Student Name

ID Number

Fibre Optic Project

Date

Lecturer: Lloyd Brown

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Introduction

Vector Technology Institute is being tasked to designed a Fibre Optic Network. It is our objective to design the fiber optic network for the Fiber to the desktop (FTTD) deployment at the main campus which has space for about 78 students and the fiber run from the main campus to the priory campus.

Network Topology

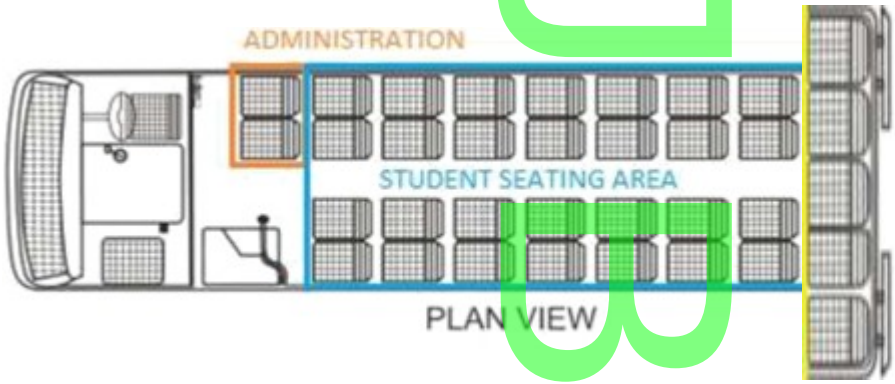
Main Campus

[redacted]

Library
Kitchen
Restroom
Registrar Office
Room 2
J.haye
Room 1
Lab
Managers office
Room 3
Lunch Area

Mobile Classroom

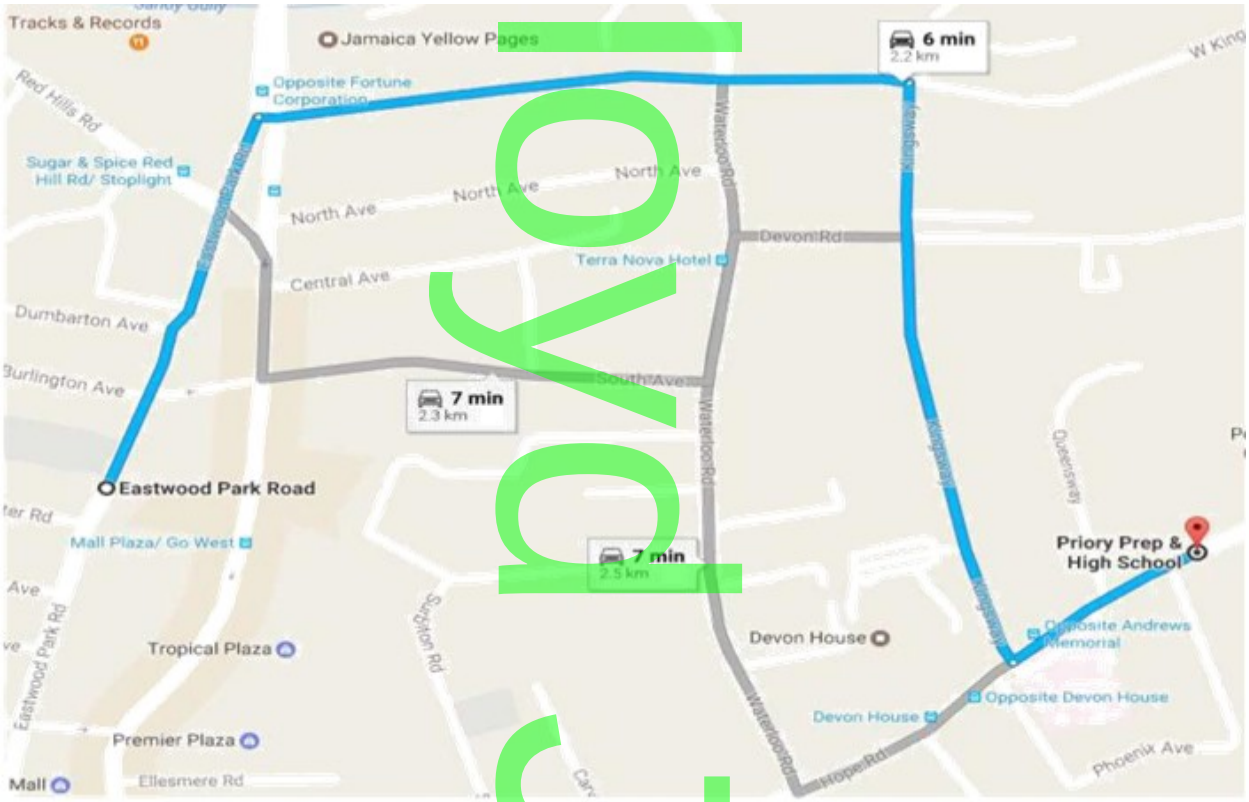
As specified for the project, a refurbished bus will be used as the mobile classroom. The mobile classroom should seat 24 students, there will be 2 instructors and personal laptop users should be able to access content on the fibre network interface. [redacted]



