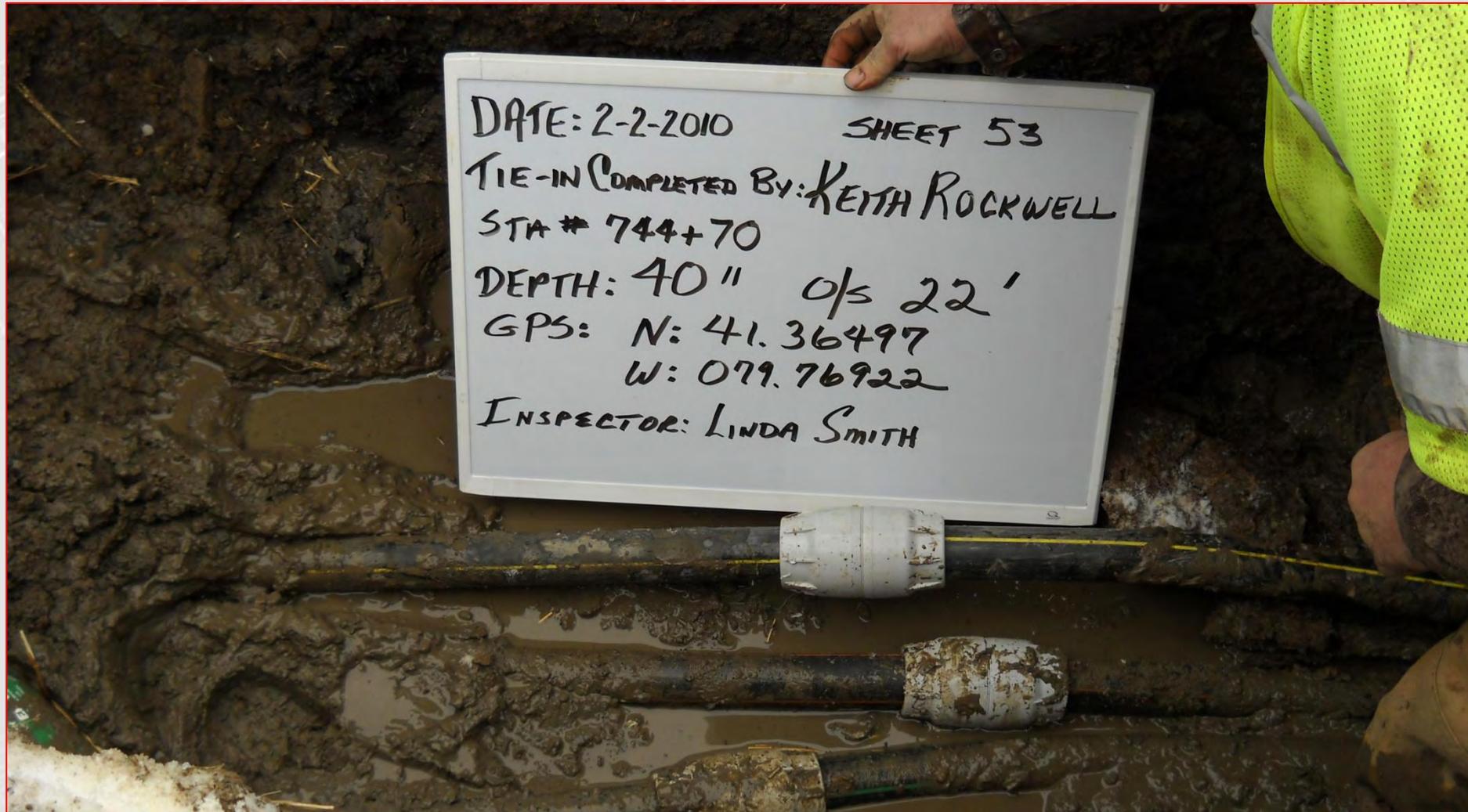
# Bridge Attachments



# Engineering Hand Hole – Man Hole Locations

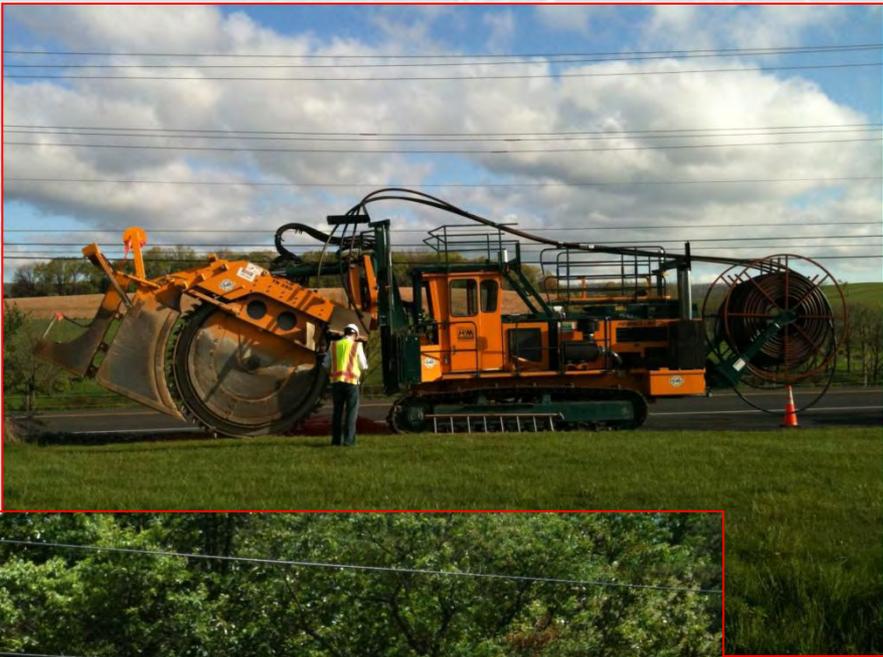


# Duct Installation Inspection and Coupler Location Documentation



DATE: 2-2-2010      SHEET 53  
TIE-IN COMPLETED BY: KEITH ROCKWELL  
STA # 744+70  
DEPTH: 40"      o/s 22'  
GPS: N: 41.36497  
      W: 079.76922  
INSPECTOR: LINDA SMITH

# Directional Boring, Rock Saw, Trenching



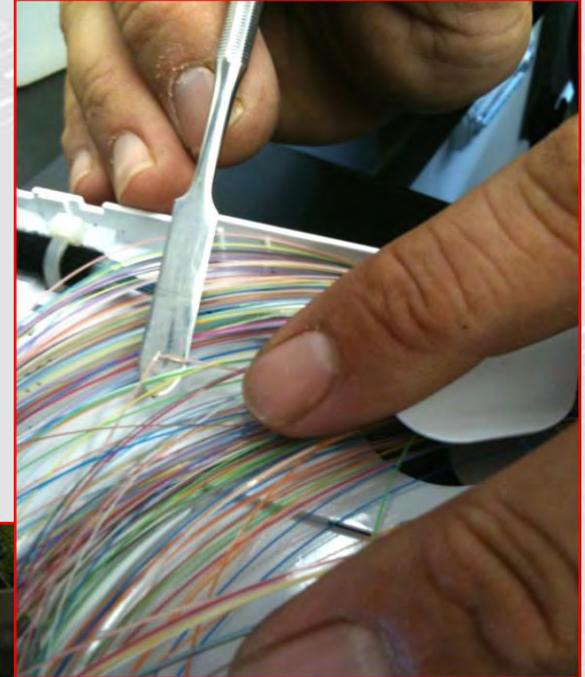
# Building a Regeneration Site



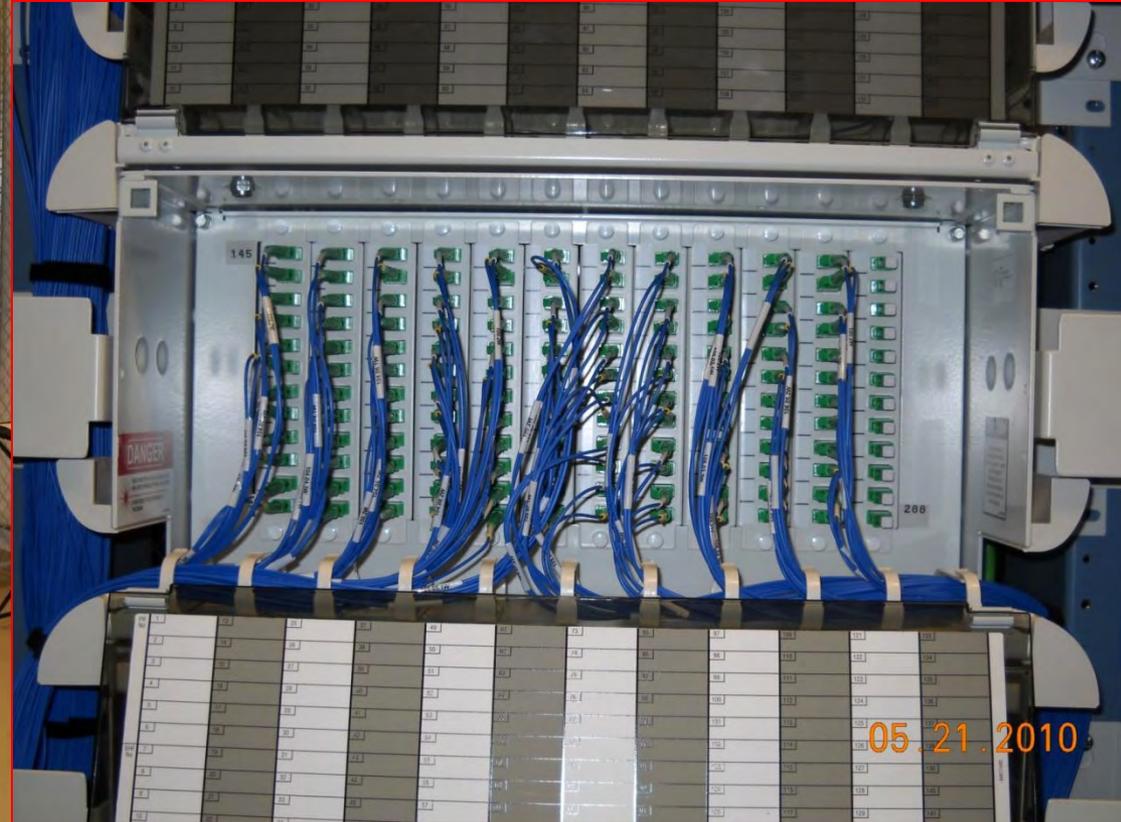
# Power Supply Racks, Overhead Ladder Racks & Data Cabinets



# Splicing Fiber in Field & at Patch Panel



# Spliced Up Fiber & Patch Panel Routing



# Walkout Examples

- Line Extension Walkouts
- Walkout for Numerous CATV Systems in North America
- Walkout of Long Haul Fiber
- As-Built Verification
- Pole Profile – Pole Permits

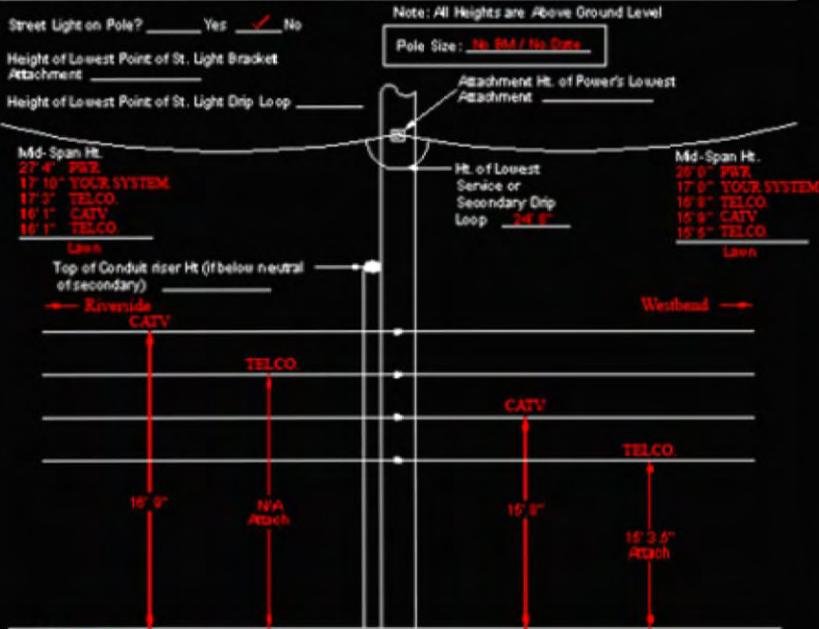
# As-Built Cable and Fiber



# Pole Attachment Sheet

## Pole Attachment Data Sheet - Cable

Name of Company Requesting Attachment: \_\_\_\_\_  
 Pole Num. (reference attached drawing) No Tag Date: March 03, 2007  
 Street Location: Avenue O  
 City \_\_\_\_\_ State Texas County \_\_\_\_\_  
 Complete the following for each proposed attachment. On the drawing below show lowest Power Attachment and all other existing attachments and equipment located on the pole to be low power attachment. Indicate height of each attachment above ground level.



Map No. 5965  
 Picture No. 28-475  
 Make Ready Work Required  
 Yes  No  
 If Yes, Describe Work Required  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Show all existing attachments including height above ground level and proposed position of new attachment including attachment height.



