



FIBER AND CABLE SELECTION GUIDELINES

SELECTION OF OPTICAL FIBER:

Introduction:

Optical fibers are normally classified into two types, Single Mode Optical Fibers and Multi Mode Optical fibers, according to the number of modes the fiber carries. Further, Single mode optical fibers are classified into 3 categories by International Telecommunication Union (ITU). These fibers are differentiated by the Chromatic dispersion.

- a. G.652 - Dispersion Un-shifted Single Mode Fiber, also called as Standard Single Mode Fiber.
- b. G-653- Dispersion Shifted Single Mode Fiber.
- c. G.655- Non Zero Dispersion Shifted Single Mode Fiber.

Since the invention of Single Mode fibers in early 1970s, Standard Single Mode Fibers were widely deployed in Telecom networks with Single Channel transmission at 1310nm. During 1990s Dispersion Shifted Single Mode Fiber was introduced to utilize low attenuation properties of fiber at 1550nm there by increasing the transmission distance without repeaters. With the availability of WDM technology, 1550nm transmission at higher bit rates was effected due to nearly Zero dispersion value at 1550nm. In order to achieve higher bit rate transmission and WDM transmission, Non-Zero Dispersion Shifted Single Mode Fiber was invented and is being deployed by Telecom carriers.

Multi Mode Fibers are available in Graded index and Step index type. Graded index type Multi Mode fibers are in use due to reduced modal dispersion and higher bandwidth. 50/125 μ m and 62.5/125 μ m are widely deployed Multi Mode fibers in Local Area Network (LAN). Recent developments and ratification of Gigabit Ethernet Standards for transmission at Gigabit speeds in LANs has brought the need for new type of Laser Optimized 50/125 μ m Multi Mode fiber with high bandwidth required by Gigabit Ethernet standard.

While choosing right type of Optical fiber for the networks, in general, the following factors shall be considered:

- Present capacity requirements
- Future demand and requirements
- Active and Passive component costs



The following table outlines basic types of fibers:

Fiber Type	Transmission Wavelength/ Window	Advantages	Applications
50/125µm Multi Mode 62.5/125µm Multi Mode (ITU-T G.651)	850nm 1300nm	<ul style="list-style-type: none"> - Cost effective - Large core size - Easy to splice - Large NA 	<ul style="list-style-type: none"> - LAN - SAN
50/125µm Laser Optimized Multimode	850nm	<ul style="list-style-type: none"> - Higher bandwidth 	<ul style="list-style-type: none"> - Gigabit Ethernet - 10 Gigabit Ethernet
Dispersion Un-shifted Single Mode (G.652)	1310nm	<ul style="list-style-type: none"> - Low Dispersion at 1310nm 	<ul style="list-style-type: none"> - upto 2.5 Gbits/sec
Dispersion Shifted Single Mode (G.653)	1550nm	<ul style="list-style-type: none"> - Utilizes Low attenuation and Low dispersion at 1550nm - Long distance repeater spacing 	Now this Fiber is obsolete
Non-Zero Dispersion Shifted Single Mode (G.655)	Across the 1550nm window	<ul style="list-style-type: none"> - Low dispersion and Low loss at 1550nm window - Overcomes Non-linearities - Supports WDM, DWDM - Operates at high bit rates 	<ul style="list-style-type: none"> - For high bit rate transmission - DWDM transmission



SELECTION OF OPTICAL FIBER CABLE:

Introduction:

Wide variety of Optical Fiber Cables with innovative designs are available from manufacturers. Primarily these cables are categorized into:

- Indoor Cables
- Outdoor Cables

The following table outlines different types of Optical Fiber Cables and their applications:

<u>Indoor Cables</u>		
Indoor Cables are available for Riser, Plenum, Low smoke and Zero Halogen Jackets, meeting industry requirements.		
Cable Type	Features	Applications
Simplex and Zipcord	<ul style="list-style-type: none"> - Simplex cables are one fiber tight buffered with 900µm buffer - Jacket is usually 3.0mm - Zipcord is two simplex cables joined by a web 	<ul style="list-style-type: none"> - Used for patch cord - Backbone application
Distribution Cables	<ul style="list-style-type: none"> - Several Tight buffers are bundled in a single jacket with Aramid yarns - Small size - Direct termination 	<ul style="list-style-type: none"> - Short, dry conduits - Riser and Plenum applications
Breakout Cables	<ul style="list-style-type: none"> - Several Tight buffers are bundled in Subunit with Aramid yarns - Several Subunits are stranded around FRP - Strong and rugged design - Direct termination 	<ul style="list-style-type: none"> - Riser and Plenum - Breakout of desired fibers



Outdoor Cables

Outdoor cables are usually manufactured with loose tube type construction. These cables have high pulling strength than indoor cables and the outer jackets are UV resistant.

Cable Type	Features	Applications
Duct Cables	<ul style="list-style-type: none"> - Single jacketed - Water resistant - UV resistant jacket 	- Laying in ducts
Direct Buried	<ul style="list-style-type: none"> - Double jacketed - Water resistant - UV resistant jacket 	- Direct burial
Armored Cables	<ul style="list-style-type: none"> - Steel tape armored - Steel wire armored in specific cases - High crush resistant 	<ul style="list-style-type: none"> - Rodent protection - Direct buried
Aerial Cables	<ul style="list-style-type: none"> - Fig-8 construction - ADSS construction available 	<ul style="list-style-type: none"> - Installation on existing poles - Lashing to a messenger wire