



In Building Public Safety Glossary Terms

**Absorption (Fiber Optic):** The process where light signal energy is converted into heat as it travels through the optical fiber, due to interaction with the material's atoms or impurities, leading to signal loss. (edited)

**Absorption (RF):** The loss of power in radio frequency (RF) signals as they pass through materials or across transmission media, which results in the diminution of the signal strength. (edited)

**Acceptance Test:** A formal testing process to determine if a system or component satisfies its specified requirements and criteria, marking it as acceptable for operational use

**Active Component:** An electronic component that requires a source of energy to operate and can introduce gain or switch signals in a circuit, such as amplifiers, transistors, or integrated circuits.

**Active DAS System (Distributed Antenna System):** A network of spatially separated antenna nodes connected to a common source via a transport medium that provides wireless service within a geographic area or structure, amplified by active electronic components.

**Active RF Emitting Device:** A device that actively transmits radio frequency (RF) signals, such as a transmitter, cellular base station, or any device that can generate and emit RF energy as part of its intended operation.

**Amplitude (RF):** The maximum extent of a vibration or oscillation, measured from the position of equilibrium, in an RF signal, representing the signal's strength or power.

**Analog Public Safety Radio System:** A traditional radio system that uses analog signals for communication among emergency services, such as police, fire, and emergency medical services, allowing direct voice communication.

**Annunciator Panel:** A panel displaying a set of indicators that inform the status of a system, such as a fire alarm system, showing the location of

alarms, faults, or other relevant information in building security and safety systems.

**Antenna:** A device made of conductive material that radiates or receives electromagnetic waves, translating electrical signals into RF waves or vice versa, used in broadcasting and receiving radio, television, and other signals.

**APCO (Association of Public-Safety Communications Officials):** An international organization that provides support, resources, and advocacy for public safety communications professionals, including standards development for emergency communications.

**Attenuation (RF):** The reduction in strength of a radio frequency (RF) signal as it travels through space or a medium, caused by absorption, reflection, and scattering, leading to signal loss.

**Area of Refuge:** A designated location within a building meant to hold occupants during an emergency when evacuation may not be safe or possible, equipped with emergency communication systems to assist in the coordination of rescue efforts.

**As-Built Drawings:** Detailed drawings created after the completion of a construction project, reflecting all changes made to the original plans during the construction process. These drawings show the building as it was actually built, including modifications, field changes, and exact locations of all elements.

**Authorities Having Jurisdiction (AHJ):** Official bodies or individuals responsible for enforcing codes and standards within a particular jurisdiction. AHJs have the authority to review designs, inspect installations, and approve equipment, ensuring compliance with safety and building codes.

**Authorization to Proceed (ATP):** A formal approval granted by a client or authority, allowing a contractor or project team to begin work on a particular phase of a project. ATP is often required before the commencement of construction or implementation of a specific part of a project.

**Automatic Gain Control (AGC):** A feedback system found in electronic devices, designed to automatically adjust the gain of a signal to maintain the output level constant despite variations in the input signal's amplitude. AGC is widely used in communication devices to ensure consistent signal strength.

**Auxiliary Radio Communication System (ARCS):** A wireless communication system used within buildings to enhance radio signal strength for public safety purposes. ARCS typically includes repeaters, antennas, and other components to ensure reliable communication for emergency responders throughout a building.

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**Backbone Cable (In Code, Formerly Riser Cable):** A type of cable that is used to connect telecommunications rooms, equipment rooms, and entrance facilities within the same building or between buildings. It is designed to handle major network traffic and can include both vertical (riser) and horizontal (backbone) cabling segments.

**Bands (Public Safety Spectrum, USA):** Specific ranges of radio frequencies allocated by regulatory bodies like the Federal Communications Commission (FCC) for use by public safety agencies in the United States. These bands are reserved for communications essential to emergency services, such as police, fire, and emergency medical services.

**Bandwidth:** The range of frequencies within a given band, particularly those used for transmitting a signal. In telecommunications, bandwidth represents the capacity of a connection and is a measure of how much data can be transmitted over a network in a given amount of time, typically measured in megabits per second (Mbps) or gigabits per second (Gbps).

**Baseband Unit (BBU):** A component of mobile network infrastructure that processes baseband signals. The BBU is responsible for communication through radio technology, converting data from the mobile network into a format that can be transmitted or received over the radio interface by the remote radio heads (RRHs).

**Base Station:** A fixed point of communication in a mobile network that serves as a central hub for wireless devices to connect to the network. It consists of radio equipment, including antennas and transceivers, to facilitate wireless communication between users and the network.

