



## **Chapter 1**

# **Introduction to Outside Plant**

Chapter 1 offers an overview of outside plant (OSP) fundamentals. An introduction to standardization and valuable resources for the OSP designer are also included in this chapter.



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## Introduction to Outside Plant (OSP)

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### Introduction

**WARNING:** Outside plant (OSP) is inherently dangerous. This manual does not address safety issues associated with its use. BICSI® shall not be liable to the purchaser or any other entity with respect to any liability, loss, or damage caused directly or indirectly by the application or use of this manual.

It is the responsibility of the user of this manual to:

- Determine and use the applicable local safety and health practices associated with OSP.
- Determine the applicability of all regulatory agencies.

No project is so important or completion deadline so critical to justify nonconformance with industry codes, standards, and regulations.

### About Outside Plant (OSP)

Telecommunications OSP cabling began with the placement of the first telegraph system, which consisted of wires linking two stations. From this simple beginning, OSP has expanded into a vast global telecommunications infrastructure.

The majority of OSP facilities are designed, installed, and maintained by local access providers (APs) serving specific geographic areas. However, OSP facilities located on private properties or in areas not covered by a local AP become the customer's responsibility. To support the needs of the local APs, many private companies offer OSP design, engineering, and construction services.

In some countries, the AP (the provider of the physical connection) is also the service provider (SP [the provider of the desired service]) and can be the same company.

BICSI defines OSP as the telecommunications infrastructure that is designed and installed externally to buildings and typically routed into an entrance facility (EF).

OSP may include:

- Optical fiber cabling.
- Balanced twisted-pair cabling.
- Coaxial cabling.
- Supporting structures required to link serving facilities to outlying locations and enable voice, data, video, and other low-voltage systems.

The cabling generally required to accommodate LANs or campus area networks can be copper, optical fiber, wireless, or coaxial. Because of the relatively short distance of geographical coverage, these networks are called short haul networks. Conversely, networks required to cover expanded distances (e.g., city to city, country to country) are called wide area networks, known as long haul networks, and generally require optical fiber cable, wireless, or satellite provisioning.

## Outside Plant (OSP) Designer

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### Overview

OSP designers are responsible for designing the interbuilding cabling and EF infrastructure and the termination of the OSP cabling. An OSP designer should have knowledge of:

- Pathways and spaces.
- Cabling (cable and connecting hardware).
- Bonding and grounding (earthing).
- Right-of-way (R/W).
- System documentation.
- Applicable codes and standards.

Advances in technology and high levels of technical expertise in all aspects of the information and communications technology (ICT) industry have increased the importance of training. Based on current standards for OSP network design, the methodology presented in this manual provides a useful reference for those seeking design assistance or training.

### Professional Development

Keeping up with professional developments requires an OSP designer's commitment. A competent OSP designer must possess both management and business skills to be able to monitor the design and construction of an OSP project. To stay current, an OSP designer should take advantage of:

- Industry-related organizations—The OSP designer should maintain a membership or certification in one or more industry-related organizations. More information on these organizations is included in Appendix A: Codes, Standards, Regulations, and Organizations.
- Internet—Online research is a valuable source of real-time information. An OSP designer can research topics of particular interest and sign up for online services that periodically send updated information by e-mail.
- Continuing education—OSP designers can take advantage of continuing education training courses to stay up-to-date or to expand their knowledge of the ICT industry.
- Meetings and conferences—Attending professional meetings and conferences is a valuable networking tool that allows an OSP designer to learn about the latest changes in the industry and to meet others with the same concerns.
- Governmental regulations—Various levels of governmental regulations may affect the OSP designer's work. Reading articles in periodicals or accessing government websites is necessary for legal compliance.

By understanding all of the available options, an OSP designer can provide customers with the optimum systems available.

# Standardization

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## Overview

OSP networks may differ because of:

- Topography.
- Climate.
- Choice of cabling.
- Economics.
- Local code requirements.
- Network functionality.
- Current and future types of supported equipment.
- Customer requirements.