Pole No. 5965-14 Picture No. 28-475



# O-Calc Pro Analysis on Pole Loading

## O-Calc® Pro Analysis Report

Friday, December 10, 2010 9:49:51 AM

Pole ID:	65478 Hanoverville	Pole Length / Class:	55 / 2	Code:	NESC	Structure Type:	GuyedTa
Group ID:	N/A	Pole Species:	SOUTHERN PINE	NESC Rule:	Rule 250B	Status:	At Installation
Related To:	N/A	Setting Depth (ft):	8.42	Construction Grade:	C	Strength Factor:	0.85
Aux Data 1:	Unset	G/L Circumference (in):	46.00	Loading District:	Heavy	Transverse Wind LF:	1.75
Aux Data 2:	Unset	G/L Fiber Stress (psi):	8,000	Ice Thickness (in):	0.50	Wire Tension LF:	1.30
Aux Data 3:	Unset	Fiber Stress Ht. Reduction:	No	Wind Speed (mph):	39.53	Vertical LF:	1.90
Aux Data 4:	Unset	Allowable G/L Moment	68,567	Wind Pressure	4.00	Max 250C Wind	75.90

Pole Capacity Utilization		Height	Wind Angle
Groundline:	40.3%	0.0 ft	120.0°
Maximum:	45.3%	27.3 ft	122.8°
Vertical:	10.7%	35.5 ft	0.0°

Pole Moments		Load Angle	Wind Angle
Groundline:	67,255 ft-lb	103.9°	120.0°
Max Capac. Util:	29,122 ft-lb	180.8°	122.8°

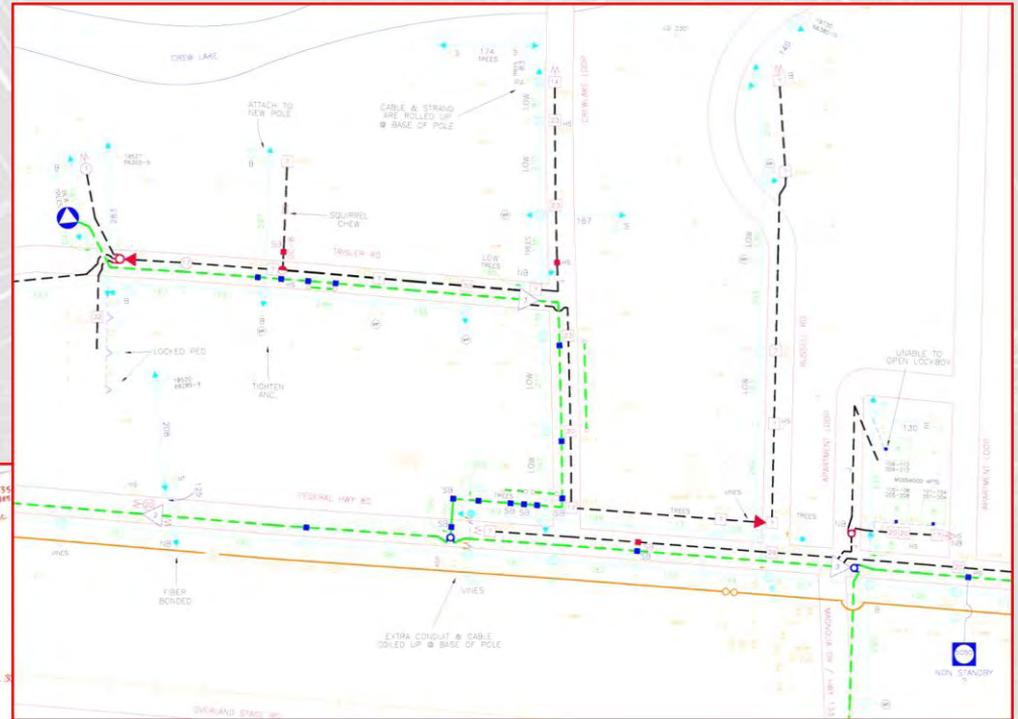
Guy Summary		Guy Tensions		Maximum Guy Tensions	
	Attach Height (ft)	% Allowable Tension	Wind Angle	% Allowable Tension	Wind Angle
Guy 1	44.1	46.8%	122.8°	48.4%	80.0°
Guy 2	34.8	64.3%	122.8°	67.0%	73.4°
Guy 3	26.5	0.0%	122.8°	0.0%	0.0°
Guy 4	25.6	0.0%	122.8°	0.9%	330.0°
Guy 5	14.4	5.0%	122.8°	5.5%	150.0°

Anchor Summary		
	Lead Length (ft)	% Allowable Capacity
Anchor 1	14.0	34.2%
Anchor 2	14.0	0.0%
Anchor 3	125.0	2.7%

GROUNDLINE LOAD SUMMARY:*Wind at 120.0°, Applied Moment 67,255 ft-lb at 103.9°, Allowable Moment 174,738 ft-lb										
	Shear Load (lbs)*	Percent Applied Load	Bending Moment (ft-lb)	Percent of Applied Moment**	Percent of Pole Capacity	Bending Stress (+/-psi)	Vertical Load (lbs)	Vertical Stress (psi)	Total Stress (psi)	Percent of Pole Capacity
Powers:	4,014	168.9	159,041	-4.5	-0.7	6,192	1,667	10	6,202	91.2
Comms:	1,744	73.4	45,889	-0.2	0.0	1,787	915	5	1,792	26.3
Guys/Braces:	-3,711	-156.2	-145,438	-213.3	-35.5	-5,663	14,547	86	-5,576	-82.0
Pole:	295	12.4	6,192	21.3	3.5	241	3,806	23	264	3.9
Streetlights:	23	1.0	1,067	3.7	0.6	42	76	0	42	0.6
Insulators:	12	0.5	505	0.2	0.0	20	188	1	21	0.3
Pole Load:	2,377	100.0	67,255	231.0	38.5	2,619	21,200	126	2,745	40.3
Pole Reserve Capacity:			107,482		61.5	4,185			4,059	59.7

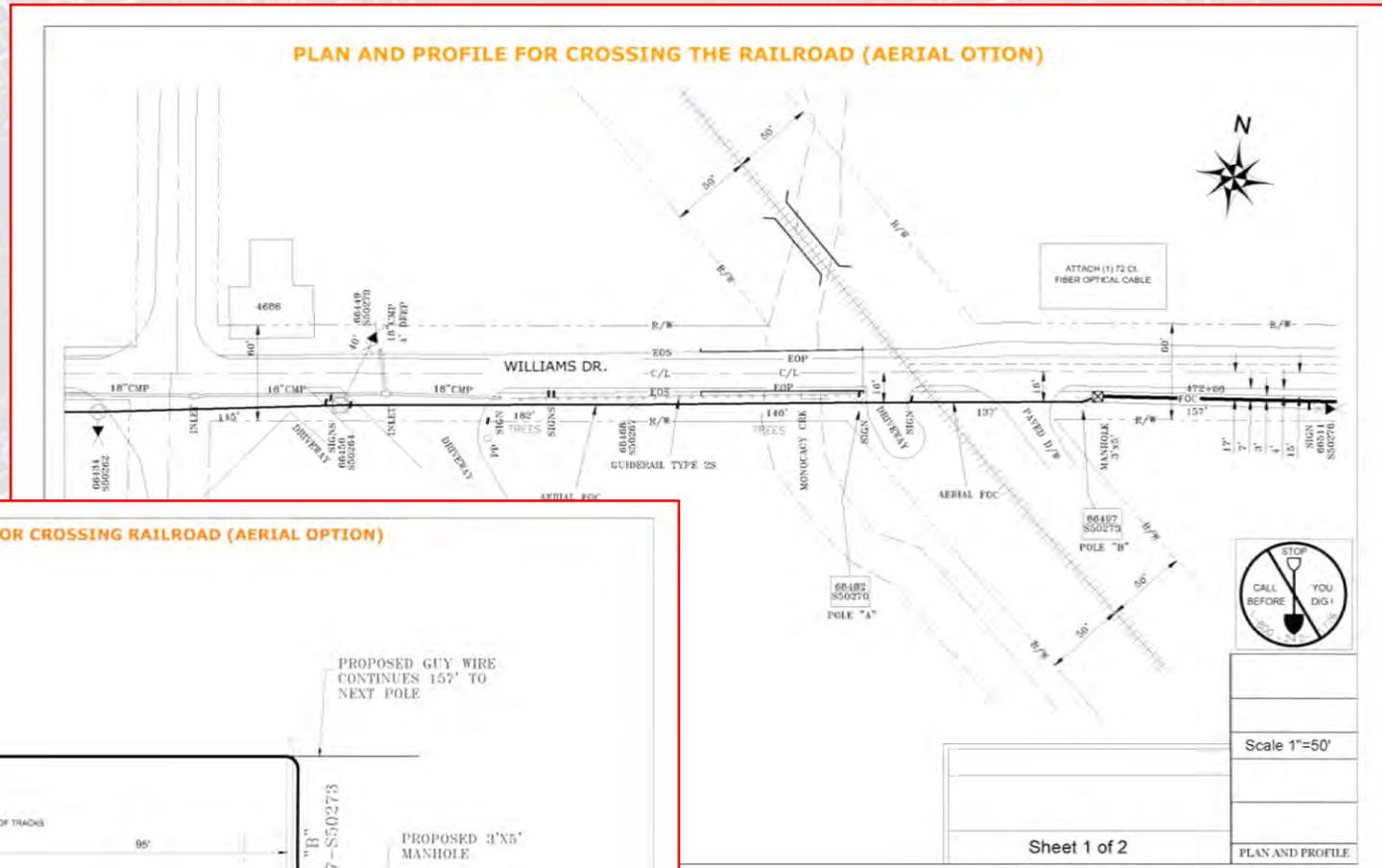
# CAD'd Walkout Map

## Walkout Map Hand Drawn

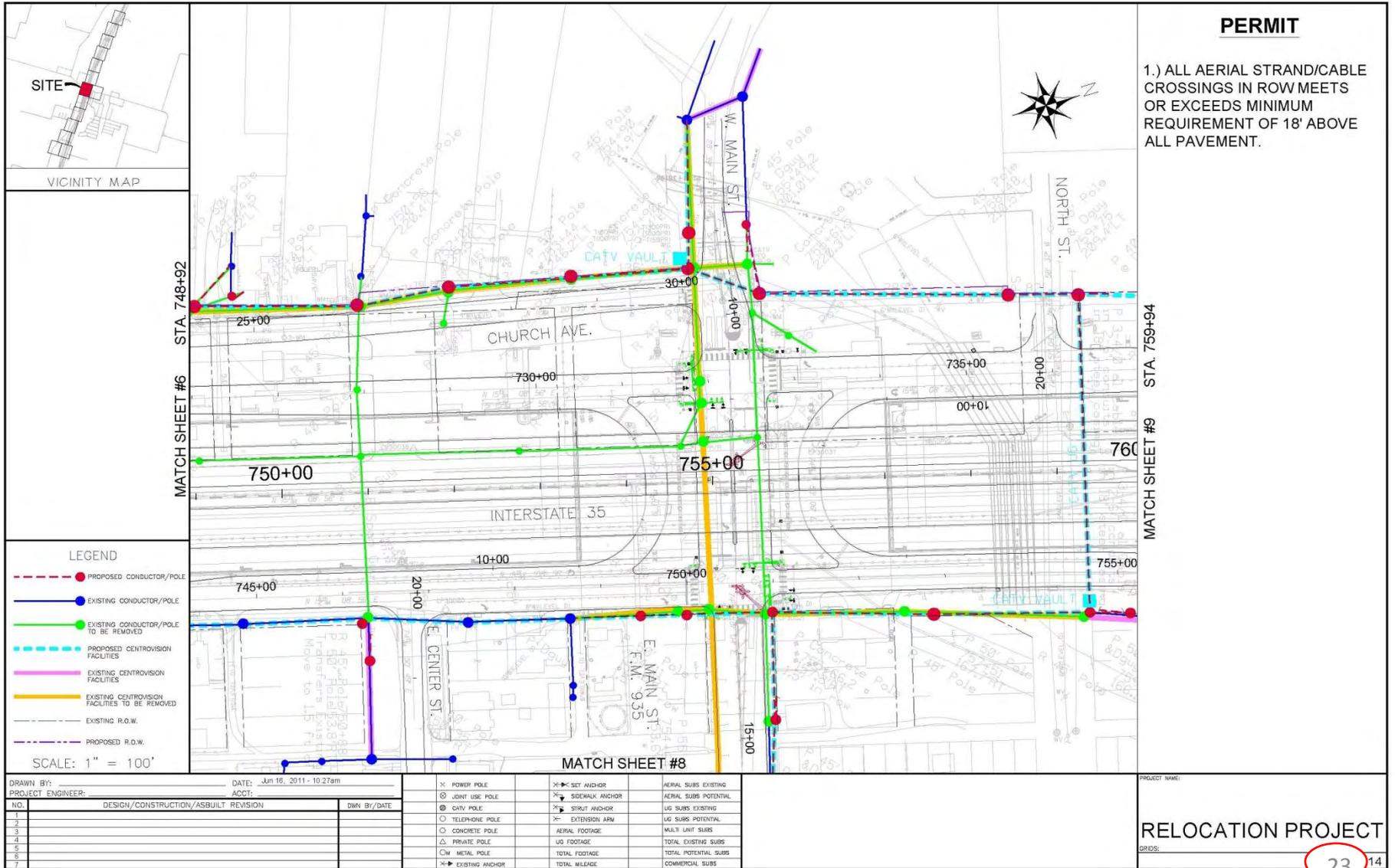




# Railroad Aerial Crossing Permit Plan



# Road Widening Pole Relocation Project



**PERMIT**

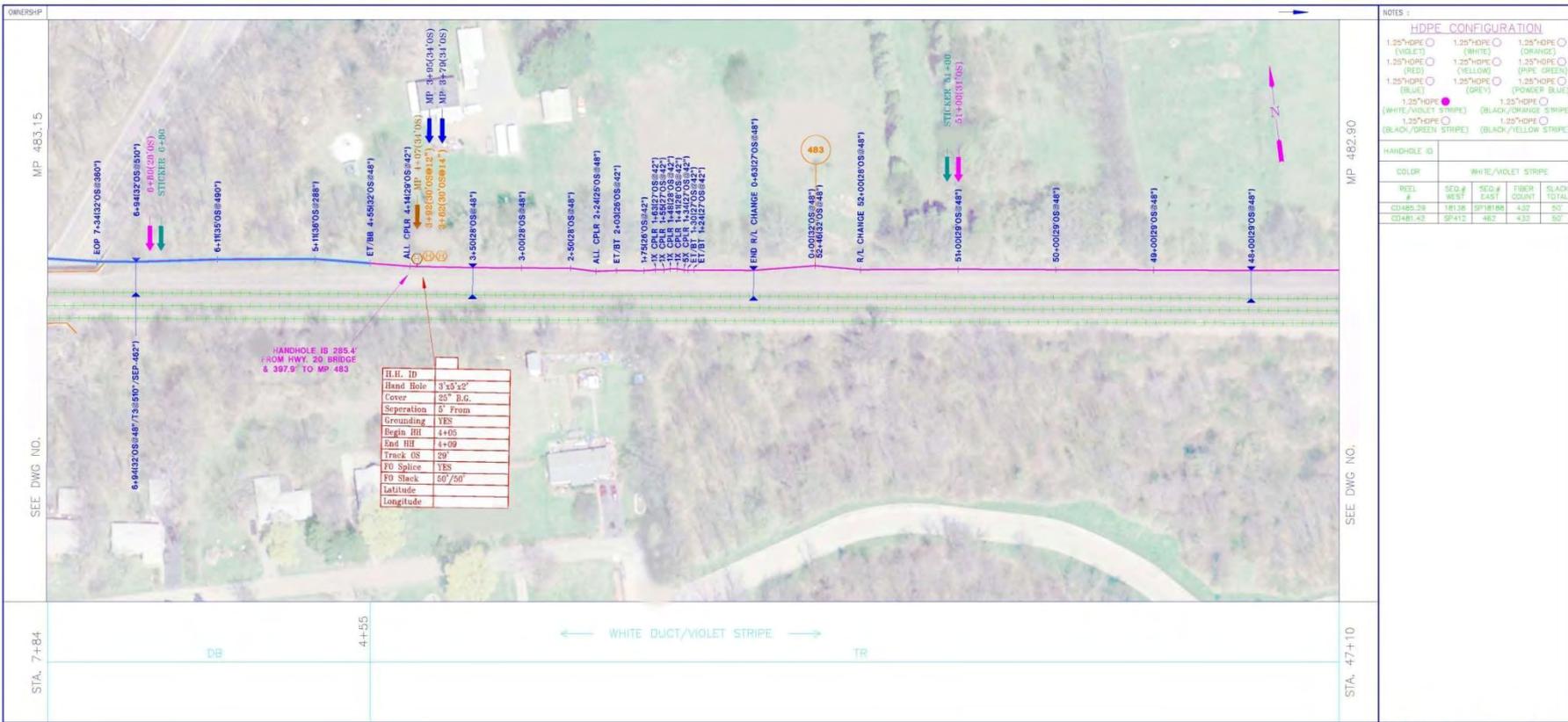
1.) ALL AERIAL STRAND/CABLE CROSSINGS IN ROW MEETS OR EXCEEDS MINIMUM REQUIREMENT OF 18' ABOVE ALL PAVEMENT.

