

# IoT For All and Anywhere



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President.

**V****AXIS**  
TECHNICAL SERVICES

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# IoT For All and Anywhere

## CASE STUDY:

- Hartley Bay, BC First Nations Community- Deploying Robust FTTx Infrastructure and PON technology, to a remote community



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# The Context

- Hartley Bay is a coastal Community 4 hours by boat from Prince Rupert with projected expansion of 100 homes
- Leadership was looking to improve speed and QOS for community internet service
- Lack of interest from Service Providers to upgrade infrastructure



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# Limiting Factors

## Logistics

- Transportation of Equipment and Materials to site
- Transportation of Technicians to site
- Housing for Technicians in the Community
- Limited ability to bring additional materials

## Geography

- Layout of the Community
- No Roads or Vehicles

## Human Resources

- Technician Availability
- Local Labour Resources



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Where do our technicians stay?



Where do we install the cables?



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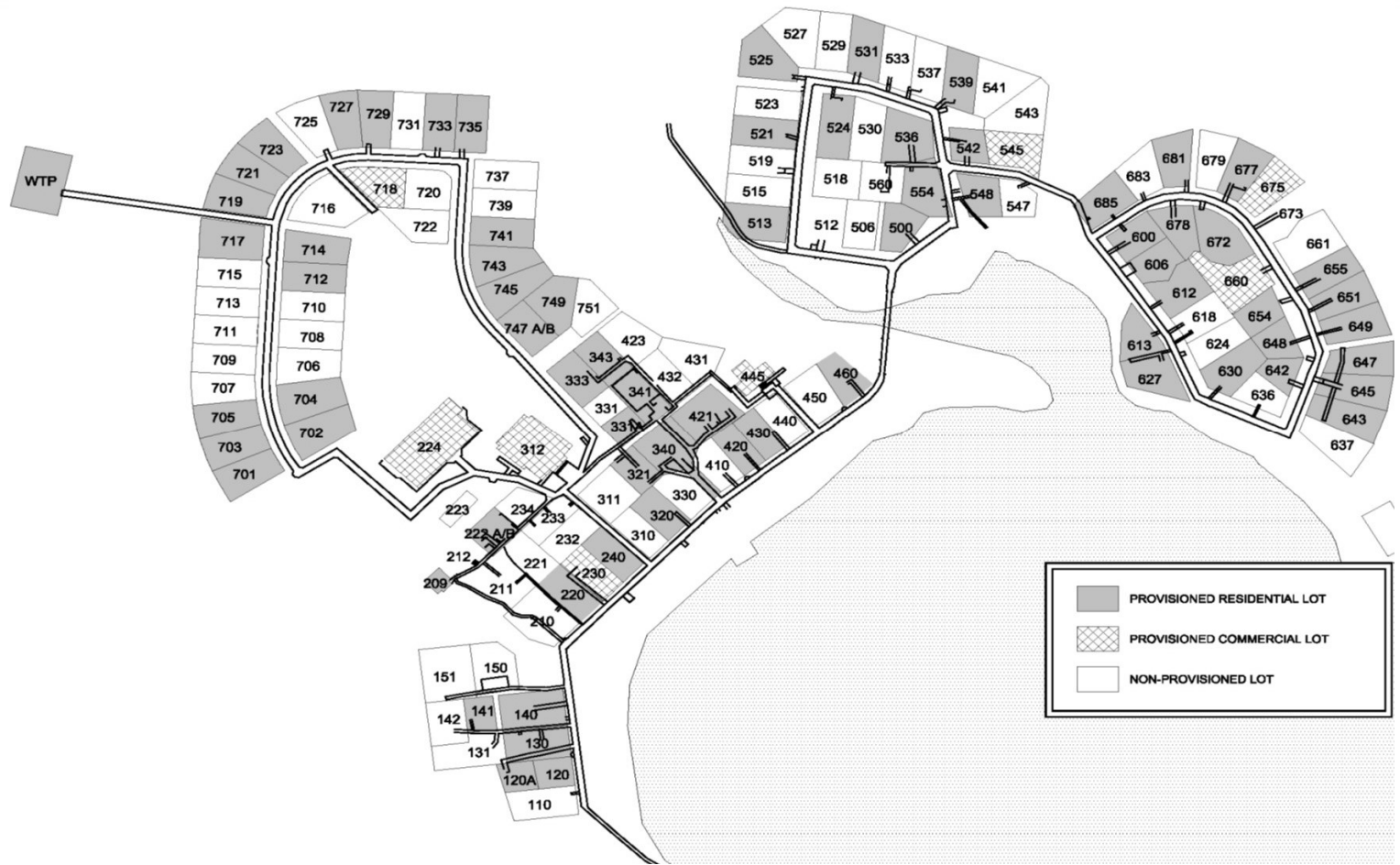
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# Final Design Parameters

- Band will become the Service Provider to the community, with the server room being located in the Band Office
- FTTH cabling infrastructure under the Boardwalk expandable and flexible
- Pre-terminated OSP assemblies to minimize splicing work, need for specialized tech and equipment
- GPON network solution to provide Internet, IP TV and future VOIP for the community
- Create detailed documentation, as built and training aides to assist community in management of the network after turnover