Storage Area

Area	Network Drop Count
Mobile Classroom	30

Outside Plant (Aerial View)

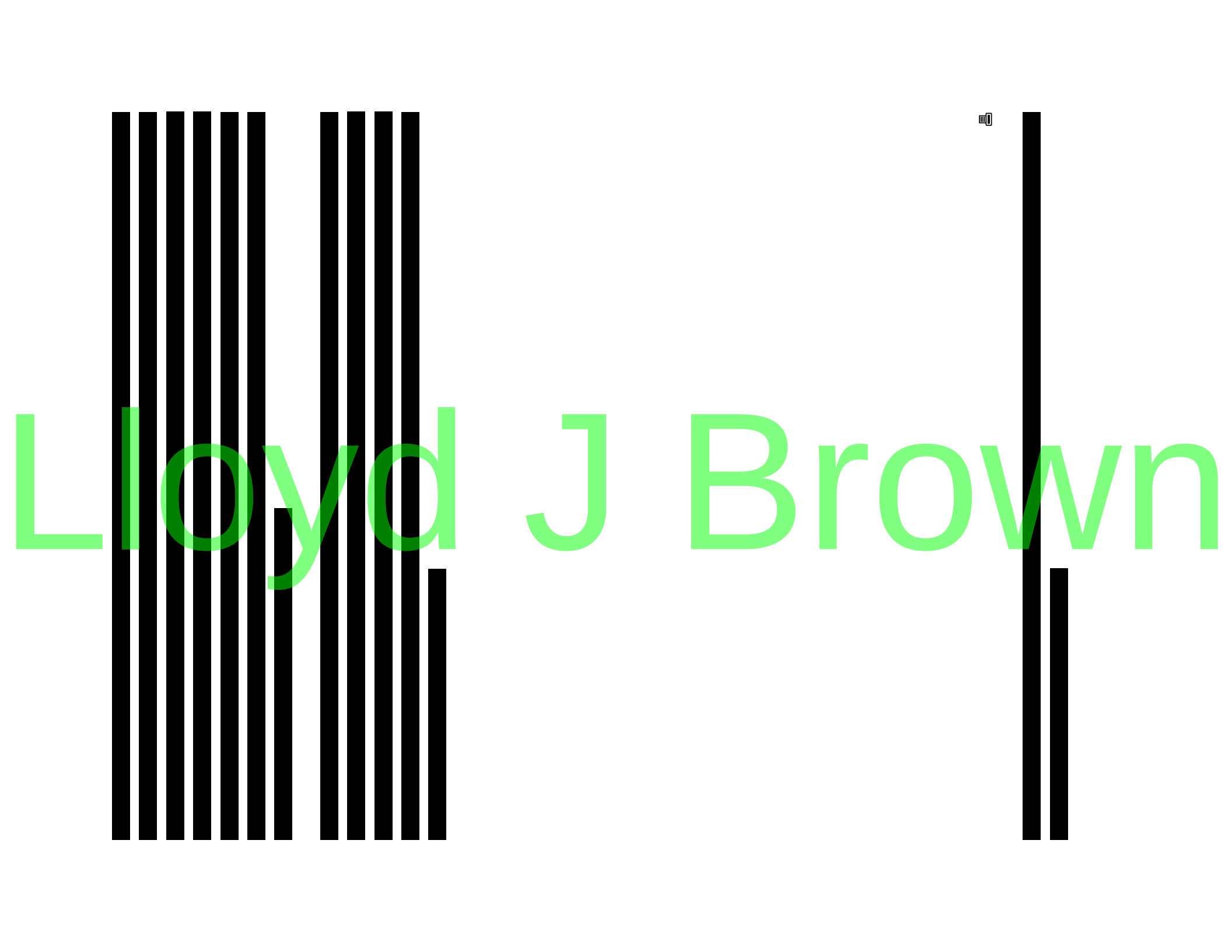


Roadway Path Taken for Fiber Installation

Fibre Installation Method