DRAWN BY:		DATE: Jun 18, 2011 - 10:27am
PROJECT ENGINEER:		ACCT:
NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE
1		
2		
3		
4		
5		
6		
7		

⊗ POWER POLE	⊗ SET ANCHOR	⊗ AERIAL SUBS EXISTING
⊙ JOINT USE POLE	⊗ SIDEWALK ANCHOR	⊗ AERIAL SUBS POTENTIAL
⊙ CAVY POLE	⊗ STRUT ANCHOR	⊗ UG SUBS EXISTING
⊙ TELEPHONE POLE	⊗ EXTENSION ARM	⊗ UG SUBS POTENTIAL
⊙ CONCRETE POLE	⊗ AERIAL FOOTAGE	⊗ MULTI-LINE SUBS
⊙ PRIVATE POLE	⊗ UG FOOTAGE	⊗ TOTAL EXISTING SUBS
⊙ MW METAL POLE	⊗ TOTAL FOOTAGE	⊗ TOTAL POTENTIAL SUBS
⊗ EXISTING ANCHOR	⊗ TOTAL MILEAGE	⊗ COMMERCIAL SUBS

PROJECT NAME:	RELOCATION PROJECT
GRIDS:	

# Fiber along Railroad



H.H. ID	
Hand Hole	3'x5'x2'
Cover	25" B.G.
Separation	6" From
Grounding	YES
Begin HH	4+05
End HH	4+09
Track OS	29'
PO Splice	YES
PO Slack	50'/50'
Latitude	
Longitude	

NOTES:

**HDPE CONFIGURATION**

1.25" HDPE (VIOLET)	1.25" HDPE (WHITE)	1.25" HDPE (ORANGE)
1.25" HDPE (RED)	1.25" HDPE (YELLOW)	1.25" HDPE (PIPE GREEN)
1.25" HDPE (BLUE)	1.25" HDPE (GREY)	1.25" HDPE (DUMPER BLUE)
1.25" HDPE (WHITE/VIOLET STRIPE)	1.25" HDPE (BLACK/ORANGE STRIPE)	1.25" HDPE (BLACK/YELLOW STRIPE)

HANDHOLE ID

WELL #	SEC # WEST	SEC # EAST	FIBER COUNT	SLACK TOTAL
CD485.29	18139	SP18168	432	50'
CD481.42	SP413	483	433	50'

REVISIONS

DATE	BY	DESCRIPTION
5/05/09	WC	CAO BASEMAP
2/02/10	DPC	CAO ASSULTS

LEGEND

<ul style="list-style-type: none"> <li>Interstate Hwy.</li> <li>U.S. Hwy.</li> <li>State Hwy.</li> <li>County Road</li> <li>RR Mile Mar.</li> <li>Wisc. Road Sign</li> <li>Fiber Marker</li> <li>Proposed Fiber Marker</li> </ul>	<ul style="list-style-type: none"> <li>H.H. ID</li> <li>Manhole</li> <li>Power Pole</li> <li>Water Valve/Meter</li> <li>Signal Pole</li> <li>RR Switch</li> <li>Slope Indicator</li> <li>Gas Marker</li> </ul>	<ul style="list-style-type: none"> <li>Cooling Pipe</li> <li>New Fiber Cable</li> <li>Fiber Optic</li> <li>Township Line</li> <li>City Limits</li> <li>R/R Line</li> <li>River/Stream</li> <li>Conventional Bore</li> <li>Track</li> <li>Ditch</li> <li>Fence</li> <li>Oil Pipeline</li> <li>Gas Pipeline</li> <li>Power Line</li> <li>Water Line</li> </ul>	<ul style="list-style-type: none"> <li>San. Sewer</li> <li>Storm Drain</li> <li>Aerial Tel.</li> <li>Buried Tel.</li> <li>Buried CDRY</li> <li>Buried Power</li> <li>DB Directional Bore</li> <li>RR</li> <li>RR Plow</li> <li>BA Bridge Attachment</li> <li>BD Ballast Deck</li> <li>BLP Black Iron Pipe</li> <li>G.I.P. Galvanized Iron Pipe</li> </ul>
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METHOD OF CONST. QTY ITEM QTY

1-1/4" HDPE	0	CABLE LENGTH	1321
2" HDPE	0	RR LENGTH	0
JOINT 5" BSP	0	INNERDUCT	0
JOINT 6" BSP	0	HDPE CASING (10")	0
JOINT 6" GSP	0	STEEL CASING (10")	0
RAIL PLOW (RP)	0	HANDHOLES	0
TRENCH (TR)	0	MANHOLES	0
CONV. BORE (CB)	0	ROCK	0
DIR. BORE (DB)	0	MARKERS	0
BALLAST DECK (BD)	0	GALV. PIPE	0
BRIDGE ATTACH (BA)	0		

## FIBER OPTIC ROUTE

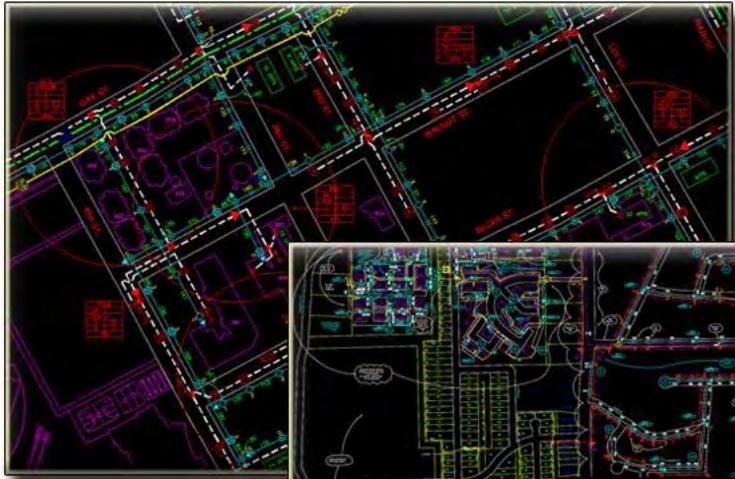
DRAWN BY:	WC	DATE:	5/05/09
CHECKED BY:		DATE:	
DESIGNED BY:		DATE:	
APPROVED BY:		DATE:	
DRAWING SCALE:	1"=100'	DIVISION:	
DRAWING NUMBER:	482-458		



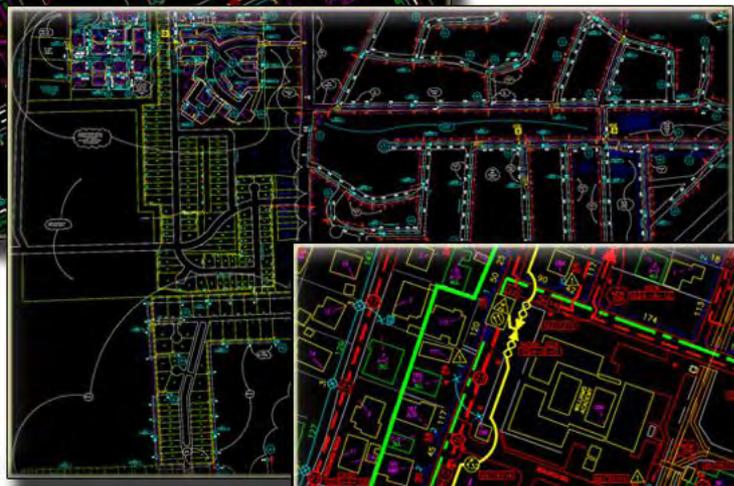
# Design/Diagram Software We Use

- AutoCAD
- Lode Data (Fiber and Coax)
- Bentley Comms (MicroStation)
- OSPInSight
- MapInfo
- Visio

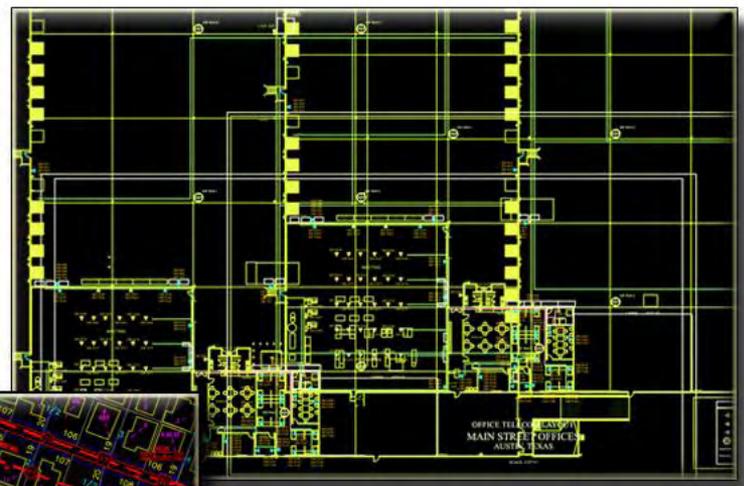
# Telecommunications Design and Drafting



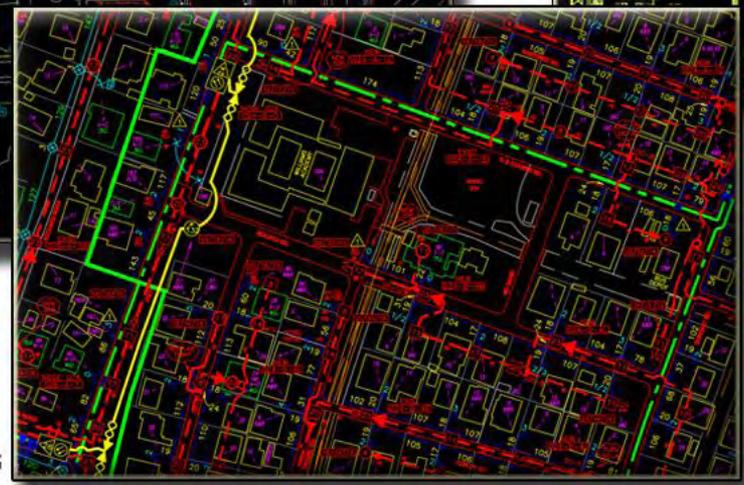
WIRELESS MODEM DIAGRAM



COAXIAL DRAFTING



TELECOM OFFICE LAYOUT



FIBER & COAXIAL DRAFTING

# Coax Design Examples

- Upgrade Design for HFC Plant – Retrofits and Re-Builds
- Node Size Reductions and Node outs
- Customer Support After Design For Field Changes

# Node Design

Design Assistant - Design - V003-D

File Edit Mode Tools Global Change Spec Edit Test Misc Help

EQ Manual OP On

0 Alter 1 Jump 2 Forward 3 Carry 4 Fwd2A 5 Test 6 WillWrk 7 AutoCpl 8 Recalc 9 Toggle / Distance  
 0 Break 1 Join 2 BkFeed 3 UnBkFd 4 XFwd2A 5 MoveCpl 6 XWillWrk 7 SetMDU 8 RotTap 9 Copy + Name  
 0 SpcVw 1 Xspec 2 FwdFd 3 UnFFd 4 BrlLabel 5 Dsmry 6 ClPLEs 7 CAwBF 8 XCamp 9 LckDStr + Notes

IN	1870	55	40	5	ftg-hc-cab-lv	amp	taps	cplr[lb]	cplr[lb]	1625	F4	F5	F6	R3	R4
1	0.00	0.00	0.00	0.00	0	406	61	U003A00	200< 2>	200< 3>	0.00				
2	45.00	33.00	17.00	17.00	0	406			200 [ 4 ]		41.60				
3	45.00	33.00	17.00	17.00	0	406					41.60				
4	45.00	33.00	17.00	17.00	0	406					41.60				
5	41.81	32.25	17.59	17.20	226	406					38.98				
6	41.46	32.17	17.65	17.23	25	407					38.69				
7	40.54	31.96	17.82	17.28	65	407					37.93				
8	40.33	31.91	17.86	17.30	15	407					37.76				
9	39.90	31.81	17.94	17.33	31	407					37.40				
10	36.65	31.05	18.54	17.53	230	407					34.73				
11	35.02	30.66	18.84	17.64	116	407					33.39				
12	31.68	29.88	19.46	17.85	237	407					30.64				
13	29.88	29.46	19.79	17.96	127	407					29.16				
14	27.94	29.01	20.15	18.09	138	407					27.56				
15	25.78	28.50	20.54	18.23	153	407					25.79				
16	23.61	27.99	20.94	18.37	154	407					24.00				
17	21.47	27.49	21.34	18.50	152	407					22.24				
18	21.14	27.42	21.40	18.52	23	407					21.97				
19	20.82	27.34	21.46	18.54	23	507					21.71				
20	42.43	32.40	17.47	17.16	182	407					39.49				
21	40.23	31.88	17.88	17.30	156	407					37.68				
22	39.83	31.79	17.95	17.33	29	407					37.34				
23	39.47	31.71	18.02	17.35	25	407					37.05				
24	39.47	31.71	18.02	17.35	0	406					37.05				
25	36.79	31.08	18.51	17.52	190	406					34.85				
26	36.13	30.92	18.64	17.57	47	406									
27	32.70	30.12	19.27	17.78	243	406									
28	29.88	29.46	19.79	17.96	200	406									
29	27.35	28.87	20.26	18.13	190	406									
30	23.62	28.00	20.94	18.36	264	406									
31	23.27	27.91	21.01	18.39	25	407									
32	18.34	26.76	21.92	18.70	350	407									
33	17.98	26.68	21.98	18.72	25	407									
34	17.98	26.68	21.98	18.72	0	406									
35	41.67	32.22	17.61	17.21	236	406									
36	37.81	31.32	18.33	17.46	274	406									
37	33.23	30.24	19.17	17.75	325	406									
38	28.88	29.23	19.97	18.03	300	406									
39	26.08	28.57	20.49	18.21	199	406									
40	21.68	27.54	21.30	18.49	312	406									
41	16.62	26.36	22.23	18.81	359	406									
42	45.00	33.00	17.00	17.00	0	406									
43	43.35	32.32	17.67	17.62	25	407									
44	36.79	30.78	18.87	18.04	465	407									
45	36.44	30.70	18.94	18.06	25	407									
46	34.89	30.34	19.23	18.16	110	406									
47	32.41	29.76	19.68	18.32	176	406									
48	28.32	28.80	20.44	18.58	290	406									
49	19.82	28.30	20.94	17.88	0	406									
	45.00	33.00	17.00	17.00											