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Central Office

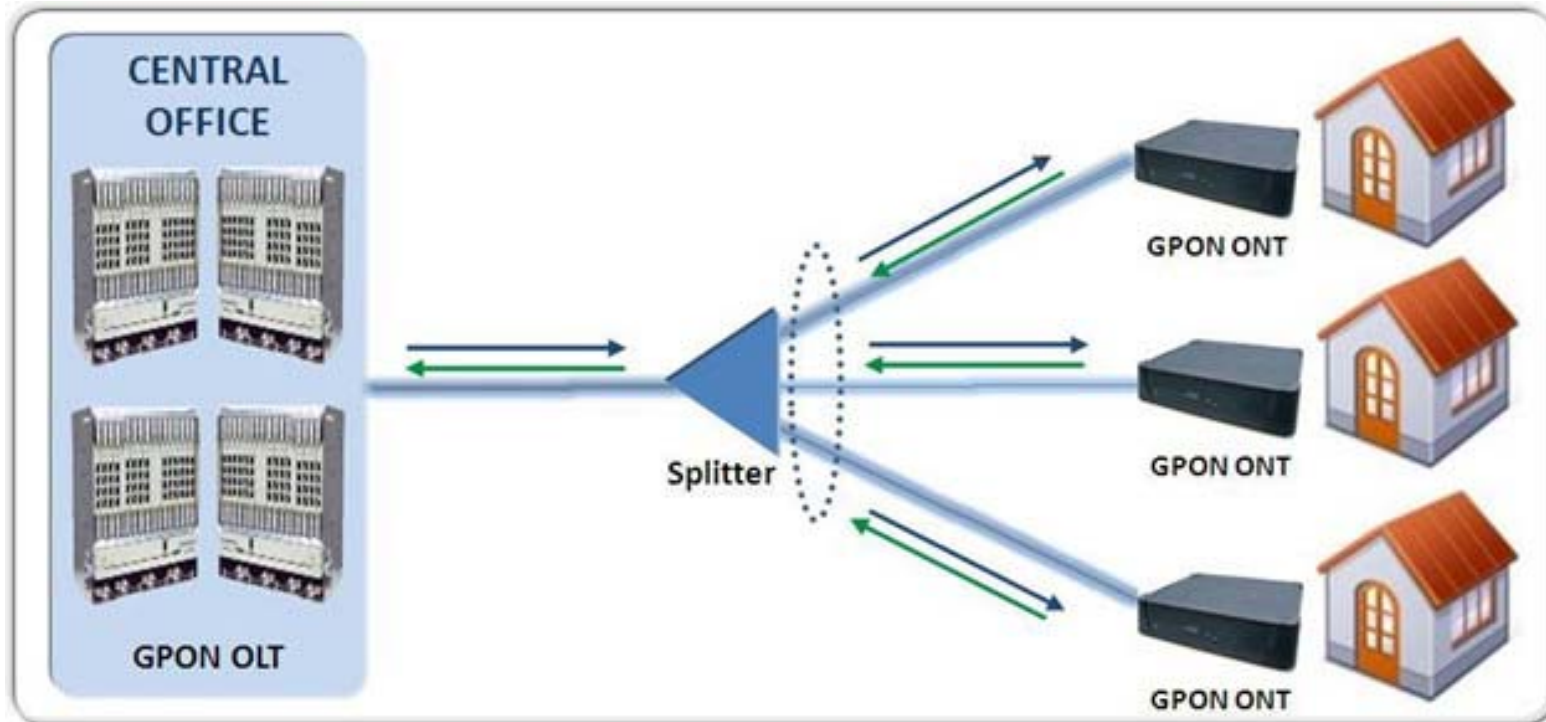
Multiport Terminal

Drop Cable

Indoor GPON ONT



# Typical FTTH Network Solution



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# Key Elements- Fiber Distribution

- Engineered OSP Cable design with pre-terminated tethers
- 3 trunk cables with sufficient capacity for future
- Multi port assemblies (taps) cables distributed strategically along each trunk to connect to the tethers
- Pre-terminated drop cables of various lengths
- NID boxes and indoor/outdoor rugged patch cables to transition services into the home

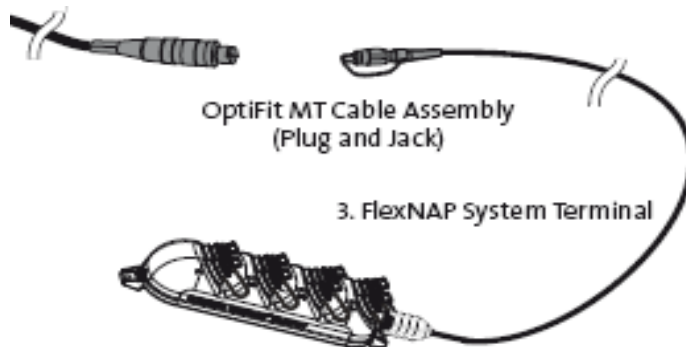
# Cable System Construction

Standard Distribution Cable



Pre-terminated access point engineered onto the distribution cable

Modular, pre-terminated harness for Multiport Assembly



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# Cable Construction - Green trunk