Three methods generally involved in installing OSP cables: aerial, direct-buried, and underground.

[redacted]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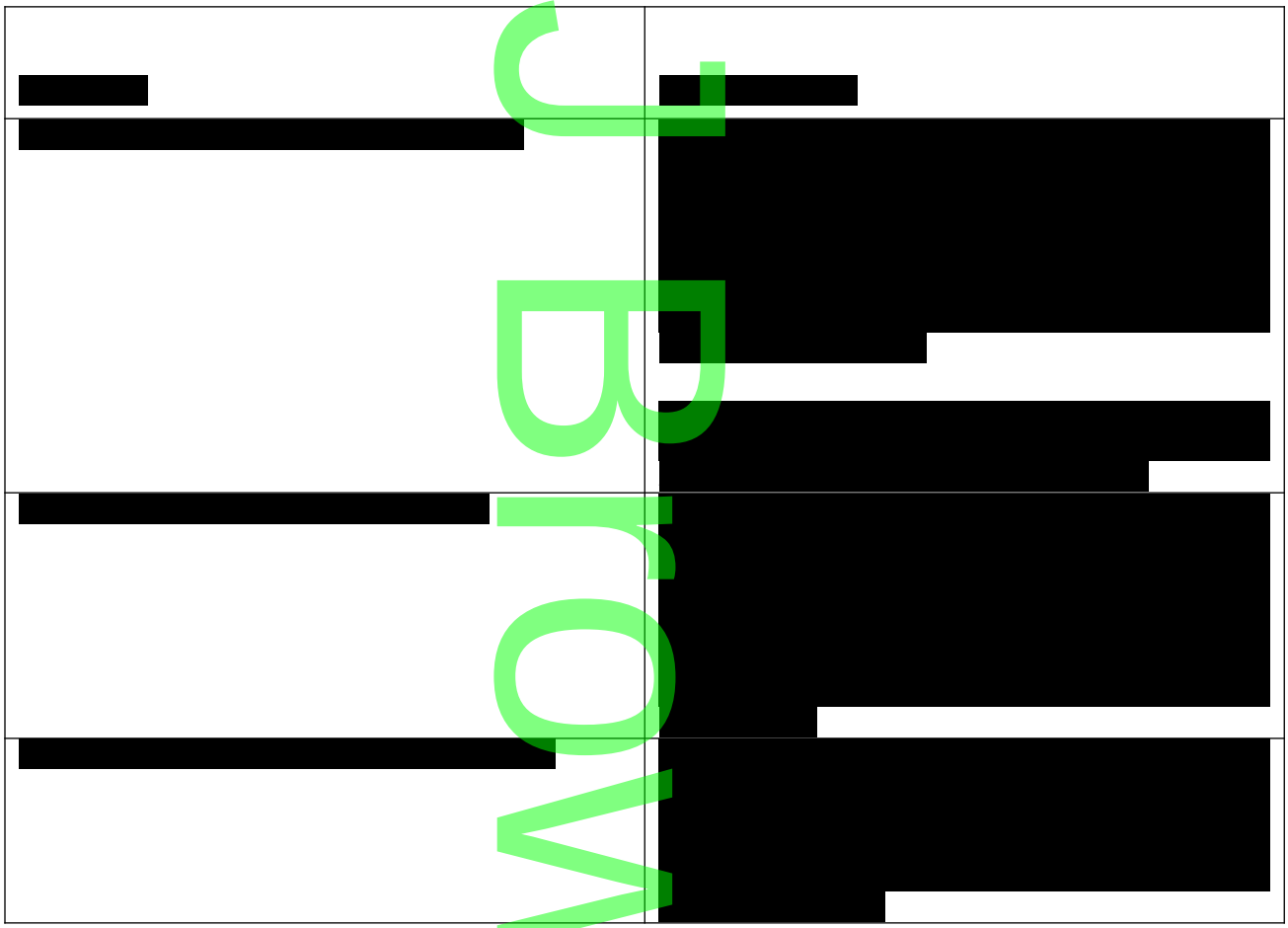
Some common tools for aerial fiber cable installation are:



Fibre Implementation

Fiber Type (OSP): Singlemode (SM)

Wavelength (OSP): 1310nm

Connectors: LC

LIST OF TEST EQUIPMENT, TOOLS AND CONSUMABLES:

Quantity	Tools or Equipment	Comments
1	[redacted]	[redacted]
1	[redacted]	[redacted]
1	[redacted]	[redacted]
1	[redacted]	[redacted]
1	[redacted]	[redacted]
1	[redacted]	[redacted]

		[redacted]
1	[redacted]	[redacted]
1	[redacted]	
1	[redacted]	
1		
1	[redacted]	[redacted]
1	[redacted]	[redacted]
1	[redacted]	[redacted]

	Test Equipment	
2	[redacted]	[redacted]
1	[redacted]	[redacted]

1	[redacted]	[redacted]
As needed	[redacted]	[redacted]
2 per test kit	[redacted]	[redacted]
2 per test kit	[redacted]	[redacted]
1	[redacted]	[redacted]

		[redacted]
Optional	[redacted]	[redacted]
Optional	[redacted]	[redacted]

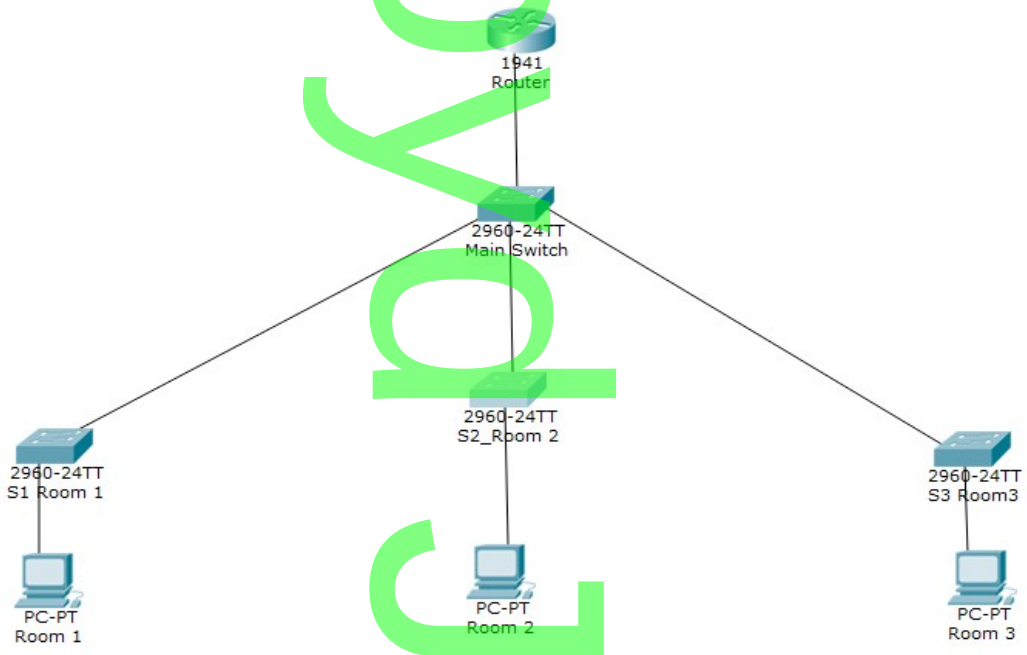
	Cleaning/Safety Materials	
1	Safety Glasses	ALWAYS wear safety glasses
Many	Alcohol-saturated pads – to clean fiber and connectors during splice, termination, test, CleanTex 806 or equivalent (may also use lab wipes and reagent grade ethanol)	MUST be pure alcohol since rubbing types have high water content that will cause problems with adhesives and fibers
Many	Lab wipes – e.g. Kimwipes	Use to clean up, dry off connectors after cleaning with alcohol pads
1 per job	Trash bin – small disposable container with top to hold fiber scraps	1 pint deli container with lid works well

1 per student	Black work mat	Helps see the fiber scraps to clean up – black place mats or vinyl cut to size
1	Dry connector cleaner	These have opening to push connector in, operate once to clean connector. Neater than wet cleaning, just as effective
	Termination Consumable Kit:	
Optional	Connector Curing Oven – to cure epoxy/polish connectors	Epoxy/polish connectors are still the cheapest and most reliable and a portable curing oven allows fast installation
