

ETA Competency Requirements

2007

Fiber Optics Designers are expected to obtain knowledge of basic concepts of fiber optics design and installation which are applicable to all the functions required to safely and competently install fiber optics communications cabling in a LAN environment. Once a CFOD has acquired these skills, abilities and knowledge, he or she should be able to enter employment in the telecommunications cabling field. With minimal training in areas unique to the special requirements of individual products or systems designs, the Fiber Optics Designer should become a profitable and efficient part of the workforce.

Fiber Optics Designers must be knowledgeable and have abilities in the following technical areas:

Fiber Optics Designer – FOD

1.0 Theory and Principles of Fiber Optics

- 1.1 Outline the basic construction of optical fiber.
- 1.2 Describe the terms "core" and "cladding."
- 1.3 Describe the principles of operation as the light travel down the fiber.
- 1.4 Define the term "index of refraction."
- 1.5 Describe the angles of incidence and refraction
- 1.6 Describe the principle of "total internal reflection."
- 1.7 Describe "numerical aperture."
- 1.8 Describe the system parameters that affect the transmission system's operation.
- 1.9 Characterize the relationship of wavelength to frequency.
- 1.10 Describe "attenuation."
- 1.11 Describe "intrinsic" factors.
- 1.12 Describe "extrinsic" factors.
- 1.13 Define the term "microbend."
- 1.14 Define the term "macrobend."
- 1.15 Define the term "dispersion."
- 1.16 Name and describe the three main types of dispersion.
- 1.17 Define the term "information-carrying capacity."

2.0 Fiber Types

- 2.1 Outline the basic construction of optical fiber.
- 2.2 Describe the terms "core" and "cladding."
- 2.3 List the common classifications for optical fibers.
- 2.4 Describe the three different types of optical fiber material makeup.
- 2.5 Define "differential mode delay."
- 2.6 Describe the need for a mode conditioning patch cord.
- 2.7 Describe the differences between over filled launch (OFL) and restricted mode launch (RML).
- 2.8 Name and describe fiber types optimized for different applications.

3.0 Optical Sources

- 3.1 Distinguish the main difference between an LED and a Laser regarding emission.
- 3.2 Describe the attributes of the Laser and how they differ from the LED.
- 3.3 Name and describe the different types of LED sources.
- 3.4 Name and describe the different types of Laser sources.
- 3.5 Describe the different modulation techniques used with optical sources.

4.0 Cable Selection in Network Design

- 4.1 Name and describe the four main parts of a fiber-optic cable.
- 4.2 Describe the two types of buffers used in fiber optic cables.
- 4.3 Describe the temperature effects on loose tube fiber optic cables.
- 4.4 Describe "ribbon" cable.
- 4.5 Describe the design benefits of single tube fiber optic cables.

5.0 Termination and Splicing

- 5.1 Name and describe the different single fiber termination connector styles.
- 5.2. Name and describe the different multi-fiber termination connector styles.
- 5.3 Describe the field installable connector technologies.
- 5.4 Describe the heat cured epoxy technology.
- 5.5 Describe quick cure terminations.
- 5.6 Describe no epoxy, no polish terminations.
- 5.7 Define "pigtail splicing."
- 5.8 Describe preconnectorized assemblies and cables.
- 5.9 Describe the splicing types and methods.
- 5.10 Describe fusion splice technology.
- 5.11 Describe mechanical splice technology.

6.0 Hardware

- 6.1 Describe the advantages of patch panels.
- 6.2 Define the typical usage areas of patch panels.
- 6.3 Describe main cross connect.
- 6.4 Describe intermediate cross connect.
- 6.5 Describe horizontal cross connect.
- 6.6 Describe a telecommunications room.
- 6.7 Describe work areas.
- 6.8 Define distributed zone architecture.
- 6.9 Describe passive fiber zone box.
- 6.10 Describe active fiber zone box.

7.0 ANSI/TIA/EIA Building Codes

- 7.1 Identify the major telecommunication standards and governing bodies.
- 7.2 Interpret TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements.
- 7.3 Understand TIA/EIA-568-B.2 Commercial Building Cabling Standard – Part 2: Balanced Twisted Pair Cabling Components.
- 7.4. Interpret TIA/EIA-568-B.3 Commercial Building Cabling Standard – Part 3: Optical Fiber Cabling Components Standard.
- 7.5. Describe structured cabling architecture.
- 7.6 Define structured cabling distances.
- 7.7 Interpret the industry networking concepts to include engineering subcommittee updates.
- 7.8 Interpret the Administration Standard for the Telecommunications Infrastructure of Commercial Buildings – TIA/EIA-606

8.0 National Electric Code

- 8.1 Detail the considerations for fiber optic cable installation inside a building including grounding, cable support, fill ratios, and information technology rooms.
- 8.2 List the correct terminology and classifications of optical fiber cables.
- 8.3 Describe the possible scenarios and considerations to take into account when developing a cost comparison model.

9.0 Ethernet

- 9.1 Explain the purpose of the OSI Seven Layer Model as a common reference model for system interconnection.
- 9.2 Describe the features, functions and components of the 10 Mbps Ethernet.
- 9.3 Explain Carrier Sense Multiple Access/Collision Detection technology
- 9.4 Describe the various speeds at which a standards-based implementation of Ethernet operates.
- 9.5 Describe the features, functions and components of the 100 Mbps "Fast" Ethernet.

- 9.6 Describe the features, functions and components of the 1000 Mbps “Gigabit” Ethernet.
- 9.7 Describe the features, functions and components of the 10 Gigabit Ethernet.
- 9.8 Define “differential mode delay.”