**Base Transceiver Station (BTS):** A piece of equipment that facilitates wireless communication between the network and the mobile device. Located in the

base station, the BTS manages the radio interface, including transmitting and receiving radio signals with mobile phones within its vicinity.

**Baseline Uplink Noise Floor Measurement:** The process of measuring the ambient radio frequency (RF) environment in a particular area before introducing new services or equipment. This measurement helps in understanding the background level of RF energy, aiding in the identification of interference sources and in the planning of wireless networks to ensure optimal performance and minimal interference.

**Battery Backup:** A system or device that provides power during a failure or outage of the primary power source. It's essential for maintaining the operation of critical systems, including communication, security, and emergency systems, during power interruptions.

**Bay:** In the context of data centers and telecommunications, a bay refers to a standard unit of space for housing equipment such as servers, network devices, or telecommunications gear. It can also refer to a section within a rack or a frame that holds such equipment.

**Bend Radius:** The minimum radius an optical fiber or cable can be bent without kinking, breaking, or causing significant signal loss. Adhering to the specified bend radius is crucial for maintaining the integrity and performance of the cable.

**BER (Bit Error Rate or Ratio):** A measure of the quality of a digital signal, represented by the ratio of received bits that have been altered due to noise, interference, distortion, or bit synchronization errors, to the total number of transferred bits over a given time period. A lower BER indicates a more accurate and reliable transmission.

**Bi-Directional Amplifier (BDA):** A device that amplifies signals in both directions, used to enhance wireless communication within buildings, tunnels, or other areas where signal strength might be weak. BDAs are critical in public safety communications to ensure reliable connectivity for emergency responders.

**Bill of Materials (BOM):** A comprehensive list detailing the raw materials, assemblies, sub-assemblies, parts, and components, as well as the quantities of each needed to manufacture or repair a product, structure, or installation.

**Booster System:** A system designed to amplify a signal to extend its coverage area or to improve signal strength in areas where reception is poor. Booster systems are often used in telecommunications to enhance cell phone signal strength in buildings, remote areas, or in environments where signal obstruction is an issue.

**Breadcrumb Testing:** A method of testing or troubleshooting where markers (breadcrumbs) are left or recorded at various points in a process or system. This approach helps in identifying the point at which a system or process fails or deviates from expected behavior.

**Broadband BDA (Bi-Directional Amplifier):** A specific type of BDA designed to amplify broadband signals, covering a wide range of frequencies. Broadband BDAs are used to improve the signal strength and quality of broadband communications, including internet and cable services, across large areas or structures.



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**Cable:** A bundle of one or more conductors, typically insulated, used for transmitting electricity or telecommunication signals.

**Cable Run:** The complete path a cable takes from its starting point to its endpoint, including any intermediate connections, pathways, or devices it passes through.

**Cable Tray:** A support system for insulated electrical cables used for power distribution, control, and communication. Cable trays are used to organize cables within a building or structure.

**Category Cable:** A type of twisted pair cable standardized by the Telecommunications Industry Association (TIA) used for Ethernet and other data signal transmissions. Categories range from Cat 3 to Cat 8, with higher numbers supporting higher frequencies and bandwidths.

**Channelized BDA:** A BDA that is designed to amplify specific frequency bands or channels, allowing for selective amplification of signals and reducing interference with other communications.

**Class A and Class B Signal Boosters:** **Class A Signal Booster:** Designed to amplify specific frequency bands with adjustable gain for each band, allowing for fine-tuning and minimizing interference.

**Class B Signal Booster:** Amplifies a broader range of frequencies with a fixed gain, suitable for general coverage improvement but with a higher potential for interference.

**Certificate of Occupancy (CO):** A document issued by a local government agency or building department certifying a building's compliance with applicable building codes and other laws, indicating it is in a condition suitable for occupancy.

**Coax Cable (Coaxial Cable):** A type of electrical cable consisting of a central conductor, insulator, metallic shield, and protective outer layer used for transmitting television, internet, and telephone signals.

**Combiner:** A device used in telecommunications to merge two or more signals into a single output while maintaining the integrity of the individual signals.

**Conduit:** A tube or trough for protecting electric wiring or providing a path for electrical cables in a building or structure.

**Composite Power:** The total power of a transmitted signal, representing the sum of the power of all individual carriers or channels in a multi-frequency system.

**Connector:** A device used to join electrical terminations and create an electrical circuit, allowing for the connection and disconnection of circuit parts.

**Continuous Wave (CW) Testing:** A method of testing the performance and range of wireless communication systems by transmitting a continuous, unmodulated signal at a fixed frequency.