PW-870-60 : PW-870-MOT-MOT : PW-870SAPCT : PW-870-MOT-

Design Assistant - Design - V003-D Starting 1.49

File Edit Mode Tools Global Change Spec Edit Test Misc Help

EQ Manual OP On

0 Alter 1 Jump 2 Forward 3 Carry 4 Fwd2A 5 Test 6 WillWrk 7 AutoCpl 8 Recalc 9 Toggle / Distance  
 0 Break 1 Join 2 BkFeed 3 UnBkFd 4 XFwd2A 5 MoveCpl 6 XWillWrk 7 SetMDU 8 RotTap 9 Copy + Name  
 0 SpcVw 1 Xspec 2 FwdFd 3 UnFFd 4 BrlLabel 5 Dsmry 6 ClPLEs 7 CAwBF 8 XCamp 9 LckDStr + Notes

IN	1870	55	40	5	ftg-hc-cab-lv	amp	taps	cplr[lb]	cplr[lb]	1625	F4	F5	F6	R3	
1	51.00	39.00	17.00	17.00	0	406			200 [ 6 ]	200 [ 4 ]	45.90				
2	47.04	38.00	17.80	17.27	204	402			808 [ 12 ]		42.62				
3	40.51	35.52	20.21	19.18	182	3402	1				217				
4	35.30	33.51	22.09	20.83	176	1402	1				211				
5	27.91	29.26	26.21	24.57	185	402	131N				U103B04A				
6	51.00	39.00	17.00	17.00	0	3402	1				223				
7	44.87	37.18	18.65	18.12	244	2402	1				220				
8	37.65	35.10	20.52	19.31	300	3402	1				211				
9	27.89	30.29	25.12	23.21	307	402	1								
10	22.01	28.89	26.30	23.60	303	402	132N				U103B04B				
11	51.00	39.00	17.00	17.00	0	4402	1				226				
12	41.57	35.77	20.03	19.28	290	1402	1				812<10>				
13	35.50	33.96	21.67	20.39	241	4402	1				220				
14	26.23	29.26	26.17	24.26	282	402	133N				U103B04C				
15	51.00	39.00	17.00	17.00	0	3402	1				223				
16	44.11	37.00	18.00	18.17	283	3402	1				220				
17	38.87	35.39	20.28	19.23	198	3402	1				214				
18	31.26	32.40	23.00	21.66	258	2402	1				200				
	0.00	0.00	0.00	0.00							22.26	16.60	31.00	29.66	0.00

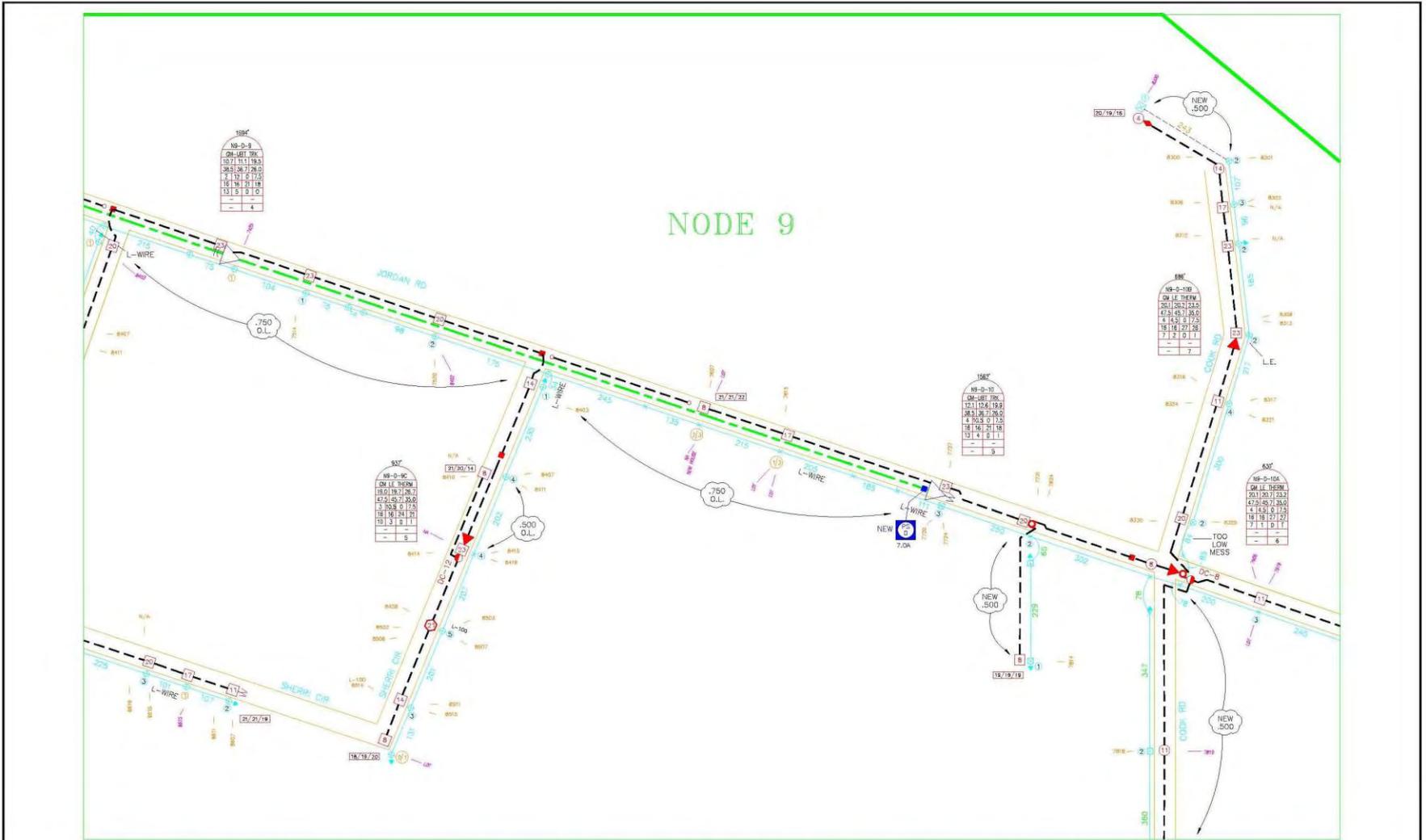
PW-870-60 : PW-870-MOT-MOT : PW-870SAPCT : PW-870-MOT-

Branch 5 of 43 Feeder 1.1 Imp



# 870mhz Design w/Tombstones

NODE 9



ROUTE SYMBOLS	QTY	ROUTE SYMBOLS	QTY	ROUTE SYMBOLS	QTY	FOOTAGE	SIZE	CABLE DESCRIPTION	PRICE
L.D. LONG DROP	0	P. PUSH POLE	0	AMP. SINGLE DWELL. ACT./POT.	55/59				
EXISTING ANCHOR	8	POWER POLE	12	AMP. COMMERCIAL UNITS	0				
KEY ANCHOR	0	PINPOLE POLE	0	AMP. MULTI-DWELLING UNITS	0				
SIDEWALK GUY	0	JOINT USE POLE	03	U-G-SINGLE DWELL. ACT./POT.	1/1				
SIDEWALK SET GUY	0	CATV SET POLE	0	U-G-COMMERCIAL UNITS	0	243'			
POLE TO POLE GUY	0	TRANS. POLE	5	U-G-MULTI-DWELLING UNITS	0	TOTAL			
OVERHEAD GUY	0	COND. METAL POLE	0	WOTH. UNITS	0	8899'			
WIRE	0	WIRELESS	0	U-G-WIRE	6	0			

DESIGN SYMBOLS	NOTES/AMP./L.E. DATA
2 POINT TAN	2 POINT TAN
4 POINT TAN	4 POINT TAN
8 POINT TAN	8 POINT TAN
2 WAY SPLIT	2 WAY SPLIT
3 WAY SPLIT	3 WAY SPLIT
4 WAY SPLIT	4 WAY SPLIT
5 WAY SPLIT	5 WAY SPLIT
6 WAY SPLIT	6 WAY SPLIT
7 WAY SPLIT	7 WAY SPLIT
8 WAY SPLIT	8 WAY SPLIT
9 WAY SPLIT	9 WAY SPLIT
10 WAY SPLIT	10 WAY SPLIT
11 WAY SPLIT	11 WAY SPLIT
12 WAY SPLIT	12 WAY SPLIT
13 WAY SPLIT	13 WAY SPLIT
14 WAY SPLIT	14 WAY SPLIT
15 WAY SPLIT	15 WAY SPLIT
16 WAY SPLIT	16 WAY SPLIT
17 WAY SPLIT	17 WAY SPLIT
18 WAY SPLIT	18 WAY SPLIT
19 WAY SPLIT	19 WAY SPLIT
20 WAY SPLIT	20 WAY SPLIT
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REVISIONS	DATE	BY	DESCRIPTION
1	10/27/09	DESIGN	DESIGN
2	11/12/09	DESIGN	DESIGN
3	11/17/09	DESIGN	DESIGN
4	11/17/09	DESIGN	DESIGN
5	11/17/09	DESIGN	DESIGN
6	11/17/09	DESIGN	DESIGN
7	11/17/09	DESIGN	DESIGN
8	11/17/09	DESIGN	DESIGN
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98	11/17/09	DESIGN	DESIGN
99	11/17/09	DESIGN	DESIGN
100	11/17/09	DESIGN	DESIGN

NOTES
EXISTING AMPLETER LOCATION
NEW AMPLETER LOCATION
SCALE: 1"=100'

WILLIAMS COMMUNICATIONS
11000 N. LOOP W. SUITE 201 DALLAS, TEXAS 75248 PHONE: (972) 258-9441 FAX: (972) 258-3008

SYSTEM NAME	LOCATION
TX1700-2225	TX1700-2225
TX1699-2225	TX1699-2225
TX1698-2225	TX1698-2225



# Fiber Design & Layout for FTTH and Long Haul Transport

- Design Layout for Long Haul Fiber Build
- Design FTTH System
- Input Fiber Information for Database - OSPInSight

# Fiber Link Analysis Sheet

1310 Link Analysis Sheet



Company: Any Company  
 System: Any Town  
 Project: System Nodes - All OTR Footage

Transmitter Node No	Harmonic Node Name	Manuf. Transmitter	DFB Model #	Calc'd CNR	Fiber Loss @ 0.35 dB/km	Split % (Layer)	Conn. Loss @ 1.25 per	Total Path Loss	Xmitr No	Typical Launch Power @ Node	Calculated Power At Node		
1	Node 1	Hamonic	PWL4710	54.32	14.81 km	5.183	100	0.00	1	6.18 dB	2	9.5 dBm	3.32 dBm
2	Node 2	Hamonic	PWL4710	52.5	30.00 km	10.499	100	0.00	1	11.50 dB	3	13.0 dBm	1.50 dBm
3	Node 3	Hamonic	PWL4716	49.75	37.65 km	13.248	100	0.00	1	14.25 dB	1	13.0 dBm	1.25 dBm
4	Node 4	Hamonic	PWL4106S	51.63	14.49 km	5.072	100	0.00	1	6.07 dB	10	6.5 dBm	0.43 dBm
5	Node 5	Hamonic	PWL4106S	53.95	16.44 km	5.754	100	0.00	1	6.75 dB	9	9.5 dBm	2.75 dBm
6	Node 6	Hamonic	PWL4713	51.34	24.39 km	8.538	80	1.80	1	11.34 dB	6	11.5 dBm	0.16 dBm
7	Node 7	Hamonic	PWL4716	52.06	31.27 km	10.945	100	0.00	1	11.94 dB	5	13.0 dBm	1.06 dBm
8	Node 8	Hamonic	PWL4716	54.09	25.45 km	8.907	100	0.00	1	9.91 dB	4	13.0 dBm	3.09 dBm
9	Node 9	Future Node											
10	Node 10	Hamonic	PWL4110S	52.49	17.79 km	6.227	75	2.20	1	9.43 dB	12	10.5 dBm	1.07 dBm
11	Node 11	Hamonic	PWL4713	52.52	4.82 km	1.666	20	8.10	1	10.79 dB	6	11.5 dBm	0.71 dBm
12	Node 12	Aurora	AT3306S-N1	52.4	1.14 km	0.397	100	0.00	1	1.40 dB	15	3.0 dBm	1.40 dBm
13	Node 13	Hamonic	PWL4713	52.78	2.41 km	0.843	50	8.20	1.5	10.54 dB	7	11.5 dBm	0.96 dBm
14	Node 14	Future Node											
15	Node 15	Hamonic	PWL4110S	53.26	2.99 km	1.046	25	7.10	1	9.15 dB	12	10.5 dBm	1.35 dBm
16	Node 16	Future Node											
17	Node 17	Hamonic	PWL4104S	53.01	4.82 km	1.666	100	0.00	1	2.69 dB	11	4.5 dBm	1.81 dBm
18	Node 18	Hamonic	PWL4106S	51.63	14.49 km	5.072	100	0.00	1	6.07 dB	13	6.5 dBm	0.43 dBm
19	Node 19	Aurora	AT3306L	53.57	14.81 km	5.183	100	0.00	1	6.18 dB	14	8.8 dBm	2.57 dBm
20													
21													
22													
23													
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25													
26													
27													
28													
29													
30													

- Note: 1) Target signal at Node is: -3.0 dBm to +3.0 dBm (Target = 53 CNR + 5)  
 Typical CATV Optical Receiver input spec. = -3.0 dBm to +3.0 dBm (Target = 53 CNR + 5)  
 2) Design parameters are for SMP 28 CATV fiber with a 8.3 um core, cladding diameter of 125 um and coated with acrylate for a final diameter of 250 um. (Matched Clad)  
 3) CNR values are calculated from vendor data and calculated for each fiber run.  
 4) Coupler Value Color Codes - Red 1x2, Blue 1x3, Green 1x4

Page 2

Reverse Link Analysis



Company: Any Company  
 System: Any Town  
 Project: System Nodes - All OTR Footage