The specifics of telecommunications infrastructure may be unique; however, overall OSP network components and the methods used to complete and maintain installations are relatively standard. Standardizing cabling installations is necessary to ensure successful performance of increasingly complex arrangements.

Standards are beneficial because they:

- Promote design and installation consistency.
- Impose conformance to physical and transmission line requirements.
- Provide a structured telecommunications facility that enables efficient system expansion and other changes.
- Provide for uniform documentation.

Standardization also allows for interoperability and compatibility of materials and products from various vendors so that an installation not only meets or exceeds the applicable standards, but also does so in a cost-optimized and efficient manner. The overall effect of standardization is to support current and future needs and reduce the risk of obsolescence.

## Codes, Standards, and Methodology

Building codes and standards regulate construction in most of the world and encompass most aspects of the construction industry. Their purpose is to protect life, health, and property.

Installation methods, materials, and electrical products must conform to local code requirements. In order to do this, codes are normally enforced by a local authority having jurisdiction (AHJ).

## **Codes, Standards, and Methodology, continued**

While codes address minimum safety requirements, standards are intended to ensure system performance by providing installation requirements and guidelines.

In general, standards are established as a basis to compare, measure, or judge:

- Capacity.
- Quantity.
- Content.
- Extent.
- Value.
- Quality.

Independent organizations specialize in establishing, certifying, and maintaining these codes and standards.

Methodology is the implementation of practices and procedures employed within a particular industry. Design manuals are examples of methodology.

## **Planning**

Planning the construction of an OSP network may require:

- Completing a needs assessment.
- Determining the capacity of an existing network.
- Calculating transmission requirements.
- Coordinating with APs, AHJs, and utilities.
- Ensuring compliance with safety regulations and practices.
- Determining the need for R/W.
- Selecting the physical topology.
- Selecting a route.
- Selecting the desired cable type.
- Preparing and sending a request for information and evaluating the responses.



## Project Documentation

After making planning decisions, construction drawings and specifications must be generated.

They typically consist of:

- A plan view of the area showing obstacles, control points, and other utilities.
- Notification of known hazardous conditions.
- Measurements for facility placement.
- R/W limits.
- Support structures, including:
  - Conduit sizes and profile views of proposed routing.
  - Maintenance holes (MHs).
  - Handholes (HHs).
  - Poles, support strands, and guying information.
- Media, including:
  - Cable sizes, types, and gauges.
  - Cable identification and pair/strand counts.
  - Direction of cable placement.
  - Reel identifications for cables.
- Protection, including:
  - Overvoltage and overcurrent protection systems.
  - Bonding and grounding (earthing) plans.

## Right-of-Way (R/W)

If an OSP network is going to extend beyond the property owned or controlled by the customer:

- Leased lines from the AP may be obtainable.
- A franchise may be purchased.
- The need for R/W arises.

To continue an OSP network outside the boundaries of a customer's property, the customer must either buy the strip of land or obtain written permission:

- To attach to a utility provider's pole line.
- To use a utility provider's conduit.
- From the AHJ to use public R/W or other AP or utility easements.
- From private parties to use their land.

## **Pathways and Spaces**

The basic types of OSP pathways and spaces are:

- Underground.
- Direct-buried.
- Aerial.

Underground pathways and spaces may consist of:

- Conduit.
- MHs.
- HHs.
- Utility tunnels.
- Pedestals and cabinets.
- Vaults.

Direct-buried pathways and spaces may consist of:

- Trenches for direct-buried cable.
- Pedestals and cabinets.

Aerial pathways and spaces may consist of:

- Poles.
- Support strands/messengers.
- Anchors.
- Guys.

All of these pathways and spaces may be involved when installing wireless components (e.g., towers, masts, support structures).

## **Cabling**

Cable selection depends on the customer's needs. OSP cabling can consist of one or more of:

- Optical fiber cable.
- Balanced twisted-pair cable.
- Coaxial cable.

Similar to pathways and spaces, OSP cables are specifically designed for:

- Underground installation.
- Direct-buried installation.
- Aerial (e.g., lashed, self-supporting) installation.