**Coupler:** A device used in telecommunications to divide or combine signals, allowing a portion of the signal to be directed to another circuit.

**Coverage Area:** The geographical area within which a wireless network or telecommunications system can provide adequate signal strength for communication.

**Critical Areas:** Specific locations or environments within a building or infrastructure deemed essential for safety, security, or operational purposes, requiring special attention to communication and power needs.

**Customer Premise Equipment (CPE):** Telecommunications equipment, such as telephones, modems, or routers, located on the customer's premises and connected to the telecommunications provider's network.

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**Dark Fiber** Dark fiber refers to optical fiber infrastructure that is currently in place but not being used. Telecom companies often install more fiber than needed to cater to future demand, leaving some of it "dark" until it is needed. This unused fiber can be leased to other companies who want to establish optical connections without the significant expense of laying new fiber. Dark fiber offers high-capacity bandwidth potential and is beneficial for organizations looking for scalable and flexible network solutions.

**Decibels (dB)** Decibels (dB) are a unit of measurement that expresses the ratio of one value of a physical property to another on a logarithmic scale. In telecommunications and acoustics, dB is commonly used to quantify sound levels and signal strengths. The dB scale is logarithmic, meaning a small change in dB can represent a large change in actual value. This measurement is crucial for assessing and comparing the intensity of sound waves and electronic signals.

**DBc (Decibels over Carrier)** DBc is a unit of measure expressing the ratio of the power of a signal to the power of the carrier signal, in decibels (dB). It's commonly used in telecommunications to describe the power level of an unwanted signal or noise relative to the carrier signal. DBc helps in assessing the purity of the carrier signal and the effectiveness of signal transmission and reception, particularly in the context of interference and signal-to-noise ratios.

**dBm (Decibels per Milliwatt)** dBm is a unit of power expressed in decibels relative to one milliwatt (mW). It is used to quantify signal power level in wireless communications, indicating the absolute power of a signal rather than a ratio. dBm provides a convenient way to express power levels without specifying the power's absolute value in a linear scale, facilitating easier comparison and calculation of signal loss or gain through different components of a telecommunications system.

**Delivered Audio Quality (DAQ)** Delivered Audio Quality (DAQ) is a rating system used to evaluate the audio quality of voice transmissions over communication systems. The DAQ scale ranges from 1 to 5, with:

**DAQ 1:** Unusable, where speech is not understandable.

**DAQ 2:** Poor, where speech is understandable with considerable effort and frequent repetition.

**DAQ 3:** Fair, where speech is understandable without repetition, but effort is required.

**DAQ 4:** Good, where speech is easily understandable, though some noise may be present.

**DAQ 5:** Excellent, where speech sounds clear and natural, akin to face-to-face conversation.

**Design Submittal** Design submittal refers to the comprehensive presentation or delivery of project design documents to a client, contractor, or regulatory body for review, approval, or feedback. This process is critical in construction and engineering projects, ensuring that all aspects of the design meet the required specifications, codes, and standards before proceeding with construction or implementation. It typically includes drawings, specifications, calculations, and other relevant documents.

**Diffraction (Fiber Optic Cable)** In the context of fiber optic cables, diffraction refers to the phenomenon where light waves spread out as they pass through a narrow aperture or around the edge of an obstacle within the fiber. This can affect the propagation of light through the fiber, potentially causing signal loss or dispersion, especially in multimode fibers where the light can take multiple paths. Understanding and managing diffraction effects are crucial for maintaining high signal quality and transmission efficiency in fiber optic communication systems.

**Diffraction (RF)** Diffraction in radio frequency (RF) propagation refers to the bending and spreading of RF waves when they encounter obstacles, such as buildings or terrain features. This phenomenon allows RF signals to reach areas where direct line-of-sight is not possible, enabling communication around obstacles. Diffraction is a critical factor in designing and planning wireless networks, as it affects signal coverage, strength, and reliability.

**Digital Trunked Radio System** A digital trunked radio system is an advanced communication system that uses digital technology and a method known as trunking to provide more efficient use of radio bandwidth and greater flexibility than traditional analog systems. In trunking, multiple users share a pool of channels through an automated system that dynamically allocates channels as needed. This setup is highly efficient, allowing for a large number of users or groups to communicate within a limited spectrum allocation, making it ideal for public safety, emergency services, and commercial operations.

**Directional Coupler** A directional coupler is a device used in RF technology to sample a small portion of the energy from a main transmission path and redirect it to a secondary path. This allows for the measurement of power levels, signal direction, and frequency without interrupting the main signal flow. Directional couplers are essential components in many RF and microwave systems, including antenna distribution systems, where they facilitate signal monitoring and management.