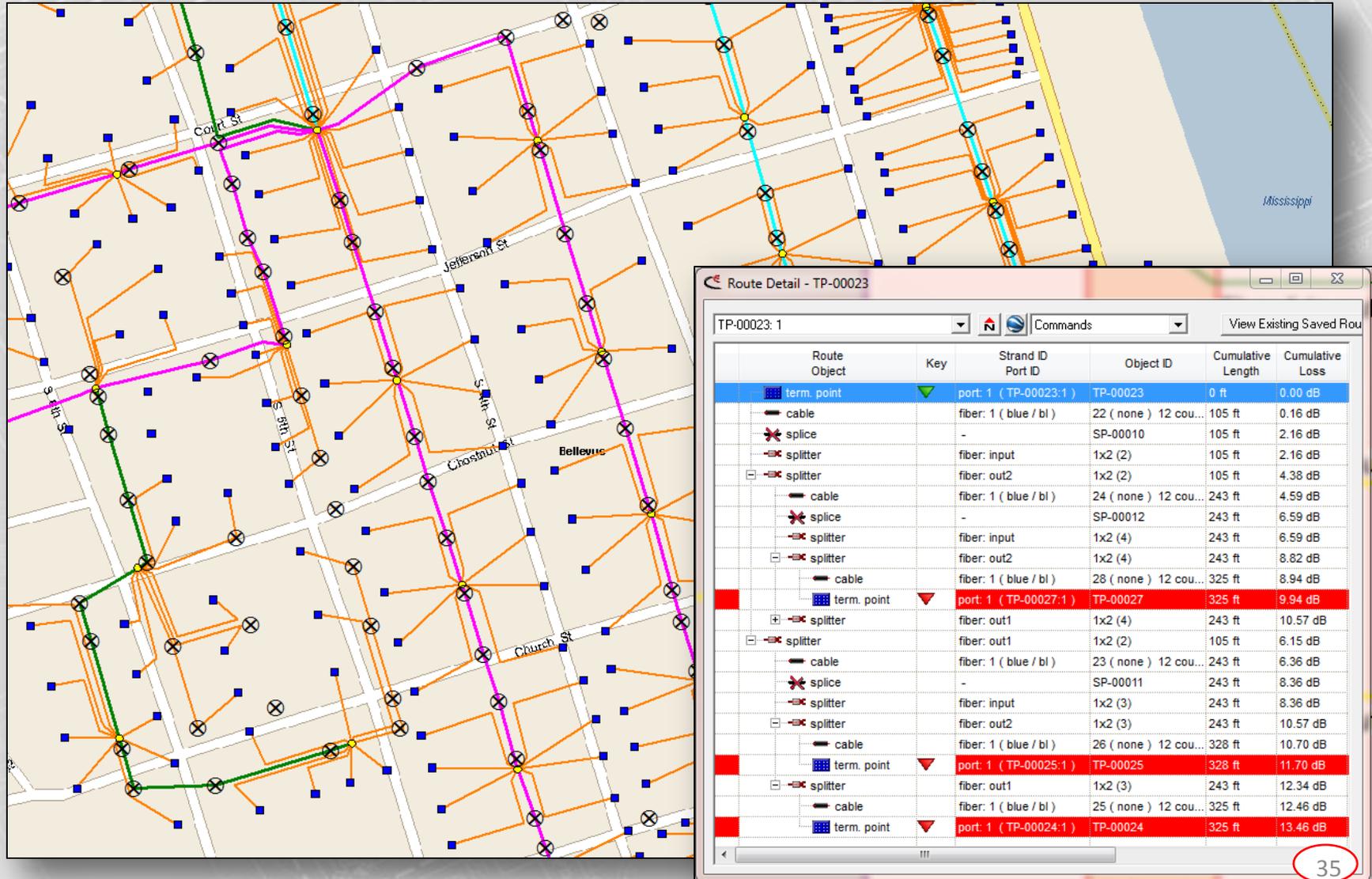
REVERSE TRAFFIC: 5 - 200 MHz Data and Video

Transmitter Node No	1310 nm Transmission Node Name	Sheath Fiber Ft	REV Model #	Fiber Loss @ 0.35 dB/km	Conn. Loss @ 0.25 per	Max.Dist/Mux Loss if Needed	Total Path Loss	Typical Launch Power @ Node	Calculated Power At Rec @ Node	Desired Power At Rec @ Node	Required Optical Attenuation
1	Node 1	48588	NTM3245	14.810	5.183	0.5	5.683	3	-2.68	-6.00	3.00
2	Node 2	98412	NTM3245	29.966	10.499	0.5	10.999	3	-8.00	-6.00	N/A
3	Node 3	124183	NTM3245	37.851	13.248	0.5	13.748	3	-10.75	-6.00	N/A
4	Node 4	47540	NTM3245	14.490	5.072	0.5	5.572	3	-2.57	-6.00	3.00
5	Node 5	53938	NTM3245	16.441	5.754	0.5	6.254	3	-3.25	-6.00	3.00
6	Node 6	80025	NTM3245	24.395	8.538	0.5	9.038	3	-6.04	-6.00	0.00
7	Node 7	102565	NTM3245	31.271	10.945	0.5	11.445	3	-8.44	-6.00	N/A
8	Node 8	83493	NTM3245	25.449	8.907	0.5	9.407	3	-6.41	-6.00	N/A
9	Node 9										
10	Node 10	58374	NTM3245	17.793	6.227	0.5	6.727	3	-3.73	-6.00	2.00
11	Node 11	15908	NTM3245	4.818	1.686	0.5	2.186	3	0.81	-6.00	7.00
12	Node 12	3726	NTM3245	1.136	0.397	0.5	0.897	3	2.10	-6.00	8.00
13	Node 13	7904	NTM3245	2.409	0.843	0.5	1.343	3	1.66	-6.00	8.00
14	Node 14										
15	Node 15	9803	NTM3245	2.988	1.046	0.5	1.546	3	1.45	-6.00	7.00
16	Node 16										
17	Node 17	15908	NTM3245	4.818	1.686	0.5	2.186	3	0.81	-6.00	7.00
18	Node 18	47540	NTM3245	14.490	5.072	0.5	5.572	3	-2.57	-6.00	3.00
19	Node 19	48588	TR4020-PI DT 4030E	14.810	5.183	0.5	5.683				THIS UNIT WILL WORK FOR UP TO 20km LINK
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Page 3

# FTTH Sample OSPInSight

No matter how complex the network is, splitters are easy to trace.



# Fiber to Home Design w/Drops



# Lode Fiber PON Design

The image displays a fiber network design software interface. On the left, a map shows a residential area with fiber lines (red and green) connecting various nodes (T3-39, T3-38, T3-36, T3-35, T3-34, T3-33, T3-2, T3-3, T3-5, T3-4, T3-32, T3-31, T3-30, T3-29) and a central node labeled PON-3. The map includes street names like Greene Drive, Reeves Ave, Howey Rd, and Wilcomm Ave. On the right, a Microsoft Excel spreadsheet titled 'PON SPLICE 4D' is open, showing a table of fiber connections.

	A	B	C	D	E	F	G	H	I	J	K
10	288 123797	Blue	BL		48 156481	Blue	BL	807 FIRST STREET 1			Fusion
11	288 123797	Blue	OR		48 156481	Blue	OR	805 FIRST STREET 1			Fusion
12	288 123797	Blue	GR		48 156481	Blue	GR	803 FIRST STREET 1			Fusion
13	288 123797	Blue	BR		48 156481	Blue	BR	801 FIRST STREET 1			Fusion
14	288 123797	Blue	SL		48 156481	Blue	SL	1215 BRADY AVENUE 1			Fusion
15	288 123797	Blue	VH		48 156481	Blue	VH	804 FIRST STREET 1			Fusion
16	288 123797	Blue	RD		48 156481	Blue	RD	1211 AUSTIN AVENUE 1			Fusion
17	288 123797	Blue	BK		48 156481	Blue	BK	Drop-6 1213 & 1215 Austin 1			Fusion
18	288 123797	Blue	YE		48 156481	Blue	YE	Drop-6 1213 & 1215 Austin 2			Fusion
19	288 123797	Blue	VI		48 156481	Blue	VI	1217 AUSTIN AVENUE 1			Fusion
20	288 123797	Blue	RD		48 156481	Blue	RD	905 First 1			Fusion
21	288 123797	Blue	AQ		48 156481	Blue	AQ	901 FIRST STREET 1			Fusion
22	288 123797	Orange	BL		48 156481	Orange	BL	1300 AVENUE A 1			Fusion
23	288 123797	Orange	OR		48 156481	Orange	OR	1305 1/2 Ave A 1			Fusion
24	288 123797	Orange	GR		48 156481	Orange	GR	1301 AVENUE A 1			Fusion
25	288 123797	Orange	BR		48 156481	Orange	BR	809 FIRST STREET 1			Fusion
26	288 123797	Orange	SL		48 156481	Orange	SL	1207 AUSTIN AVENUE 1			Fusion
27	288 123797	Orange	VH		48 156481	Orange	VH	0 AUSTIN AVENUE 1			Fusion
28	288 123797	Orange	RD		48 156481	Orange	RD	0 AUSTIN AVENUE 1			Fusion
29	288 123797	Orange	BK		48 156481	Orange	BK	1216 AVENUE A 1			Fusion

# OSPInSight Fiber

OSPInSight - Edit 'Northland' (edit)

Backup Network... Find Address... Get Info

File Edit Toolg Lists Reports Objects Table Options Query Map Window Help

Data View

Termination Points

- Racks (1)
- Rings (0)
- Rooms (1)
- Saved Routes (0)
- Splice Points (7)
- Termination Points (5)
- Visio Drawings (0)
- Work Orders (0)

Termination Points - ALL

ID	Data
1	MF-Headend
4	NO-AveG-3rd
2	NO-AveG-N
3	NO-Cott
5	NO-MeadowLk

Relations More Info

Termination Point - MF-Headend

Item	Info
ibermgrid	1
name	MF-Headend
roomid	na
installcompany	unk
workorderid	<none>
comments	none
updateime	6/13/2011 3:06:48 PM
updateuser	Howardt
x_table	Building
x_id	Marble Falls HE
stage	pre-post
ea1	none
ea2	none
ea3	none
ea4	none
ea5	0
ea=F	n

Zoom: 1.952 mi Editing: NorthlandFRA Selecting: None Connected - 00

# OSPInSight with Aerial Background

**OSPInSight - Edit 'Northland' (edit)**

Backup Network... Find Address... Get Info

File Edit Toolg Lists Reports Objects Table Options Query Map Window Help

**Data View**

- Termination Points
- Racks (1)
- Rings (0)
- Rooms (1)
- Saved Routes (0)
- Splice Points (7)
- Termination Points (5)
- Visio Drawings (0)
- Work Orders (0)

Termination Points - ALL

ID	Data
1	MF-Headend
4	NO-AveG-3rd
2	NO-AveG-N
3	NO-Cott
5	NO-MeadowLk

Relations More Info.

Termination Point - MF-Headend

Item	Info
fibermgid	1
name	MF-Headend
roomid	na
installcompany	unk
workorderid	<none>
comments	none
updateime	6/13/2011 3:06:48 PM
updateuser	Howardt
x_table	Building
x_id	Marble Falls HE
stage	pre-post
ea1	none
ea2	none
ea3	none
ea4	none
ea5	0
ea6	n

Zoom: 0.4881 mi Editing: NorthlandFRA Selecting: None Connected - 00

Microsoft Bing © 2010 Microsoft Corporation

# OSPInSight Patch Panel Layout

Termination Point Panel: MF-Headend

Print      Modify      Cancel      Apply

Jack	Group	#	User	Saved Route
36	TP-00001	36	Future	
37	TP-00001	37	Ave G-3rd-FWD	
38	TP-00001	38	Ave G-3rd-RTN	
39	TP-00001	39	Ave G-3rd-RTN	
40	TP-00001	40	Spare	
41	TP-00001	41	MeadowLK-FWD	
42	TP-00001	42	MeadowLK-RTN	
43	TP-00001	43	Spare	
44	TP-00001	44	Spare	
45	TP-00001	45	Future	
46	TP-00001	46	Future	
47	TP-00001	47	Future	

Front and Back Panel Connections

Jack	Patch Cord	#	Type	Cable SpanID	#
34	none	0	...	7	34
35	none	0	...	7	35
36	none	0	...	7	36
37	none	0	...	7	37
38	none	0	...	7	38
39	none	0	...	7	39

Reserve      Notes

Jack	Status	Priority	Comments
36	Available	high	none
37	Used	high	Ave G-3rd-FWD
38	Used	high	Ave G-3rd-RTN
39	Used	high	Ave G-3rd-RTN
40	Reserved	high	Ave G-3rd-Spare
41	Used	high	MeadowLK-FWD
42	Used	high	MeadowLK-RTN
43	Reserved	high	MeadowLK-Spare
44	Reserved	high	MeadowLK-Spare
45	Available	high	none
46	Available	high	none
47	Available	high	none

Info      Route      Graphic      OTDR      Install      Customers

# OSPInSight Splice Sheet & Diagram

Splice Spreadsheet										
Splice Point: SP-00005										
Reference span: 7 <input checked="" type="checkbox"/> Include "dead" and "no splice". <input type="button" value="Print ..."/>										
GO <input type="checkbox"/> Order by tray <input type="checkbox"/> Display users										
type	tray	span: 7	bundle	fiber	span: 8	bundle	fiber	span: 14	bundle	fiber
fusion		37	br	bl				1	bl	bl
fusion		38	br	or				2	bl	or
fusion		39	br	gr				3	bl	gr
fusion		40	br	br				4	bl	br
fusion		41	br	sl	1	bl	bl			
fusion		42	br	wh	2	bl	or			
fusion		43	br	rd	3	bl	gr			
fusion		44	br	bk	4	bl	br			
fusion		45	br	yl	5	bl	sl			
fusion		46	br	vi	6	bl	wh			
fusion		47	br	rs	7	or	bl			
fusion		48	br	aq	8	or	or			
dead		1	bl	bl						
dead		2	bl	or						
dead		3	bl	gr						
dead		4	bl	br						
dead		5	bl	sl						
dead		6	bl	wh						
dead		7	bl	rd						
dead		8	bl	bk						
dead		9	bl	yl						
dead		10	bl	vi						
dead		11	bl	rs						
dead		12	bl	aq						
dead		13	or	bl						
dead		14	or	or						
dead		15	or	gr						
dead		16	or	br						
dead		17	or	sl						
dead		18	or	wh						
dead		19	or	rd						
dead		20	or	bk						
dead		21	or	yl						
dead		22	or	vi						
dead		23	or	rs						
dead		24	or	aq						
dead		25	gr	bl						
dead		26	gr	or						
dead		27	gr	gr						
dead		28	gr	br						
dead		29	gr	sl						
dead		30	gr	wh						
dead		31	gr	rd						
dead		32	gr	bk						
dead		33	gr	yl						
dead		34	gr	vi						
dead		35	gr	rs						
dead		36	gr	aq						
*										

Splice Point: SP-00005 (5)  
 Location: POL-00089  
 Street Address: none  
 Address Notes: none  
 Enclosure Manufacturer: TYCO  
 Enclosure Part #: none  
 Splice Comments: none

7  
 48ct Fiber  
 MF-Headend  
 Marble Falls HE  
 Mission Hill Dr.

---

1 to 36 ()  
 37 to 40 (fx) 1  
 41 to 48 (fx) 2

14  
 4ct Fiber  
 NO-AveG-3rd  
 POL-00085  
 none

---

1 to 4 (fx) 1

8  
 8ct Fiber  
 SP-00006  
 AP-00002  
 Meadowlakes Dr.