Several	Heat Cure, 2-Part Epoxy, 2.5 Gram	"BiPax" Package has epoxy and hardener in plastic package that is mixed in the package. Can be used with many connectors at one time
Several	Cheap scissors to cut corner off epoxy package	You will get epoxy on these when you cut the epoxy package so get cheap ones and discard after use
	3cc Application Syringe w/flat end needle to apply epoxy.	
1 Bottle	Anaerobic Adhesive + Accelerator (optional) (Loctite 648 adhesive, 10ml bottle, Loctite 7649 accelerator works well)	See recommended directions on FOA site (Anaerobic connector termination)
1 for each type of connector	Polishing puck	Usually come in versions for 2.5mm ferrule or 1.25mm ferrule. May be plastic or metal

Sheets as needed	[redacted]	[redacted]
Sheets as needed	[redacted]	[redacted]

Sheets as needed		
1		
1		
As needed		
As needed		
1		
1		
As needed		

Vector Technology Institute (VTI) Network Diagram



Project Timeline

The table below show the estimated projected time:

Activity	Time (Days)
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

Total: 28 days

FTTD (Fiber to the Desktop) Main Campus

Fiber to the Desktop (FTTD) for the classrooms require each classroom to have its own fiber switch, necessary fiber runs, fiber keystone jacks, fiber patch cables and media converters.

Room	Fiber Keystone Jacks (LC)
☑⑥⑥④	□□
☑⑥⑥④	□□
☑⑥⑥④	□□
Total	**62**

Cable needed: Multimode Fibre

LC Connectors

Cable Type	Room 1	Room 2	Room 3	Main to SW-R1	Main to SW-R2	Main to SW-R3	R1-R2	R1-R3	R2-R3
LC 30m				1	1	1	1	1	1
LC 20	20	20	20						
LC 4m	15	15	15						
LC 2m	5	5	5						
Cat 6	4	4	4						

Media Converter

Rooms	LC to RJ-45 (850nm)
Room 1	10
Room 2	10
Room 3	10
Total	30

Fiber Modules

From Main switch to Fiber switches for Room 1, Room 2 and Room 3 and to the desktop.