**Hartley Bay GPON - Green Run Distribution Trunk**

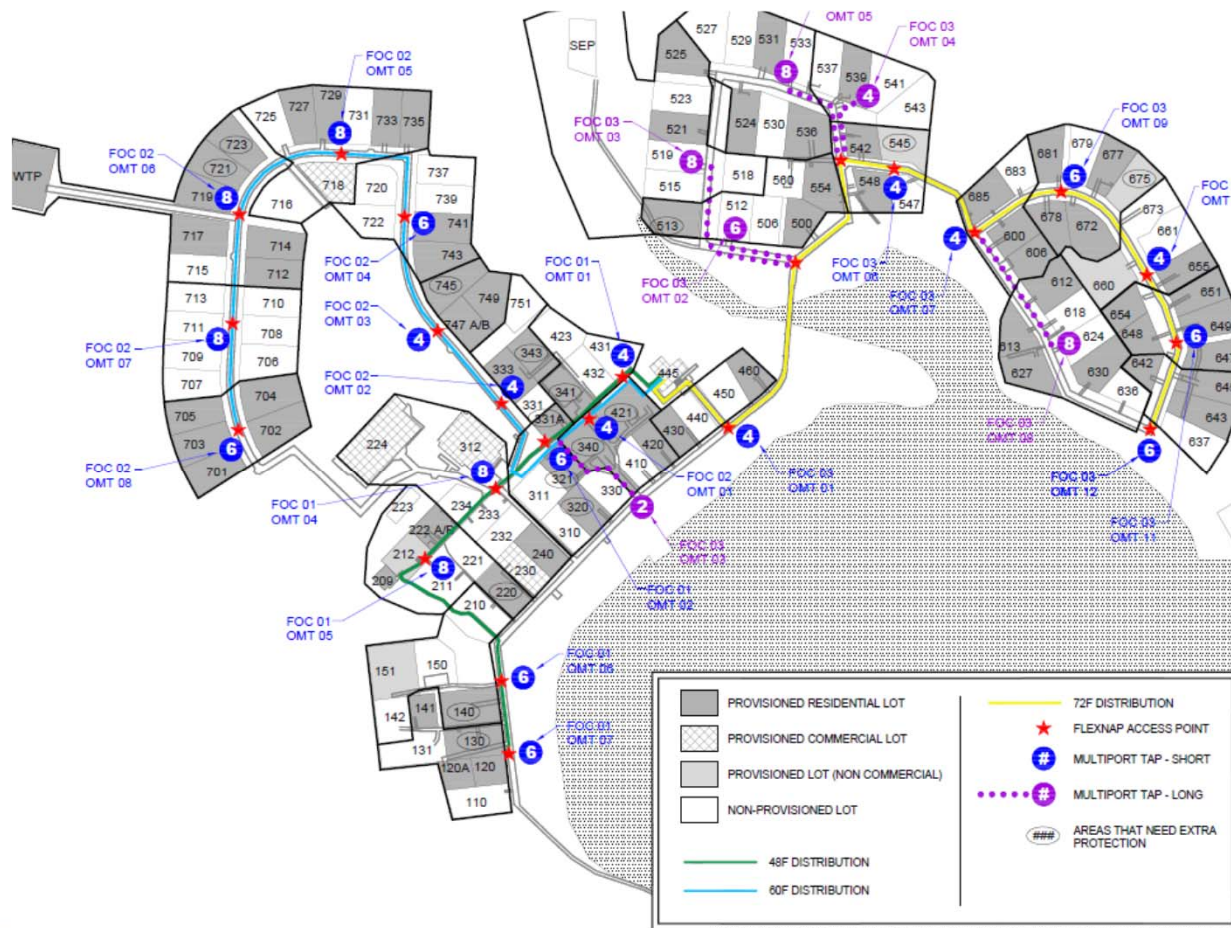
**BUILD ID:** CCS0156607

**Cable Type:** 48 Fiber Loose Tube / Gel-Free

Tube Color	Fiber Color	Fiber	Fiber ID	Location, Tether Sequence
Blue	Blue	1		Tap 3, Tether 1
Blue	Orange	2		Tap 3, Tether 1
Blue	Green	3		Tap 3, Tether 1
Blue	Brown	4		Tap 3, Tether 1
Blue	Slate	5		Tap 3, Tether 1
Blue	White	6		Tap 3, Tether 1
Blue	Red	7		Tap 3, Tether 1
Blue	Black	8		Tap 3, Tether 1
Blue	Yellow	9		Tap 1, Tether 1
Blue	Violet	10		Tap 1, Tether 1
Blue	Rose	11		Tap 1, Tether 1

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# Project Delivery

- Materials
- Approach
- Challenges
- Change Orders/Extras
- Documentation
- Turnover
- Training



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# Cable Schedule

Trunk Cable	OMT #	# of ports	Port Number	Lot #	Connected	Drop Cable ID	Trunk Cable Installed	Optitap Multiport Installed	Drop cable Installed	ONT Installed	Comments	
FOC03	OMT1	4	1		430	FOC03-OMT1(4)-1-430						
			2		460	FOC03-OMT1(4)-2-460						
			3			FOC03-OMT1(4)-3-						
			4			FOC03-OMT1(4)-4-						
	OMT2	6	1		500	FOC03-OMT2(6)-1-500						
			2		554	FOC03-OMT2(6)-2-554						
			3			FOC03-OMT2(6)-3-						
			4			FOC03-OMT2(6)-4-						
			5			FOC03-OMT2(6)-5-						
			6			FOC03-OMT2(6)-6-						
	OMT3	8	1		513	FOC03-OMT3(8)-1-513						
			2		NH	FOC03-OMT3(8)-2-NH						
			3		521	FOC03-OMT3(8)-3-521						
			4		SEP	FOC03-OMT3(8)-4-SEP						
			5			FOC03-OMT3(8)-5-						
			6			FOC03-OMT3(8)-6-						
			7			FOC03-OMT3(8)-7-						
			8			FOC03-OMT3(8)-7-						



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# Approach

- Install Trunk cables
- Upgrade Main Server Room- in parallel
- Install Multiport assemblies
- Install drop cables and Demarcation boxes
- Install and pre-program Head End equipment
- Deploy ONT's and make live



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# Trunk Cables and Multiports