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1 to 8 (fx) 2

# HFC & PON Splice Sheets

Splice Report Created on Wednesday, February 28, 2007 at 14:33  
 Enclosure: HE-PONB-ShortSt  
 Modified MARCH 17, 2008

Splicer: \_\_\_\_\_  
 Company: \_\_\_\_\_  
 Date: \_\_\_\_\_

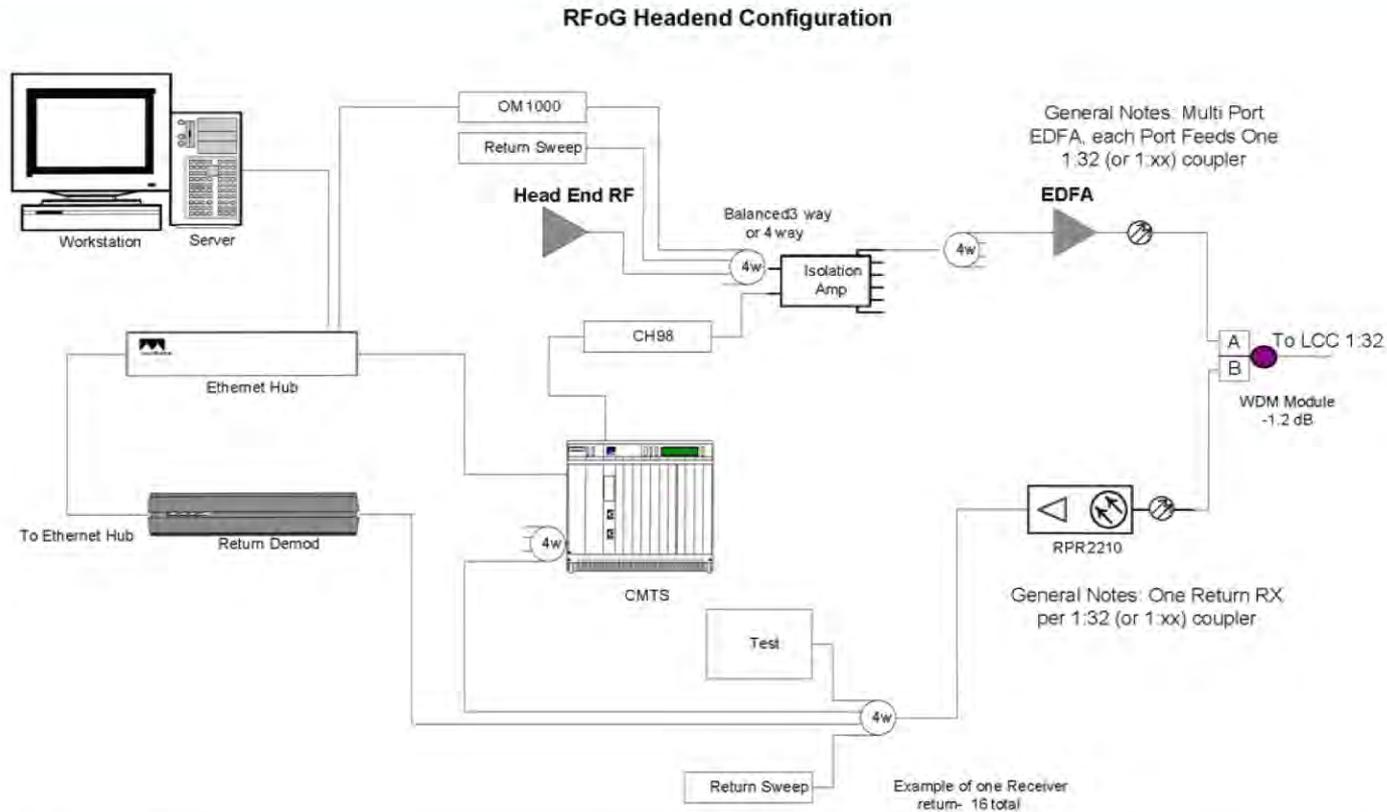
Cable	Buffer	Fiber	Destination	Cable	Buffer	Fiber	Destination	Type	Tray	Pos	Loss
288 114623	Blue	BL	48 102436	Blue	BL	104 N Main 1		Fusion			0.002
288 114623	Blue	OR	48 102436	Blue	OR	DROP 274721 1		Fusion			0.002
288 114623	Blue	GR	48 102436	Blue	GR	100 N Booker 1		Fusion			0.002
288 114623	Blue	BR	48 102436	Blue	BR	300 N Main 1		Fusion			0.002
288 114623	Blue	SL	48 102436	Blue	SL	311 N Center 1		Fusion			0.002
288 114623	Blue	WH	48 102436	Blue	WH	309 N Center 1		Fusion			0.002
288 114623	Blue	RD	48 102436	Blue	RD	307 N Center 1		Fusion			0.002
288 114623	Blue	BK	48 102436	Blue	BK	120 S Broadway 1					
288 114623	Blue	YE	48 102436	Blue	YE	209 N Broadway 1					
288 114623	Blue	VI	48 102436	Blue	VI	110 S Broadway 1					
288 114623	Blue	RO	48 102436	Blue	RO	108 S Broadway 1					
288 114623	Blue	AQ	48 102436	Blue	AQ	106 S Broadway 1					
288 114623	Orange	BL	48 102436	Orange	BL	104 S Broadway 1					
288 114623	Orange	OR	48 102436	Orange	OR	207 N Main 1					
288 114623	Orange	GR	48 102436	Orange	GR	212 N Broadway 1					
288 114623	Orange	BR	48 102436	Orange	BR	200 S Broadway 1					
288 114623	Orange	SL	48 102436	Orange	SL	205 N Center 1					
288 114623	Orange	WH	48 102436	Orange	WH	203 N Center 1					
288 114623	Orange	RD	48 102436	Orange	RD	201 N Center 1					
288 114623	Orange	BK	48 102436	Orange	BK	107 S Broadway 1					
288 114623	Orange	YE	48 102436	Orange	YE	305 N Center 1					
288 114623	Orange	VI	48 102436	Orange	VI	303 N Center 1					
288 114623	Orange	RO	48 102436	Orange	RO	301 N Center 1					
288 114623	Orange	AQ	48 102436	Orange	AQ	115 S Broadway 1					
288 114623	Green	BL	48 102436	Green	BL	309 N Fisk 1					
288 114623	Green	OR	48 102436	Green	OR	305 N Fisk 1					
288 114623	Green	GR	48 102436	Green	GR	303 N Fisk 1					
288 114623	Green	BR	48 102436	Green	BR	100 N Center 1					
288 114623	Green	SL	48 102436	Green	SL	201 S Broadway 1					
288 114623	Green	WH	48 102436	Green	WH	209 S Broadway 1					
288 114623	Green	RD	48 102436	Green	RD	211 S Broadway 1					
288 114623	Green	BK	48 102436	Green	BK	401 N Fisk 1					
288 114623	Green	YE	48 102436	Green	YE	409 N Fisk 1					
288 114623	Green	VI	48 102436	Green	VI	213 S Broadway 1					
288 114623	Green	RO	48 102436	Green	RO	301 N Fisk 1					

SYSTEM													B037	
NUM	SOURCE ID	CABLE ID	FIBER COUNT	FIBER COLOR	BUFFER COLOR	LOCATION NUMBER	TRAFFIC ID	BUFFER COLOR	FIBER COLOR	FIBER COUNT	CABLE ID	NEXT STATION ID		
1	SPL-5637	78F-1	BLUE	BLUE	BLUE	B037	B047-F	BLUE	BLUE	72F-1		SPL-5734		
2	SPL-5637	78F-2	ORANGE	BLUE	BLUE	B037	B047-R	BLUE	ORANGE	72F-2		SPL-5734		
3	SPL-5637	78F-3	GREEN	BLUE	BLUE	B037	SPARE	BLUE	GREEN	72F-3		SPL-5734		
4	SPL-5637	78F-4	BROWN	BLUE	BLUE	B037	SPARE	BLUE	BROWN	72F-4		SPL-5734		
5	SPL-5637	78F-5	SLATE	BLUE	BLUE	B037	FUTURE	BLUE	SLATE	72F-5		SPL-5734		
6	SPL-5637	78F-6	WHITE	BLUE	BLUE	B037	FUTURE	BLUE	WHITE	72F-6		SPL-5734		
7	SPL-5637	78F-7	RED	BLUE	BLUE	B037	B046-F	BLUE	RED	72F-7		SPL-5734		
8	SPL-5637	78F-8	BLACK	BLUE	BLUE	B037	B046-R	BLUE	BLACK	72F-8		SPL-5734		
9	SPL-5637	78F-9	YELLOW	BLUE	BLUE	B037	SPARE	BLUE	YELLOW	72F-9		SPL-5734		
10	SPL-5637	78F-10	VIOLET	BLUE	BLUE	B037	SPARE	BLUE	VIOLET	72F-10		SPL-5734		
11	SPL-5637	78F-11	ROSE	BLUE	BLUE	B037	FUTURE	BLUE	ROSE	72F-11		SPL-5734		
12	SPL-5637	78F-12	AQUA	BLUE	BLUE	B037	FUTURE	BLUE	AQUA	72F-12		SPL-5734		
13	SPL-5637	78F-13	BLUE	ORANGE	ORANGE	B037	B045-F	ORANGE	BLUE	72F-13		SPL-5734		
14	SPL-5637	78F-14	ORANGE	ORANGE	ORANGE	B037	B045-R	ORANGE	ORANGE	72F-14		SPL-5734		
15	SPL-5637	78F-15	GREEN	ORANGE	ORANGE	B037	SPARE	ORANGE	GREEN	72F-15		SPL-5734		
16	SPL-5637	78F-16	BROWN	ORANGE	ORANGE	B037	SPARE	ORANGE	BROWN	72F-16		SPL-5734		
17	SPL-5637	78F-17	SLATE	ORANGE	ORANGE	B037	FUTURE	ORANGE	SLATE	72F-17		SPL-5734		
18	SPL-5637	78F-18	WHITE	ORANGE	ORANGE	B037	FUTURE	ORANGE	WHITE	72F-18		SPL-5734		
19	SPL-5637	78F-19	RED	ORANGE	ORANGE	B037	B042-F	ORANGE	RED	72F-19		SPL-5734		
20	SPL-5637	78F-20	BLACK	ORANGE	ORANGE	B037	B042-R	ORANGE	BLACK	72F-20		SPL-5734		
21	SPL-5637	78F-21	YELLOW	ORANGE	ORANGE	B037	SPARE	ORANGE	YELLOW	72F-21		SPL-5734		
22	SPL-5637	78F-22	VIOLET	ORANGE	ORANGE	B037	SPARE	ORANGE	VIOLET	72F-22		SPL-5734		
23	SPL-5637	78F-23	ROSE	ORANGE	ORANGE	B037	FUTURE	ORANGE	ROSE	72F-23		SPL-5734		
24	SPL-5637	78F-24	AQUA	ORANGE	ORANGE	B037	FUTURE	ORANGE	AQUA	72F-24		SPL-5734		
25	SPL-5637	78F-25	BLUE	GREEN	GREEN	B037	B044-F	GREEN	BLUE	72F-25		SPL-5734		
26	SPL-5637	78F-26	ORANGE	GREEN	GREEN	B037	B044-R	GREEN	ORANGE	72F-26		SPL-5734		
27	SPL-5637	78F-27	GREEN	GREEN	GREEN	B037	SPARE	GREEN	GREEN	72F-27		SPL-5734		
28	SPL-5637	78F-28	BROWN	GREEN	GREEN	B037	SPARE	GREEN	BROWN	72F-28		SPL-5734		
29	SPL-5637	78F-29	SLATE	GREEN	GREEN	B037	FUTURE	GREEN	SLATE	72F-29		SPL-5734		
30	SPL-5637	78F-30	WHITE	GREEN	GREEN	B037	FUTURE	GREEN	WHITE	72F-30		SPL-5734		
31	SPL-5637	78F-31	RED	GREEN	GREEN	B037	B043-F	GREEN	RED	72F-31		SPL-5734		
32	SPL-5637	78F-32	BLACK	GREEN	GREEN	B037	B043-R	GREEN	BLACK	72F-32		SPL-5734		
33	SPL-5637	78F-33	YELLOW	GREEN	GREEN	B037	SPARE	GREEN	YELLOW	72F-33		SPL-5734		
34	SPL-5637	78F-34	VIOLET	GREEN	GREEN	B037	SPARE	GREEN	VIOLET	72F-34		SPL-5734		
35	SPL-5637	78F-35	ROSE	GREEN	GREEN	B037	FUTURE	GREEN	ROSE	72F-35		SPL-5734		
36	SPL-5637	78F-36	AQUA	GREEN	GREEN	B037	FUTURE	GREEN	AQUA	72F-36		SPL-5734		
37	SPL-5637	78F-37	BLUE	BROWN	BROWN	B037	COLLEGE	BROWN	BLUE	72F-37		SPL-5734		
38	SPL-5637	78F-38	ORANGE	BROWN	BROWN	B037	COLLEGE	BROWN	ORANGE	72F-38		SPL-5734		
39	SPL-5637	78F-39	GREEN	BROWN	BROWN	B037	COLLEGE	BROWN	GREEN	72F-39		SPL-5734		
40	SPL-5637	78F-40	BROWN	BROWN	BROWN	B037	COLLEGE	BROWN	BROWN	72F-40		SPL-5734		

# Headend/CO As-Built and Design

- As-Built Headend and Rack Equipment
- Network Diagrams
- Floor Plans
- Audit Existing Equipment and Configuration