Type of Switch	LC Fiber Module (850nm)
Cisco 9000	64

[redacted]

FTTD (Fibre to the Desktop) Mobile Classroom

Fiber to the Desktop (FTTD) for the Mobile classroom requires fiber keystone jacks, fiber switches, fiber runs patch cables and media converters.

Type	Amount
[redacted]	[redacted]

Cable Needed (Multimode)

Cable Type (850nm)	Amount
[redacted]	[redacted]
[redacted]	[redacted]

Media Converters

[redacted]

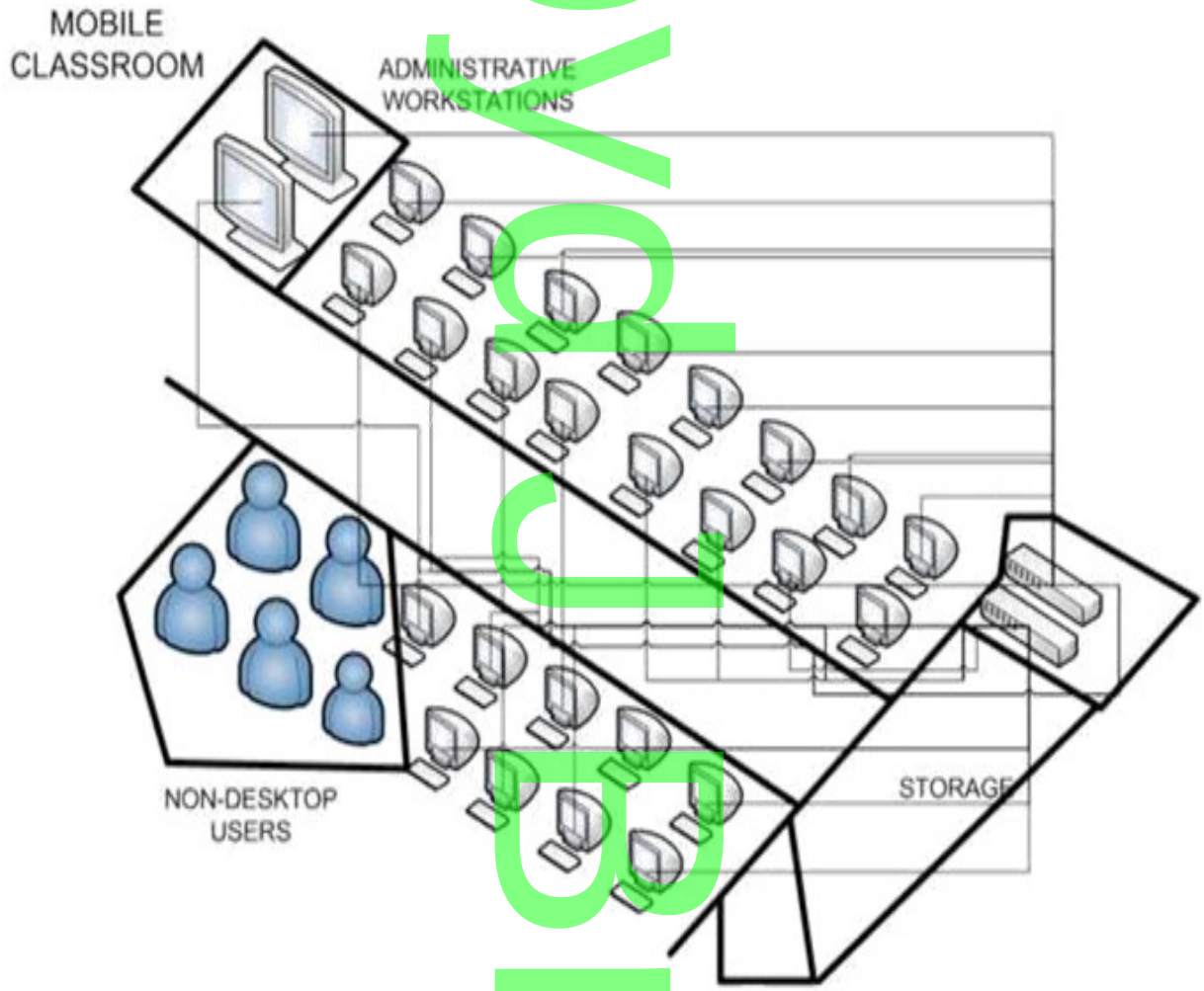
Type	Amount
[redacted]	[redacted]