**Distributed Antenna System (DAS)** A Distributed Antenna System (DAS) is a network of spatially separated antenna nodes connected to a common source, designed to provide wireless service within a geographical area or structure.

**Distribution Cable** Distribution cable is a type of cable used in telecommunications and data communications to distribute signals to multiple locations or devices. It is

designed to branch out from a central point, efficiently delivering data, voice, or video signals to various endpoints within a network, such as computer workstations, televisions, or telephones. Distribution cables are essential in structured cabling systems for buildings or campuses, ensuring reliable connectivity across different areas.

**Distribution Antenna** A distribution antenna is part of a distributed antenna system (DAS) or other wireless communication systems, designed to provide signal coverage to a specific area or sector. These antennas are strategically placed throughout a coverage area to ensure uniform signal distribution, reducing dead spots and enhancing communication reliability. Distribution antennas are crucial in large buildings, stadiums, and other areas where ensuring consistent wireless coverage is challenging.

**Divider (Power Divider)** A power divider, also known as a power splitter, is a device used in RF and microwave circuits to divide an incoming signal into two or more output signals of equal or varying power levels. Power dividers are essential in distributing signals to multiple antennas or receivers and are used in a variety of applications, including broadcasting, telecommunications, and radar systems. They ensure that the signal is evenly distributed among the outputs while maintaining the integrity of the signal's phase and amplitude.

**Donor Antenna** A donor antenna is an external antenna used in a repeater or BDA (Bi-Directional Amplifier) system to receive signals from a distant cell tower or base station. It is typically mounted outside or on a high point of a building to capture the best possible signal from the serving cell site. The donor antenna is a critical component in extending wireless coverage to areas with poor or no direct service, acting as a bridge between the remote cell site and the local repeater system.

**Donor Antenna Isolation** Donor antenna isolation refers to the degree of separation between the donor antenna and the internal antennas within a repeater or BDA system, measured in decibels (dB). Adequate isolation is crucial to prevent oscillation and feedback loops within the system, which can degrade performance or even disrupt the cell site's operation. Achieving sufficient donor antenna isolation involves careful placement and orientation of the antennas and may require the use of additional RF shielding or filtering techniques.

**Donor Site** A donor site in wireless communication refers to the cell tower or base station that provides the signal to a repeater, BDA, or DAS system. The donor site acts as the source of RF signals that are then amplified or redistributed to improve coverage in areas with weak or no direct service. The quality of the signal received from the donor site significantly impacts the overall effectiveness of the coverage enhancement system.

**Downlink** The downlink is the portion of a telecommunications link used for transmitting signals from a satellite, cell tower, or base station to a receiver, such as



a satellite dish, mobile phone, or base station antenna. It represents the downstream communication path, delivering data, voice, and video signals to end-users. Downlink performance is crucial for user experience, dictating the quality and speed of received content in wireless communication systems.

**Duplex** Duplex communication refers to the ability to send and receive signals simultaneously or alternately over a communication channel.

**Full Duplex:** A full duplex system allows for simultaneous two-way communication, meaning that both parties can talk and listen at the same time, as in a telephone conversation. This is achieved through separate paths for transmission and reception or sophisticated signal processing techniques.

**Half Duplex:** A half duplex system permits two-way communication but not simultaneously; one party can talk or send data at a time, while the other listens or receives. Walkie-talkies are a common example of half duplex communication, where the "push to talk" function activates the transmission mode, and releasing the button switches it back to receive mode.

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**Effective Radiated Power (ERP)** Effective Radiated Power (ERP) is the measure of the total power radiated by an antenna in a specific direction, taking into account the antenna's gain relative to a reference antenna, usually a half-wave dipole. ERP is a critical parameter in broadcasting and telecommunications, as it indicates the actual power transmitted towards the receiver, considering both the transmitter's output power and the antenna's ability to focus the energy in a given direction. ERP helps in assessing and planning the coverage area of a radio transmitter or television station, ensuring compliance with regulatory limits and optimizing signal reach and quality.

**EMS** EMS stands for Emergency Medical Services, a critical public health and safety service dedicated to providing acute medical care, transport to healthcare facilities, and other medical services to patients with illnesses or injuries requiring immediate attention. EMS professionals, including paramedics and emergency medical technicians (EMTs), are trained to respond quickly to emergency situations, offering life-saving interventions and stabilizing patients for transport to definitive care facilities.