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# Various Challenges



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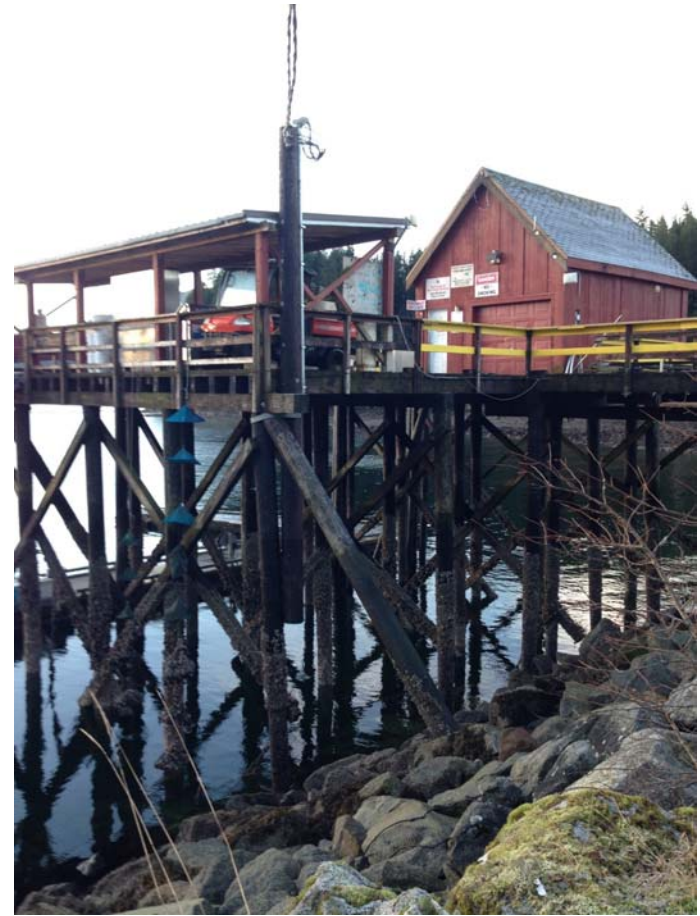


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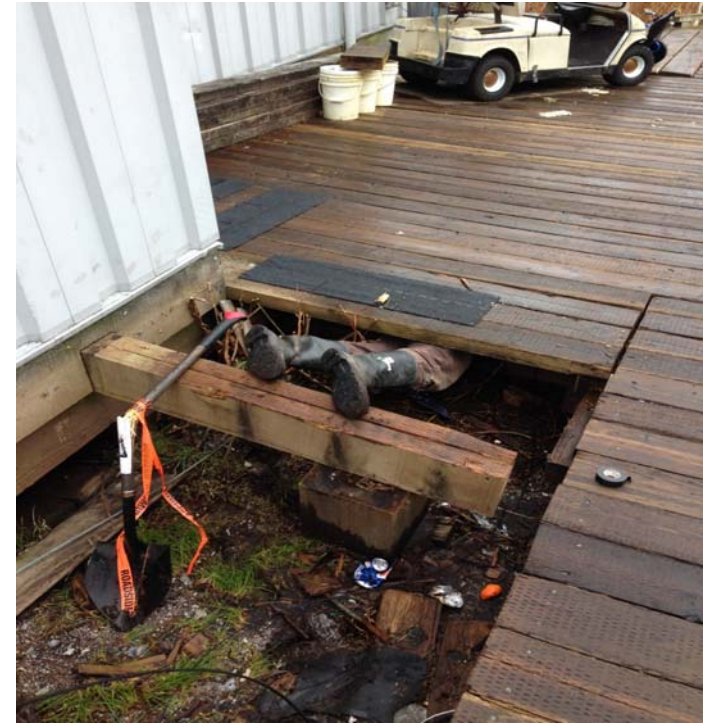


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# Drop Cables



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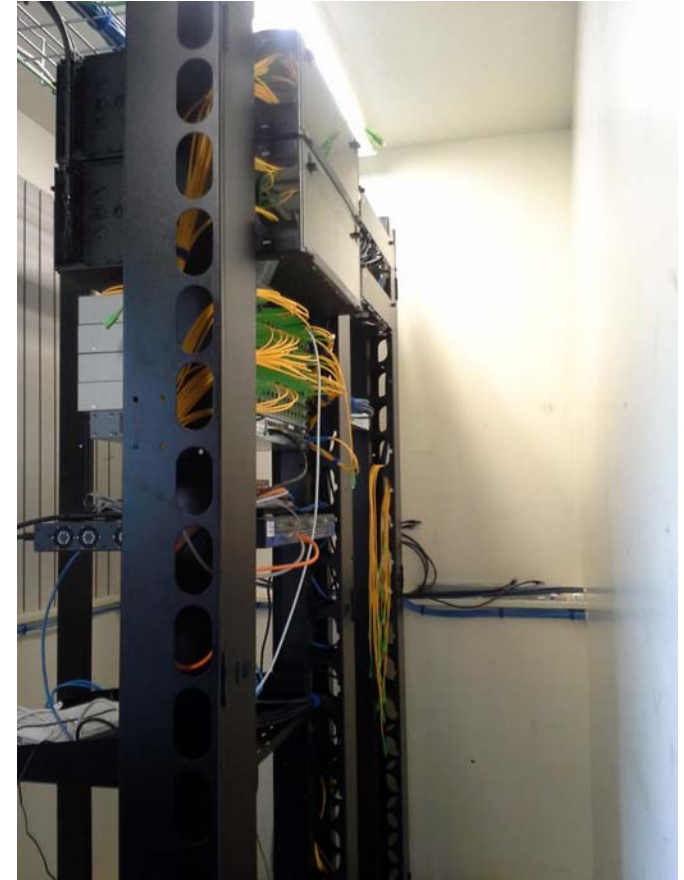


# ONT's and Head End



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# Testing, Programming and Activation