Fiber Modules

From Main switch to Fiber switches for Room 1, Room 2 and Room 3 and to the desktop.

Switch	LC Fiber Module (850nm)
Cisco 9000	40

Mobile Classroom Layout



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Link Budget Loss

Mobile Classroom

[redacted]

Fibre Type	Fibre Loss	Connector Loss	Splice Loss	Margin	Total Loss
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

OSP Aerial (Priory to VTI Main)

Fiber Type: Single Mode

Cable Length: 3.50km

Connectors: 7

Termination: 7

Fibre Type	Fibre Loss	Connector Loss	Splice Loss	Margin	Total Loss
1310	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1550	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Vector Technology Institute Main Campus

Room 1

Fiber Type: Multi-Mode

[redacted]

Fibre Type	Fibre Loss	Connector Loss	Splice Loss	Margin	Total Loss
850nm	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1300nm	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Room 2

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Room 3

Fiber Type: Multi-Mode

Cable Length:0.04km

Connectors: 21

Termination: 21

Fibre Type	Fibre Loss	Connector Loss	Splice Loss	Margin Loss	Total Loss
850nm	0.04km x 3.5db=0.14	2 x .75= 1.5	0	3	4.64
1300nm	0.04km x 1.5db= 0.06	2 x .75= 1.5	0	3	4.56

Between Switches

Fiber Type: Multi-Mode

Cable Length: 0.007km between each switch

Connectors: 10

Termination: 10

Fibre Type	Fibre Loss	Connector Loss	Splice Loss	Margin Loss	Total Loss
850nm	0.007km x 3.5db= 0.0245	2 x .75= 1.5	0	3	4.5245
1300nm	0.007km x 1.5db= 0.0105	2 x .75= 1.5	0	3	4.5105

Important Considerations in Fiber Optic Installation

Do a complete design before beginning cable plant installation

a) Establish criteria for the install, based on the communications paths required

b) Know how many fibers of what types are needed add extras for repairs or growth

c) Determine hardware requirements: connectors, splices, patch panels, closures, etc.

d. Plot the cable route and determine cable lengths

e. Show how installed (premises, buried, conduit, inner duct, underwater, pole locations for aerial, etc.)

f. Mark termination and splice points

g. Attach data from link loss budget and use it as a guide for testing

h. Don't try to build a marginal design allow for "Murphy's Law"

i. Follow the NECA 301-2004 Standard For Installing and Testing Fiber Optic Cables in design and installation

j. At the same time, design the facilities for the communications equipment, including locations, allowing for adequate spaces, power and grounding and HVAC as needed

k. Make complete lists of what components and hardware are needed and where they are to be used

Work with vendors on component specifications to get best quality and price

a) [redacted]

[redacted]

Bill of Materials

Item	Description	Quantity	Unit Price	Total Price
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

	[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]		[redacted]	[redacted]
	[redacted]		[redacted]	[redacted]
	TOTAL		**$**	**4,292,175.37**

References