**EMT** EMT stands for Emergency Medical Technician, a type of EMS (Emergency Medical Services) professional trained to provide basic emergency medical care and transportation for critical and emergent patients who access the emergency medical system. EMTs are equipped with the skills to assess a patient's condition, perform cardiopulmonary resuscitation (CPR), provide oxygen therapy, administer glucose for diabetics, and manage trauma-related emergencies, among other preliminary medical procedures, before hospital admission.

**Enclosure** An enclosure in the context of electronic and telecommunications equipment refers to a cabinet or case designed to protect its contents from environmental factors and unauthorized access. Enclosures are used to house routers, switches, wiring, and other sensitive components, ensuring they remain safe from dust, moisture, and mechanical damage. They can range from simple plastic cases for consumer electronics to robust, weatherproof cabinets for outdoor telecommunications infrastructure. Proper enclosure design is crucial for maintaining the reliability and longevity of the equipment it protects.

**ERCES** ERCES stands for Emergency Responder Communication Enhancement System, a system designed to improve wireless communication capabilities within buildings for first responders such as firefighters, police officers, and EMS personnel. These systems, which can include Distributed Antenna Systems (DAS), bi-directional amplifiers (BDAs), and other signal boosters, ensure that emergency personnel can maintain communication with each other and with external command centers, even in challenging environments like high-rise buildings, underground facilities, or in areas where building materials impede radio signals.

**ERRCS** ERRCS stands for Emergency Responder Radio Communication System, similar to ERCES, it's a system installed in buildings to ensure reliable two-way

communication for emergency responders in the building and between those inside the building and those outside. ERRCS are critical in large structures where the construction materials can block or degrade radio signals, making it difficult for first responders to communicate effectively during emergencies. These systems are typically mandated by local or national building codes to ensure public safety and effective emergency response.

**Express Consent (FCC)** Express consent, as defined by the Federal Communications Commission (FCC), refers to a situation where an individual or entity explicitly agrees to receive certain types of communications, such as telemarketing calls, prerecorded messages, or text messages, from a specific sender. This consent must be given directly by the individual or entity, either in written form, including electronic authorization, or orally. Express consent is a crucial concept in telecommunications regulation, particularly in the context of consumer protection laws like the Telephone Consumer Protection Act (TCPA), ensuring individuals have control over the communications they receive.

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**Fiber Optic Cable** A fiber optic cable is a network cable that contains strands of glass fibers inside an insulated casing. These cables are designed for long-distance, high-performance data networking, and telecommunications. Fiber optic cables support much of the world's internet, cable television, and telephone systems. They offer significant advantages over traditional metal wire cables, including higher bandwidth capacity, lower attenuation, and immunity to electromagnetic interference, enabling faster data transmission over longer distances without degradation.

**Filter** In telecommunications and electronics, a filter is a device or process that removes from a signal some unwanted component or feature. Filters are essential in a wide range of applications, including audio electronics, radio communications, and broadcasting. They can selectively pass frequencies within a certain range and attenuate others, helping to improve the clarity and quality of the signal by eliminating interference or noise.

**Fire Alarm Control Panel (FACP)** The Fire Alarm Control Panel (FACP) is the central hub of a fire alarm system, responsible for monitoring and managing all the system's components, including detectors, manual call points, and notification devices. When the system detects a fire or smoke condition, the FACP activates alarms to alert occupants and may also initiate other actions, such as closing fire doors or activating suppression systems. The FACP displays the status of the fire alarm system, provides controls for managing the system, and facilitates communication with emergency response teams.

**Fire Command Center** A Fire Command Center is a dedicated space within a building where building control systems and emergency communication devices are centralized to assist first responders during emergencies. It typically includes access to the fire alarm control panel, building plans, emergency communication systems, and other critical building systems. The Fire Command Center serves as an operational point for coordinating firefighting and rescue operations, ensuring a rapid and organized response to emergencies.

**Fire Code Official** A fire code official is a person or authority responsible for enforcing fire safety codes and regulations within a jurisdiction. Their duties include inspecting buildings for fire hazards, reviewing and approving building plans for compliance with fire safety standards, and issuing permits for activities related to fire safety. Fire code officials play a crucial role in preventing fire incidents and ensuring the safety of buildings and their occupants.

**Fire Damper** A fire damper is a device installed in ducts and air transfer openings designed to close automatically upon detection of heat, to prevent the spread of fire and smoke through the building's HVAC (Heating, Ventilation, and Air Conditioning) system. Fire dampers are critical components of a building's passive fire protection system, helping to compartmentalize and contain fires within a limited area.