10.0 Fiber Distribution Data Interface (FDDI)

- 10.1 Detail the evolution of FDDI.
- 10.2 Define the FDDI specifications.
- 10.3 Describe the functionality and different component configuration options of a FDDI network.
- 10.4 Describe FDDI network design guidelines.

11.0 Fibre Channel

- 11.1. Explain Fibre Channel technology as a computer communications protocol.
- 11.2 Define the different applications and technologies that Fibre Channel supports.
- 11.3 Describe the different physical cabling topologies of a Fibre Channel network.
- 11.4 Describe the features, scalability and components of a Fibre Channel network.
- 11.5 Identify management and configuration options of Fibre Channel structure.

12.0 Asynchronous Transfer Mode (ATM)

- 12.1 Define Asynchronous Transfer Mode (ATM).
- 12.2 Describe how an ATM works on a connection oriented process.
- 12.3 Describe the optical specifications of an ATM network.
- 12.4 Describe the different types of switches that are used with an ATM network.
- 12.5 Describe the components, topologies and characteristics of an ATM network.

13.0 Voice Networks

- 13.1 Describe the evolution of voice networks.
- 13.2 Delineate the transmission process involved in voice communication, both analog and digital.
- 13.3 Describe the different multiplexing techniques used in a voice network.
- 13.4 Define the basic design rules of voice technologies that apply to a voice network design.

14.0 Video

- 14.1 Introduce the history of video standards.
- 14.2 Describe the three predominant methods of encoding a video signal.
- 14.3 Describe the encoding methods best suited for multichannel transmission of analog signals.
- 14.4 Explain how the conversion of analog inputs to digital values allows for digital video transmission over optical fiber.

15.0 Network Cabling Design

- 15.1 Define the network cabling design goals.
- 15.2 Analyze the network environment to properly design the network cabling system.
- 15.3 Compare and contrast the different structured cabling designs.
- 15.4 Detail the physical pathway routing requirements and limitations to lay out a network.
- 15.5 Compare and contrast the functionality and major differences between the various physical topologies involved in network cabling design.
- 15.6 Describe how to segment networks into physical zones.
- 15.7 Relate the differences between distributed vs. centralized cabling design concepts.
- 15.8 Explain the importance of system redundancy.

16.0 Data Center Design

- 16.1 Describe the benefits, features, and functions of a data center.
- 16.2 Describe the various functional areas of data centers.
- 16.3 Compare and contrast the functionality and major differences between the various network protocols used in data center designs.
- 16.4 Compare and contrast the different physical cabling solutions and connectivity requirements for data centers.

17.0 Cross Connect Design

- 17.1 Explain that a cross connection is the termination point of a system.
- 17.2 Describe the numerous factors, which will affect how to terminate a cross connection design.
- 17.3 Identify the strategy or process used to layout a cross connector design.
- 17.4 Define the basic rules of fiber jumper management.

18.0 Cable Support System Design

- 18.1 Define the role of a cable support system.
- 18.2 Identify management and configuration options for cable support system design.
- 18.3 Identify the various hardware management support systems in cabling design.
- 18.4 Describe a ladder rack system.
- 18.5 Describe a raised floor ladder system.
- 18.6 Describe an overhead ladder rack support system.
- 18.7 Describe the proper methods for cable routing in a cable support system design.
- 18.8 Specify the mounting methods involved in channel, raceway, and cable tray installations.
- 18.9 Define the design specifications and construction practice within and between buildings, which are in support of telecommunications media, and equipment.

19.0 Internetworking

- 19.1 Compare and contrast characteristics of internetworking physical media.
- 19.2 Describe the role of a repeater in the network.
- 19.3 Describe the role of a hub in the network.
- 19.4 Describe the role of a bridge in the network.
- 19.5 Describe the role of a switch in the network.
- 19.6 Describe the role of a router in the network.
- 19.7 Identify differences between switched and routed network design considerations.

20.0 Logical Network Topologies

- 20.1 Define a logical topology.
- 20.2 Describe logical ring network topology.
- 20.3 Describe logical star network topology.
- 20.4 Describe logical mesh network topology.

21.0 Designing a Full Service Network

- 21.1 List the five major steps in designing a full service network.
- 21.2 Describe how to examine physical plant layout when designing a full service network.
- 21.3 Describe how to determine customer requirements when designing a full service network.
- 21.4 Describe how to determine logical network requirements when designing a full service network.
- 21.5 Describe how to choose physical topology when designing a full service network.
- 21.6 Describe how to determine fiber counts/types when designing a full service network.

- 21.7 Identify the application requirements for a simplex communication network.
- 21.8 Identify the application requirements for a duplex communication network.
- 21.9. Compare and contrast the network design and the fiber counts required to support that network system design.
- 21.10 Explain how electronic integration affects designing a full service network.

22.0 Optical Testing and Measurements

- 22.1 Describe the purpose for testing.
- 22.2 Identify the different types of network testing.
- 22.3 Describe the purpose of bandwidth testing.
- 22.4 Describe the purpose of attenuation testing.
- 22.5 Describe the purpose of Optical Time Domain Reflectometer (OTDR) testing.
- 22.6 Describe the purpose of chromatic dispersion testing.
- 22.7 Define “polarization mode dispersion.”
- 22.8 Describe the purpose of polarization mode dispersion testing.

23.0 Free Space Optics

- 23.1 Define free space wireless applications.
- 23.2 Compare and contrast the advantages and disadvantages of free space optics.