- Fiber Testing
  - ✓ Trunks
  - ✓ Multi-Ports
  - ✓ Drop cables at NID
- GPON
  - ✓ OLT and ONT programming
  - ✓ Router, firewall and WAN programming
  - ✓ Documentation
  - ✓ Client training



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# OTDR iOLM Testing

OTDR iOLM Testing													
Cable	Panel	Slot	Port	Lot	VFL	Pass	Fail	Link Loss 1310	Link Loss 1550	ORL 1310	ORL1550	Notes	Test Report
FOC-02	1	A	F1	718	yes	pass		.791	.731	42.28	44.59		yes
FOC-02	1	A	F2	727	yes	pass		1.404	1.126	42.28	44.57		yes
FOC-02	1	A	F3	729	yes	pass		.991	.827	42.73	45.02		yes
FOC-02	1	A	F4	733	yes	pass		.551	.520	42.21	44.60		yes
FOC-02	1	A	F5	Spare	yes	Pass		.381	.293	42.36	44.73	To FOC-02-OMT05-P05	yes
FOC-02	1	A	F6	Spare	yes	Pass		.732	.561	42.75	45.03	To FOC-02-OMT05-P06	yes
FOC-02	1	A	F7	Spare	yes	Pass		.560	.417	42.63	44.91	To FOC-02-OMT05-P07	yes
FOC-02	1	A	F8	Spare	yes	Pass		.983	.731	42.6	44.97	To FOC-02-OMT05-P08	yes
FOC-02	1	A	F9	340	yes	pass		1.398	1.127	50.10	52.14	church	yes
FOC-02	1	A	F10	320	yes	Pass		.909	.831	47.80	50.28	moved from FOC-01-OMT02-P01 due to pathway length	yes
FOC-02	1	A	F11	421	yes	pass		1.354	1.173	49.20	51.44		yes
FOC-02	1	A	F12	Spare	yes	Pass		.642	.598	50.84	53.29	To FOC-02-OMT01-P04	yes
FOC-02	1	B	F1	712	yes	Pass		0.852	0.722	42.00	44.38		yes
FOC-02	1	B	F2	714	yes	Pass		0.689	0.598	42.14	44.44		yes



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# OTDR iOLM Testing

iOLM Report

Pass

## General Information

Filename: FOC-01\_FPP02\_SLOT-B\_FI\_LOT140 RETEST.iolm  
 Test date: 8/18/2015  
 Test time: 4:35:53 PM  
 Job ID: D579-2690 Hartley Bay  
 Company: Axia Technical Services  
 Comments:  
 Customer: dcm  
 Operator: FTB-7300E-023B-BA  
 Unit's model: 730844  
 Unit's S/N:

## Identifiers

Cable ID	Fiber ID	Location A	Location B
FOC-1	F1	kit54	kit 3406

## iOLM Results

Link length: 0.4231 km  
 Acquisition status: Completed

Wavelength (nm)	Link loss (dB)	Link ORL (dB)
1310	0.507	-43.58
1550	0.371	-45.89

## Link View



## Element Table

Type	No.	Pos./Len. (km)	Loss (dB)		Ref. (dB)		Att. (dB/km)		Diagnostic
			1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	
Connector		-1.0431	0.186	0.181	-73.2	-79.9			
Section		1.0431	0.342	0.187			0.328	0.180	
Connector (A)	1	0.0000	0.086	0.070	---	-83.9			
Section		0.3980	0.122	0.069			0.306	0.173	
Connector	2	0.3980	0.240	0.154	-67.6	-71.5			
Section		0.0251	0.005	0.005			0.200	0.200	
Connector (B)	3	0.4231	0.055	0.072	-75.0	-86.5			
Section		0.0927	0.035	0.023			0.379	0.247	
Connector		0.5158	---	---	-68.4	-57.8			

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# OLT to ONT Details

OLT to ONT Testing Schedule											
Panel	Slot	Port	Lot	ONT S/N	FSAN S/N	MAC	Wi-Fi Password	ONT Power	Screen Shot	Network Test	OLT x connect
1	A	F1	718	3289720	00323278	000147323278	znid03289720	-13.4	x	x	1/2/27
1	A	F2	727	8064192	03408D34	000271408d34	znid8064192	-15.6	x	x	1/2/16
1	A	F3	729	304230988	03408F4C	000271408f4c	znid304230988	-14.2	x	x	1/2/17
1	A	F4	733	304227650	03408242	000271408242	znid304227650	-14.6	x	x	1/2/18
1	A	F5	Spare								
1	A	F6	Spare								
1	A	F7	Spare								
1	A	F8	Spare								
1	A	F9	340	304231230	0340903E	00027140903e	znid304231230	-14.9	x	x	1/2/2
1	A	F10	Spare								
1	A	F11	421	304229572	034089C4	0002714089c4	znid304229572	-14	x	x	1/2/4
1	A	F12	320	304229836	03408ACC	000271408acc	znid304229836				1/1/9
1	B	F1	712								
1	B	F2	714	304229176	3408838	271408838	znid304229176				
1	B	F3	717	304230548	03408D94	000271408d94	znid304230548	-15.5	x	x	1/2/12
1	B	F4	719	304230784	03408E80	000271408e80	znid304230784	-13.9	x	x	1/2/13
1	B	F5	721	304230468	03408d44	000271408d44	znid304230468				
1	B	F6	723	304225996	03407bcc	000271407bcc	znid304225996				