**Fire Rating** Fire rating refers to the classification of a building material or component based on its fire resistance, typically measured in hours. The rating indicates how long a material or assembly (such as a wall, door, or ceiling) can withstand exposure to fire before it fails to meet specific performance criteria. Fire ratings are essential for ensuring that buildings are constructed with materials that provide adequate protection against the spread of fire and smoke.

**Firestop** A firestop is a fire protection system made of various components used to seal openings and joints in fire-resistance rated wall or floor assemblies. Firestops are designed to prevent the spread of fire and smoke by filling the gaps with fire-resistant materials. They play a crucial role in maintaining the integrity of fire barriers and ensuring the safety of buildings and their occupants.

**FirstNet** FirstNet stands for the First Responder Network Authority, an independent authority within the U.S. Department of Commerce. It was established to develop, build, and operate a nationwide, broadband network specifically for first responders. FirstNet aims to provide a single, interoperable platform for emergency and daily public safety communications, offering secure and reliable connectivity to support first responders in their mission to save lives and protect communities.

**First Responder** First responders are individuals who are among the first to arrive and provide assistance at the scene of an emergency, such as an accident, natural disaster, or terrorist attack. This group includes professionals such as firefighters, police officers, emergency medical technicians (EMTs), and paramedics. First responders are trained to offer critical services, including medical care, rescue operations, and ensuring public safety in the immediate aftermath of an incident.

**Flexible Metal Conduit (FMC)** Flexible Metal Conduit (FMC) is a type of conduit used in electrical wiring installations, characterized by its flexible metal construction. FMC is used to protect and route electrical wiring in locations where rigid conduit would be difficult to install or where flexibility is required for movement or vibration. FMC provides a reliable means of protecting electrical wires from damage, interference, and exposure to potentially hazardous conditions.

**Frequency License Holder** A frequency license holder is an entity that has been granted the rights by a regulatory authority (such as the FCC in the United States) to use a specific portion of the radio frequency spectrum for a particular purpose, such as broadcasting, telecommunications, or satellite communications. Holding a frequency license means the entity has the exclusive right to operate within that frequency band in a designated area, subject to compliance with regulations and conditions set by the licensing authority to prevent interference with other spectrum users and ensure efficient use of the spectrum.

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**Gain (RF)** Gain, in the context of RF (Radio Frequency) engineering, refers to the ability of an antenna or an electronic circuit, such as an amplifier, to increase the power or amplitude of a signal. It is usually measured in decibels (dB) and indicates the effectiveness of the device in enhancing the signal strength. A positive gain means that the output signal is stronger than the input signal, which is crucial for improving the reach and quality of wireless communications.

**General Radiotelephone Operator License (GROL)** The General Radiotelephone Operator License (GROL) is a license issued by the Federal Communications Commission (FCC) in the United States. It is required for individuals who adjust, maintain, or internally repair FCC licensed radiotelephone transmitters in the aviation, maritime, and international fixed public radio services. The GROL is evidence of the holder's proficiency in the basic theory and regulations governing radio communications.

**Grid Test** A grid test is a method used in wireless communications to map and measure signal strength and quality across a specific area or building. The area is divided into a grid of evenly spaced points, and signal measurements are taken at each point to assess the coverage and performance of the network. Grid tests help identify areas of weak signal and interference, aiding in the optimization of antenna placement and network settings.

**Grounding and Bonding** Grounding and bonding are essential safety practices in electrical and telecommunication systems. Grounding involves connecting electrical equipment to the ground to prevent undesired voltage on non-current-carrying metal parts from causing shock hazards. Bonding connects electrical conductive parts together to ensure they have the same electrical potential, thus preventing electrical shock or damage from potential differences. Both practices are crucial for protecting equipment and personnel from electrical faults.

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**Hard Lid Ceilings, Hard Ceilings, Hard Cap Ceilings** **Hard Lid Ceilings:** This term generally refers to ceilings made of rigid materials, such as plaster or drywall, as opposed to drop or suspended ceilings. They provide a permanent, non-accessible finish to the ceiling area.

**Hard Ceilings:** Similar to hard lid ceilings, hard ceilings are constructed from materials like concrete, plaster, or gypsum board, offering a solid barrier without the flexibility for easy access to the space above for cabling or maintenance.

**Hard Cap Ceilings:** This term is often used interchangeably with hard lid and hard ceilings, emphasizing the solid, impenetrable nature of the ceiling structure. These ceilings do not allow for easy access to facilities such as ductwork or wiring once installed.

**Head End (DAS Head End)** The head end in a Distributed Antenna System (DAS) refers to the central component that receives, processes, and redistributes the incoming signal to multiple antennas spread throughout a building or area. It typically includes signal sources, amplifiers, and combiners that work together to ensure consistent and strong wireless coverage across the entire DAS network. The head end is crucial for managing and amplifying signals before they are transmitted by the distributed antennas.