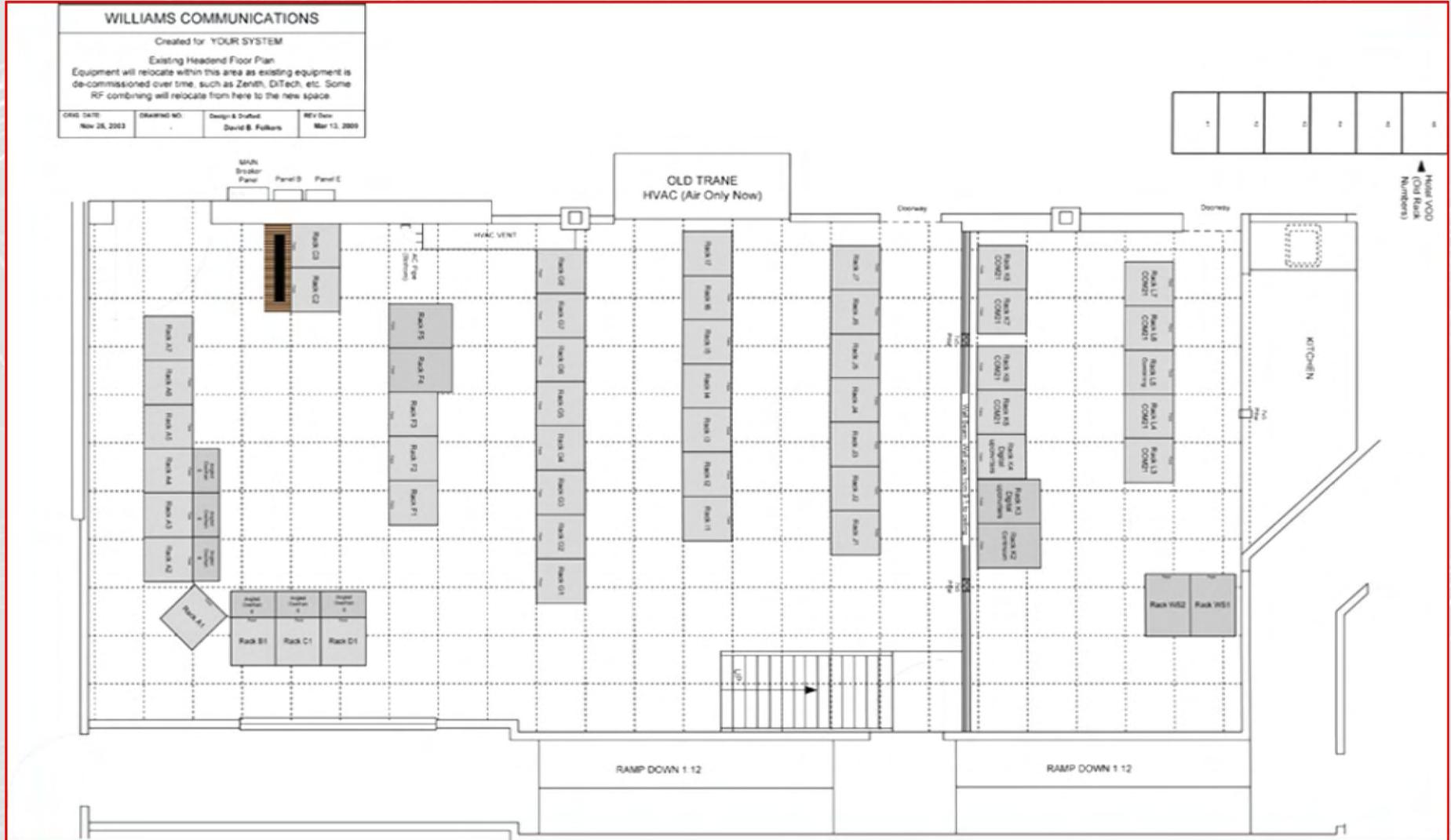
# RFoG Headend Configuration



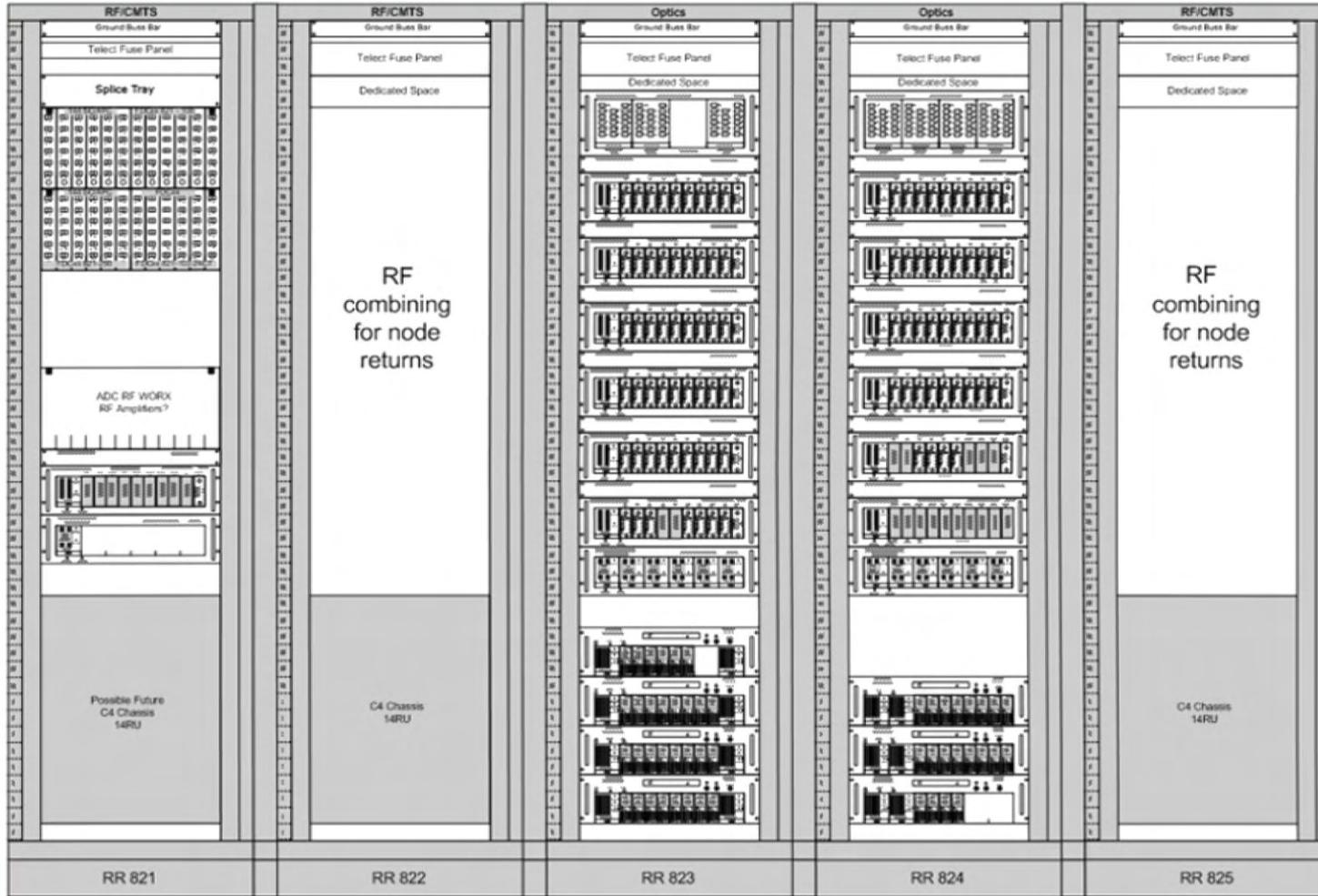
## RFoG OSP Configuration



# Headend Floor Plan



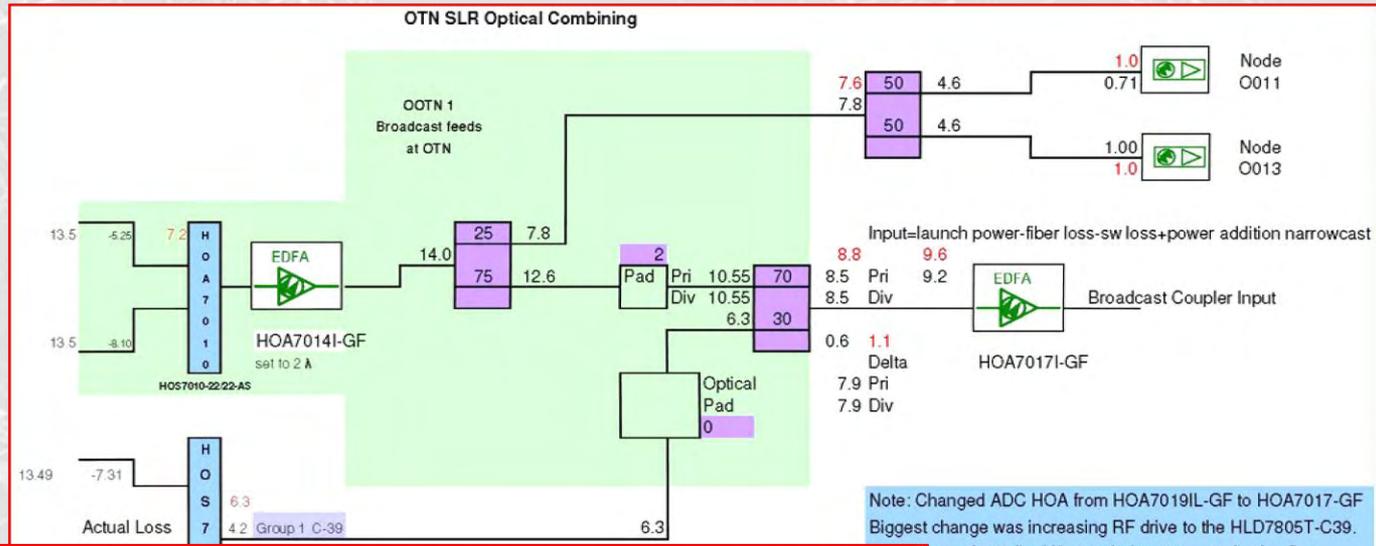
# OTN Equipment Rack



Any Row 821 to 825 "AS-BUILT"  
 Drawing reflects "as-built" not designed.  
 On-site data used.  
 Updated: 4/7/05 David Folkers

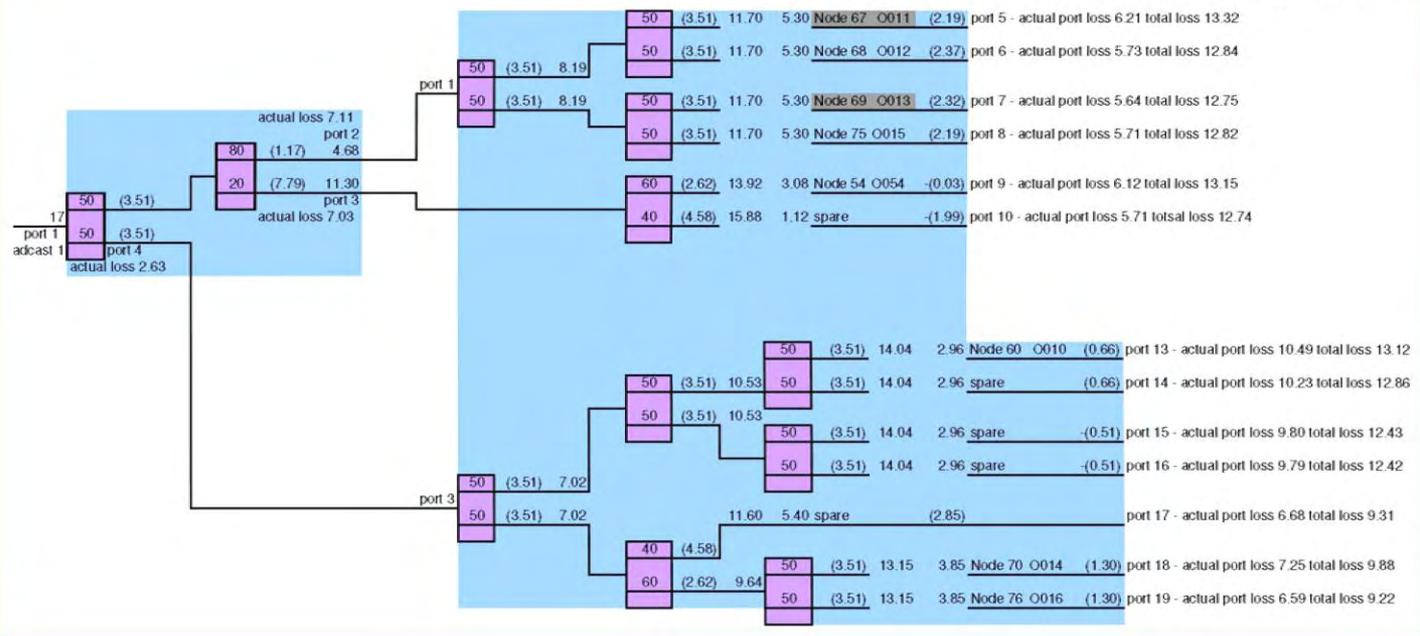
**WILLIAMS COMMUNICATIONS**  
 Created for Any Town USA  
 ROW 825  
 EAST & SOUTH OTN  
 Equipment Location  
 Date: 04/07/05  
 David Folkers

# Optical Splitter Networks



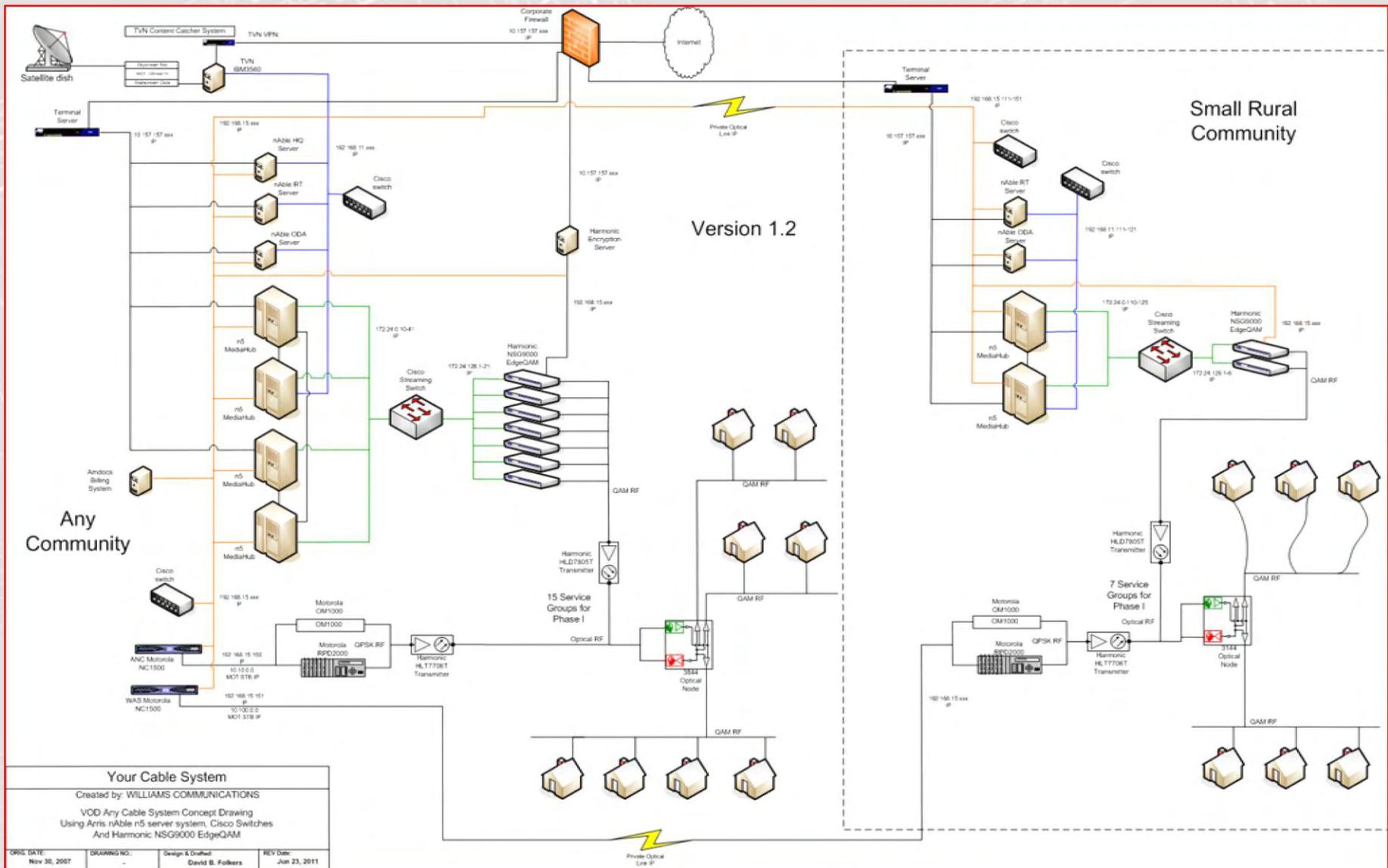
Note: Changed ADC HOA from HOA7019IL-GF to HOA7017-GF  
 Biggest change was increasing RF drive to the HLD7805T-C39.  
 sum of +26dbmV is needed to stay out of noise floor.