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# Documentation

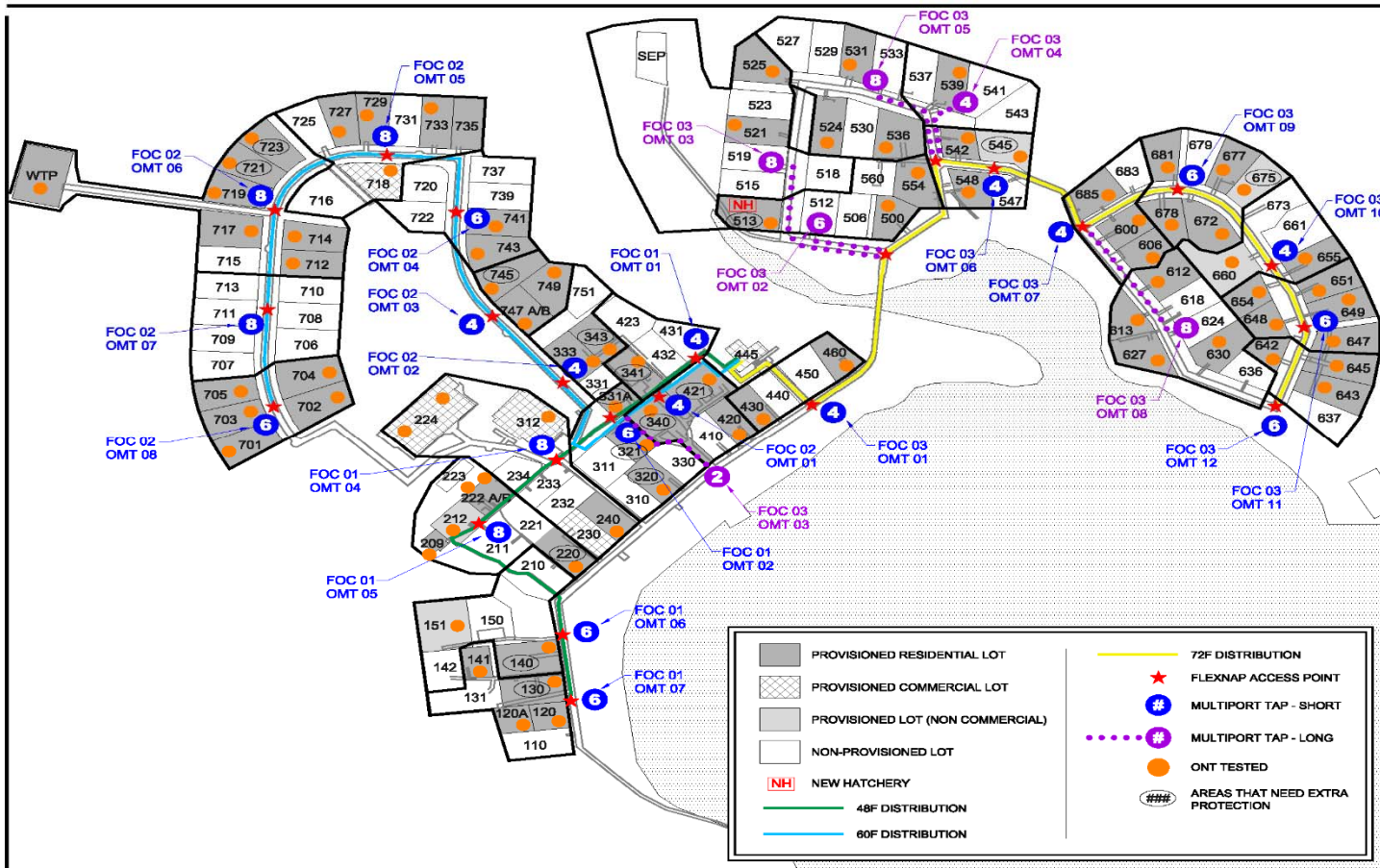
- Fiber Patch Panel Details and X connects
- Trunk system splice schedule
- Community As Built drawing
- Cabling certification
- System Documentation and Connection Details



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ISSUED FOR:  
AS-BUILT SEPT. 14, 2015

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TECHNICAL SERVICES  
AXIS TECHNICAL SERVICES CORP.  
104 - 3011 UNDERHILL AVENUE  
BURNABY, BC V3A 3C2  
TEL: 604.659.2947  
FAX: 1.866.860.6634  
www.axismect.ca

PROJECT:  
HARTLEY BAY  
FIBER OPTIC INFRASTRUCTURE  
Hartley Bay BC

SITE PLAN  
CORNING FLEXNAP SYSTEM

DRAWN / CHECKED: CT / JB  
SCALE: NTS  
CAD FILE:  
PLOT DATE: SEPT. 14, 2015

T-01a | NORTH

PROJECT No: D679-2860

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# System Documentation

Rack	Panel	Slot	Strand	Cable ID	Multi Port ID	Lot	MXK X Connect	Notes
1	FPP01	A	F01	FOC-02	OMT05-P01	718	1 /2/27	
1	FPP01	A	F02	FOC-02	OMT05-P02	727	1 /2/16	
1	FPP01	A	F03	FOC-02	OMT05-P03	729	1 /2/17	
1	FPP01	A	F04	FOC-02	OMT05-P04	733	1 /2/18	
1	FPP01	A	F05	FOC-02	OMT05-P05	unassigned		future
1	FPP01	A	F06	FOC-02	OMT05-P06	unassigned		future
1	FPP01	A	F07	FOC-02	OMT05-P07	unassigned		future
1	FPP01	A	F08	FOC-02	OMT05-P08	unassigned		future
1	FPP01	A	F09	FOC-02	OMT01-P01	340	1 /2/2	
1	FPP01	A	F10	FOC-02	OMT01-P02	320	1/1/9	
1	FPP01	A	F11	FOC-02	OMT01-P03	421	1 /2/4	
1	FPP01	A	F12	FOC-02	OMT01-P04	unassigned		future
1	FPP01	B	F01	FOC-02	OMT06-P01	712	1 /4/9	
1	FPP01	B	F02	FOC-02	OMT06-P02	714	1 /4/10	
1	FPP01	B	F03	FOC-02	OMT06-P03	717	1 2/12	
1	FPP01	B	F04	FOC-02	OMT06-P04	719	1 /2/13	
1	FPP01	B	F05	FOC-02	OMT06-P05	721	1 /4/7	
1	FPP01	B	F06	FOC-02	OMT06-P06	723	1 /4/8	
1	FPP01	B	F07	FOC-02	OMT06-P07	WTP	1 /4/6	
1	FPP01	B	F08	FOC-02	OMT06-P08			