**Hybrid Coupler** A hybrid coupler is a four-port device used in RF and microwave circuits to split an input signal into two output signals with a specific phase relationship and equal amplitude, or to combine two signals while maintaining high isolation between the ports. Hybrid couplers are used in various applications, including balancing amplifiers, measuring reflected power, and feeding antenna arrays to create specific radiation patterns. They are valued for their ability to maintain signal integrity across a broad range of frequencies.

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**Initial In-Building Coverage Assessment** An initial in-building coverage assessment is the first step in evaluating the quality and strength of wireless communication signals within a building. This assessment involves measuring signal levels, identifying areas of weak coverage, and detecting sources of interference. The goal is to understand the existing coverage conditions to design or improve a wireless communication system, such as a Distributed Antenna System (DAS), to ensure reliable connectivity throughout the facility.

**IAFC** IAFC stands for the International Association of Fire Chiefs, an organization that represents the leadership of firefighters and emergency responders worldwide. The IAFC provides training, leadership, and advocacy to support fire and emergency service leaders in their efforts to protect lives and property. It plays a significant role in developing standards and policies for fire prevention, emergency services, and public safety.

**IBC** IBC stands for the International Building Code, a model building code developed by the International Code Council (ICC). It provides comprehensive regulations covering all aspects of building design and construction, including structural integrity, fire safety, accessibility, and energy efficiency. The IBC is adopted by many jurisdictions worldwide to ensure that buildings are safe, healthy, and accessible for all occupants.

**ICC** ICC stands for the International Code Council, an organization dedicated to developing model codes and standards used in the design, build, and compliance process to construct safe, sustainable, affordable, and resilient structures. The ICC publishes the International Building Code (IBC), International Fire Code (IFC), and other related codes that govern commercial and residential construction.

**IFC** IFC stands for the International Fire Code, a model code that addresses fire prevention, fire protection, life safety, and safe storage and use of hazardous materials in new and existing buildings, facilities, and processes. Published by the International Code Council (ICC), the IFC provides guidelines to protect public health and safety from fire and explosion hazards.

**Interference (Radio Frequency Interference or RFI)** Radio Frequency Interference (RFI) is any unwanted radio frequency signal that disrupts or degrades the performance of a wireless communication system. RFI can be caused by a wide range of sources, including electronic devices, power lines, and even natural phenomena like lightning. It can interfere with the reception of desired signals, leading to poor communication quality, data errors, and loss of signal.

**Intermodulation (Intermod)** Intermodulation, or intermod, refers to the phenomenon where two or more signals mix together within a nonlinear device or medium, creating additional, unwanted frequencies that are combinations of the original frequencies. These intermodulation products can cause interference and

degrade the performance of wireless communication systems, especially in environments with many strong RF signals.

**Interoperability (Public Safety)** In the context of public safety, interoperability refers to the ability of emergency response agencies and services (such as police, fire, and EMS) to communicate with each other across different communication systems and equipment. Interoperability is crucial during emergencies and disasters to coordinate response efforts effectively, share critical information, and ensure the safety of both the public and first responders.

**Isolation (RF)** Isolation in RF systems refers to the degree to which two or more circuits or components are electrically separated from each other, preventing unwanted interaction or interference between them. In the context of antennas and signal distribution systems, isolation is crucial to minimize interference and ensure that multiple signals can coexist without degrading each other's quality. High isolation is essential in systems like repeaters, duplexers, and distributed antenna systems (DAS) to maintain clear communication channels.

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**Jurisdiction** In the context of public safety and building regulations, "jurisdiction" refers to the authority granted to a governmental body or agency to enact and enforce laws, codes, and regulations within a specific geographic area. This authority covers a wide range of activities, including building construction and modifications, fire safety, emergency services, and telecommunications infrastructure. Jurisdictions are typically defined by political boundaries, such as cities, counties, states, or provinces, and each may adopt and enforce its own set of codes and standards (e.g., building codes, fire codes). In the United States, for example, jurisdictions might adopt versions of the International Building Code (IBC) or the National Fire Protection Association (NFPA) standards, potentially with local amendments, to regulate various aspects of construction and public safety. The concept of jurisdiction is critical in the planning and implementation of in-building public safety communication systems, such as Distributed Antenna Systems (DAS) for emergency responder radio coverage. Building owners and project teams must work within the jurisdiction's regulatory framework to obtain necessary permits, pass inspections, and ensure compliance with local codes to enhance public safety and emergency response capabilities within their buildings.



