# FIBER OPTIC CABLE INSTALLATION

The following documents illustrates the consideration while managing fiber Optic Installations used with the National Computer Network (NCN) of the Maldives.

For a proper fiber optic cable installation, it is important to obey some rules when installing fiber cables. The following list some of the important factors to consider.

1. MINIMUM BEND RADIUS.

All optical fiber cable installation is maintaining the cable's minimum bend radius. Never exceed the cable bend radius. Fiber is stronger than steel when you pull it straight, but it breaks easily when bent too tightly. These will harm the fibers, maybe immediately, maybe not for a few years, but you will harm them and the cable must be removed and thrown away!
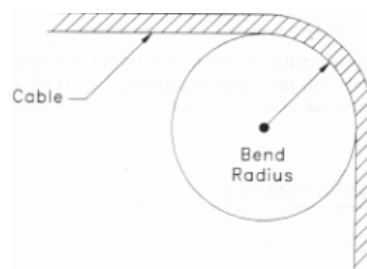
Application	Fiber Count	Loaded	
		cm	inch
Inter-building backbone	2-84	22.5	8.9
Intra-building backbone	2-12	10.5	4.1
	14-24	15.9	6.3
Horizontal cabling	2	6.6	2.6
	4	7.2	2.8

2. MAXIMUM VERTICAL RISE

The maximum vertical distance the cable can be installed without intermediate support points.

Must check the optical fiber cables maximum vertical rise that is a function of the cable's weight and tensile strength as per the cable manufactures.

Some guidelines for vertical installations include the following:

- All vertical cable must be secured at the top of the run. A split mesh grip is recommended to secure the cable.

- The attachment point should be carefully chosen to comply with the cable's minimum bend radius while holding the cable securely.
- Long vertical cables should be secured when the maximum rise has been reached.

3. DUCT UTILIZATION

When pulling long lengths of cable through duct or conduit, less than a 50% fill ratio by cross-sectional area is recommended. For example, one cable equates to a 0.71 inch outside diameter cable in a 1 inch inside diameter duct.

Multiple cables can be pulled at once as the tensile load is applied equally to all cable. Fill ratios may dictate higher fiber counts in anticipation of future needs. One sheath can be more densely packed with fiber than multiple cable sheaths.

In short, for customer premises applications, the cost of extra fibers is usually small when these extra fibers are not terminated until needed. For a difficult cable pull, extra fibers installed now but not terminated may be the most cost-effective provision for the future.

Mark cable as "Fiber Optic Cable".

Mark cable as "fiber optic cable" in all locations in which it can be easily reached. Such marking will alert electricians to the nature of the cable.

4. FIBER OPTIC CABLE SLACK

A small amount of slack cable can be useful in the event that cable repair or relocation is needed. If a cable is cut, the slack can be shifted to the damaged point, necessitating only one splice point in the permanent repair rather than two splices if an additional length of cable is added. This results in reduced labor and hardware costs and link loss budget saving.

Additional cable slack (approximately 30 feet) stored at planned future cable drop points will result in savings in labor and materials when the drop is finally needed. Relocation of terminals or cable plant can also take place without splicing if sufficient cable slack is available.

Recommended NCN cable slack = 25ft (7.5m)

5. SPLICING AND CONNECTION – FIBER TERMINATION

It is essential and required to properly terminate the fiber to the required Optical Distribution Frames.

- Fiber splicing done to 1U fiber tray & cable has to be manage inside the splice tray.
- Minimum of four (4) cores should be spliced on each side.
- The fiber color code is required to be followed as per the char below.
- For NCN distribution network, should use only single Mode SC connectors.
- Labeling should be done

Splicing Tray Sample	FIBER COLOR CODE

6. As-Built Data logs.

As-built data logs on all cables are required as it is required to be made available to those who will perform maintenance and troubleshooting. These data logs should include both insertion loss measurement and OTDR measurements. Fiber installation team should provide complete documentation as defined in this document.

SPLICE LOSS (Table)

Recommended average splice losses shall be as stated below.

Splicing parameter	Maximum Accepted loss (db)
Fusion splice	0.2

The installation documents shall include the readings for each core of the fiber as indicated by the fusion splicer. All test results should be provided both in **soft and hard copy.**

Splicing parameter	Max	Min	Core number	Reading (db)	Pass / Fail
Fusion splice	0.2	na	1		
			2		
			3		
			4		
			n		

7. Port Mapping/Assignment

Both ends of the fiber cable and all ports of the patch panels has to be clearly labeled with the appropriate identifiers.

Test results and patch panel (port Label) recodes should be minimally provided as per the table below.

Sample

Cable Details	Site A	Site B	Patch Panel 1 Port	Patch Panel 2 Port	Connector Type
Single Mode 12 Core Fiber (4/12 Used)	Council (Server room, Cabinet number, Rack unit location..)	Hospital Server room, Cabinet number, Rack unit location..)	1	1	SC
			2	2	SC
			3	3	SC
			4	4	SC
			n	n	SC

Picture of Completed Sites

A

B