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# Warranty



20 Year Warranty Certificate

Corning Optical Communications  
Extended Warranty

Extends its product warranty to Gitga'at First Nation  
For Hartley Bay First Nations  
as installed by Axis Technical Services  
Beginning Sep 15, 2015 and ending Sep 15, 2035  
Registration Number 15-041471

Stuart Holness  
Senior VP  
Enterprise Networks, TCO

Regina McCaughan, Program Manager  
Enterprise Networks  
Network of Preferred Installers

Rendered: Fri Dec 04 19:57:39 GMT 2016



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# Training

- Local resources were used during the implementation
- Onsite training
- Providing detailed shop drawings and SRPs
- Training videos for
  - ✓ System Overview
  - ✓ Inspection and cleaning
  - ✓ Multiport assemblies



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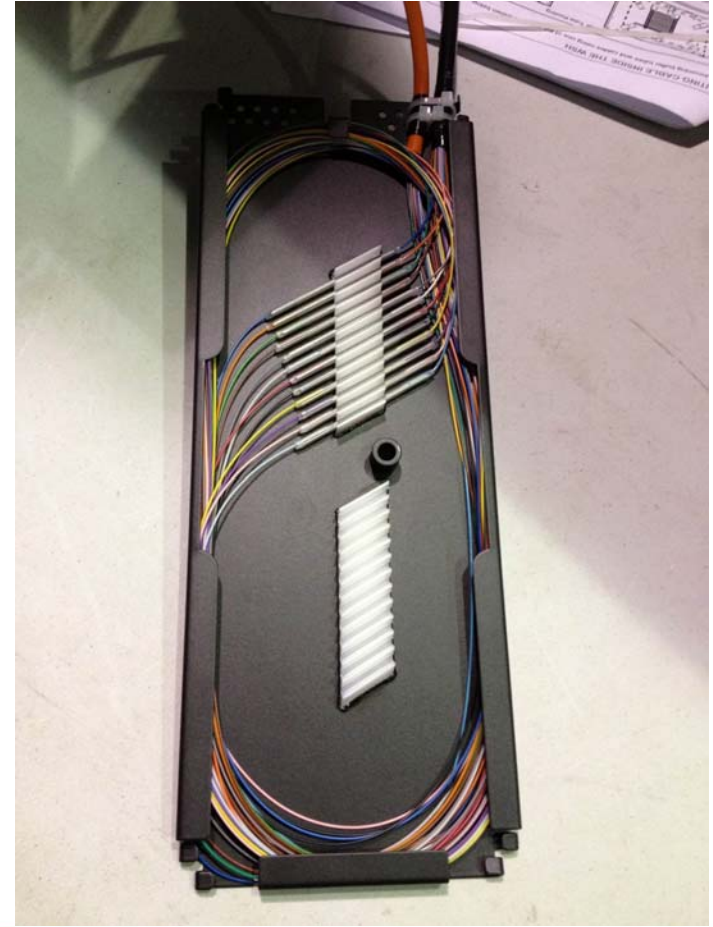
# **AXIS** TECHNICAL SERVICES

Axis Technical Services is proud to have helped deliver state-of-the-art communications technology and infrastructure, to give this BC community a stronger connection to the Global Village.

We thank the Hartley Bay Community for entrusting us with this very important project.

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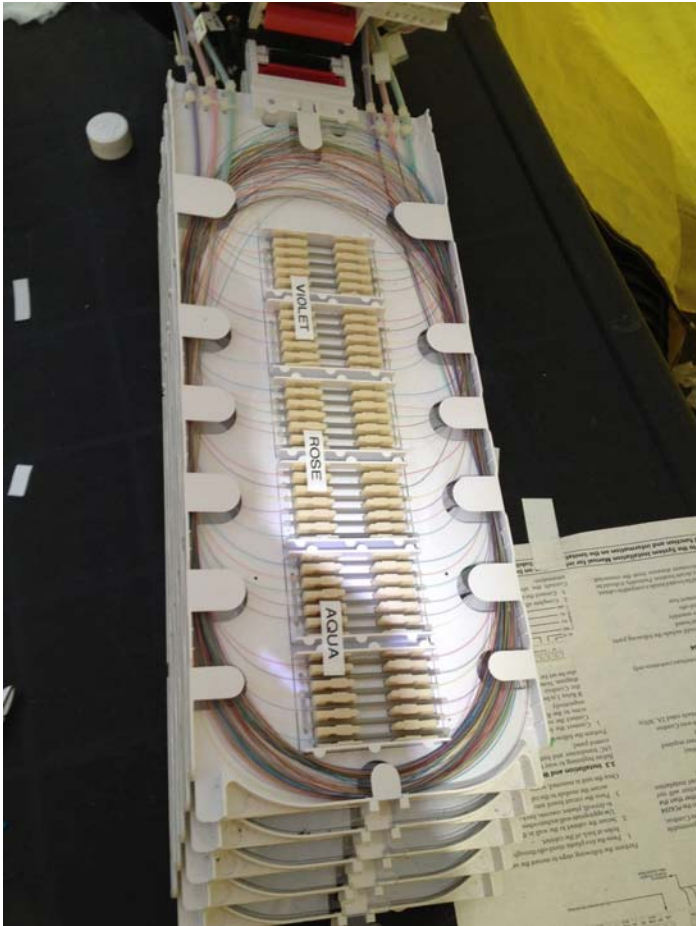