**Node O011 and O013 to be removed from broadcast coupler until they are SLR nodes**





# VOD System Concept Drawing



# Building a New Headend

## Empty Racks



## Filled Racks

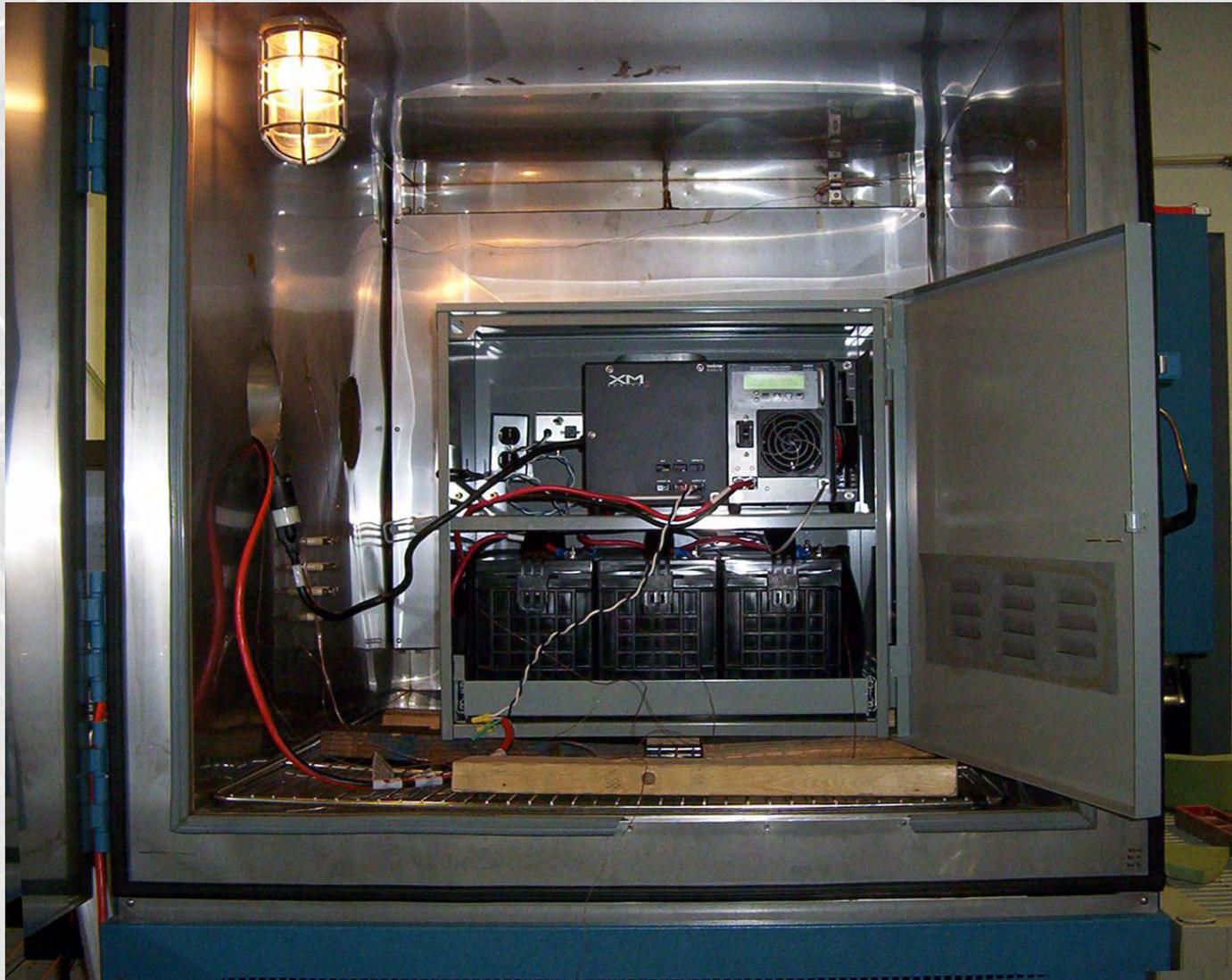


# Environmental Testing

- Testing Batteries for Thermal Conditions
- Thermal Chamber from 30C to -30C for Current Drain and Time for Standby Under Load
- Test Results showed Timeline for Failure

# Environmental Test Monitoring

Setup For Testing Battery Standby Time Under Load @ -30C



# Battery Standby Test Results

From Test Data on Thermal Battery Testing

## Heater Pad Temperature Comparison

Temperature	Test 1 @ 100V/100W			Test 2 @ 110V/120W			Test 3 @ 120V/140W			Alpha Pad 120V/200V	
	C	F	Notes	C	F	Notes	C	F	Notes	F	
Battery A (Mid-Outside)	4.6	40.3	2	12.8	55.0	2	17.7	63.9	2		
Battery B (Heater)	28.5	83.3		44.2	111.6		51.3	124.3		160	
Battery B (Low-Inside)	12.3	54.1		25.8	78.4		28.2	82.8			
Battery B (Mid-Inside)	10.2	50.4		20.9	69.6		26.0	78.8			
Battery B (High-Inside)	6.1	43.0		14.3	57.7		19.9	67.8			
Battery B (Post)	3.1	37.6	4	11.9	53.4	4	15.4	59.7	4		
Battery C (Mid-Outside)	6.8	44.2	2	16.6	61.9	2	20.9	69.6	2		
Chamber Temp.	-30.2	-22.4		-29.8	-21.6		-29.8	-21.6			
Power Supply Temp.											
Heater Voltage	99.9			113.9 V			120.0 V				
Soak Time	45			24 hrs.			24 hrs.				
Thermostat Cycled	No			No			No	5			
Temperature Range	4 to 15	40 to 60		4 to 15	40 to 60		4 to 15	40 to 60			
Recommended Fuse	49	120		54	130		60	140		180	
Recommended Range	-1 to 4	30 to 40		-1 to 4	30 to 40		-1 to 4	40 to 50		40 to 50	
Loading at -5C (36v String)	4.0 A			4.2 A			4.2 A				

### Notes:

- 1 Thermistor not insulated.
- 2 Thermistors insulated
- 3 Thermistor located
- 4 Thermistor relocated
- 5 Battery A top surface

## Battery Comparison

Test	Chamber	Time	Power Removed			Time	Standby Termination			Soak Time	Standby Duration	Load	Battery	Test	CPU
			Temp. A	Temp. B	Temp. C		Temp. A	Temp. B	Temp. C						
Bare Metal	-31C	10:51pm	-25.8	-24.4C	-25.7C	2:57am	-21.8C	-21.4C	-21.8C	12 hrs.	04:06 hrs.	4.95a	Excite	1st	XM
Bare Metal	-30C	08:43am	-24.8C	-23.7C	-24.1C	11:47am	-19.1C	-16.9C	-19.4C	12 hrs.	03:04 hrs.	4.95a	Alpha	6th	XM
Bare Metal	-30C	12:57pm	-24.0C	-23.4C	-22.7C	06:20pm	-17.5C	-16.0C	-14.8C	12 hrs.	05:23 hrs.	4.95a	Power	8th/1st	XM
Bare Metal	-30C	12:49pm	-24.8C	-23.8C	-24.1C	03:01pm	-20.5C	-18.1C	19.3C	12 hrs.	02:12 hrs.	4.95a	MK	9th	XM

### Comments:

The Excite batteries performed well versus the MK and Alpha batteries. The case density differential between the Excite and Power battery creates about a twenty-two percent reduction in standby time in the Excite battery versus the Power battery. This percentage should remain constant even in an insulated environment. The only unknown is the long term recharge/discharge impact versus the other batteries.

# Battery Standby Time

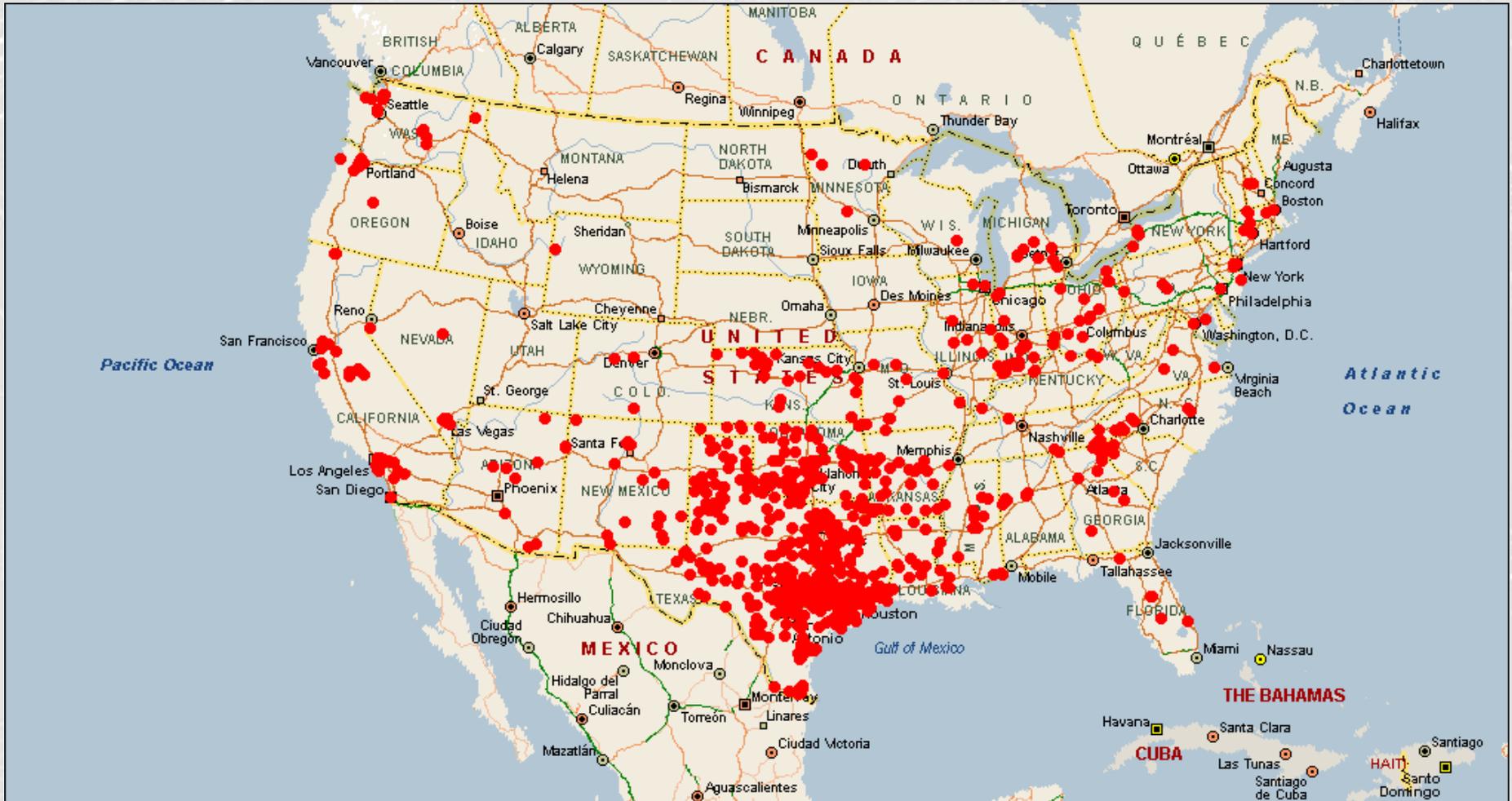
Hours	Batteries	Trays	CURRENT AT 90VAC WITH 180/GXL										
8	3	1	1.03	1.47	1.85	2.23	2.55	2.84	3.09	3.32	3.51	3.67	3.81
8	6	2	2.06	2.94	3.70	4.46	5.11	5.68	6.18	6.63	7.01	7.33	7.62
8	9	3	3.09	4.40	5.55	6.69	7.66	8.52	9.26	9.95	10.52	11.00	11.44
8	4	1	1.37	1.96	2.47	2.97	3.41	3.79	4.12	4.42	4.68	4.89	5.08
8	8	2	2.74	3.91	4.93	5.95	6.81	7.57	8.23	8.84	9.35	9.78	10.17
8	12	4	4.12	5.87	7.40	8.92	10.22	11.36	12.35	13.27	14.03	14.67	15.25
TEMPERATURE			-25C	-20C	-15C	-10C	-5C	0C	5C	10C	15C	20C	25C

Hours	Batteries	Trays	CURRENT AT 90VAC WITH 210/GXL										
8	3	1	1.17	1.67	2.11	2.54	2.91	3.23	3.52	3.78	3.99	4.18	4.34
8	6	2	2.34	3.34	4.21	5.08	5.82	6.47	7.03	7.55	7.99	8.35	8.68
8	9	3	3.52	5.01	6.32	7.62	8.73	9.70	10.55	11.33	11.98	12.53	13.02
8	4	1	1.56	2.23	2.81	3.39	3.88	4.31	4.69	5.04	5.33	5.57	5.79
8	8	2	3.13	4.46	5.61	6.77	7.76	8.62	9.38	10.07	10.65	11.14	11.58
8	12	4	4.69	6.69	8.42	10.16	11.63	12.94	14.07	15.11	15.98	16.71	17.37
TEMPERATURE			-25C	-20C	-15C	-10C	-5C	0C	5C	10C	15C	20C	25C

Note: Temperature De-Ratings taken from Memo of 12/2/05 from Alpha

The use of Alpha BHM (Battery Heater Mats) are designed so that they keep the batteries at a temperature between +5C to +10C (+40F to +50F)  
The BHM run off 120VAC and are not part of the Run Time Calculations.

# Locations We have Worked North America



# Company and Staff Memberships include:

- FTTH Council
- Texas Telephone Association
- Caribbean Cable & Telecommunications Association
- SCTE Standards Committee Member
- SCTE
- BICSI
- IEEE