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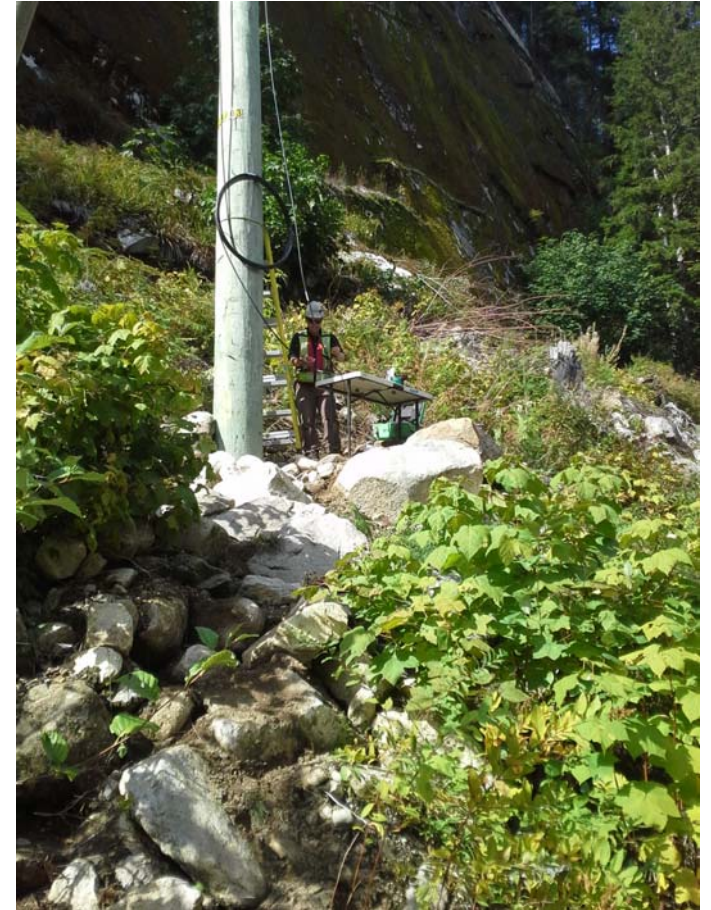
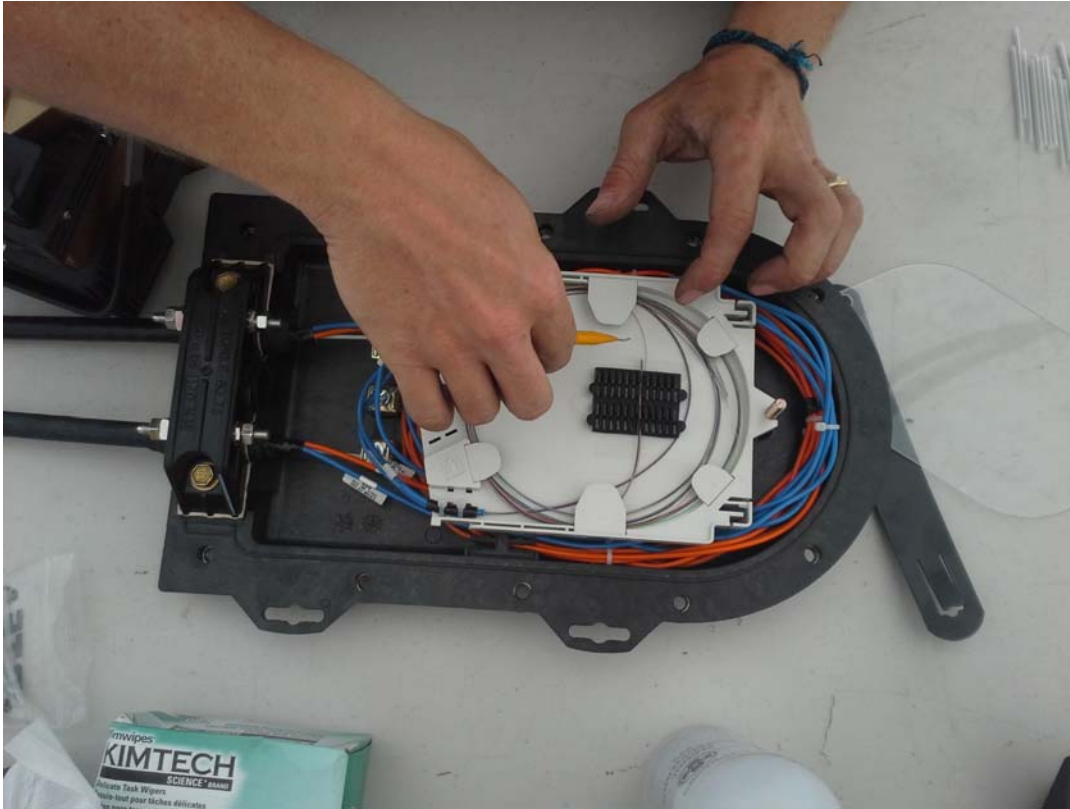






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