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**Land Mobile Radio (LMR), Private Land Mobile Radio (PLMR), Land Mobile Radio Systems (LMRS)** Land Mobile Radio (LMR) systems are wireless communication systems intended for use by terrestrial users in vehicles (mobiles) or on foot (portables). These systems are commonly used by emergency services (police, fire, and ambulance), public utilities, and businesses for operational communications. Private Land Mobile Radio (PLMR) systems refer specifically to those LMR systems that are used by private organizations or individuals, as opposed to public or government entities. Land Mobile Radio Systems (LMRS) encompass both public and private systems and include a variety of technologies, frequencies, and operational uses, typically providing two-way communication capabilities.

**Leaky Coax** Leaky coax or leaky feeder is a type of coaxial cable designed with intentional gaps or perforations in its outer conductor to allow the cable to function as a long antenna, providing radio coverage in confined areas like tunnels, subways, and large building interiors. This design enables the cable to emit and receive radio waves along its length, making it useful for establishing communication links in challenging RF environments.

**Licensee** In the context of radio and wireless communications, a licensee is an individual or entity that has been granted the legal authority by a regulatory body (such as the FCC in the United States) to operate a radio station or use a segment of the radio spectrum. Licensees must comply with specific regulations and standards, including operating within their assigned frequencies and adhering to power limits to prevent interference with other spectrum users.

**Lightning Protection** Lightning protection refers to the systems and measures designed to protect buildings and electrical systems from the damaging effects of lightning strikes. This includes the use of lightning rods (air terminals), conductors, and ground electrodes to safely redirect the electrical energy from a lightning strike into the ground, thereby preventing injury, fires, or damage to electrical equipment and structures.

**Link Budget** A link budget is a calculation used in telecommunications engineering to account for all gains and losses a signal experiences as it travels from the transmitter to the receiver. This includes the transmitter's output power, gains from antennas, losses due to propagation, and any losses or gains from intermediate components like cables and amplifiers. The link budget helps in designing and assessing the performance of communication systems, ensuring adequate signal strength for reliable connectivity.

**Listed** In the context of building materials and equipment, "listed" refers to products that have been tested and certified by a recognized testing laboratory (such as UL, Underwriters Laboratories) to meet specific safety standards. Listed products are considered to comply with the necessary requirements for a particular application, providing assurance of their safety and reliability. **Low-E Glass** Low-emissivity (Low-E) glass is a type of energy-efficient window glass that has been

coated with a thin metallic layer. This coating reflects thermal radiation, helping to keep heat inside during the winter and outside during the summer, thereby reducing energy costs and improving comfort. However, Low-E glass can also attenuate radio signals, which may impact the performance of in-building wireless communication systems.

**LTE** LTE, or Long-Term Evolution, is a standard for wireless broadband communication for mobile devices and data terminals. It is based on the GSM/EDGE and UMTS/HSPA technologies, providing increased capacity and speed using a different radio interface and core network improvements. LTE is commonly referred to as 4G LTE, offering faster download and upload speeds compared to previous 3G technologies, and it supports multimedia streaming, web access, voice, and video calls with improved quality and reliability.

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M

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**MIMO - Multiple Input Multiple Output** MIMO stands for Multiple Input Multiple Output, a wireless technology used to increase the capacity and reliability of radio communications. It involves using multiple antennas at both the transmitter and receiver to improve communication performance. MIMO technology enables the transmission of more than one data signal simultaneously over the same radio channel, leveraging multipath propagation to enhance signal strength and data rates. This technology is a fundamental element of modern wireless communication standards, including Wi-Fi (802.11n/ac/ax), LTE, and 5G networks, significantly increasing their efficiency and throughput.

**Mission Critical Push to Talk (MCPTT)** Mission Critical Push to Talk (MCPTT) is a standard for secure and reliable voice communication designed specifically for first responders and public safety organizations. It allows users to instantly communicate with a single push of a button, ensuring immediate voice transmission over cellular networks that meet the performance and reliability requirements for mission-critical communications. MCPTT is defined in the 3GPP standards (starting from Release 13) and is designed to work over LTE and 5G networks, offering features such as group calling, priority and pre-emption, and end-to-end encryption.

**Model Code** Model codes are standardized sets of guidelines, regulations, and best practices developed to ensure safety, efficiency, and reliability in various industries, including building construction, fire safety, and telecommunications. These codes serve as models for local, regional, or national authorities to adopt and enforce within their jurisdictions. Examples include the International Building Code (IBC), National Electrical Code (NEC), and NFPA codes. Model codes are regularly updated to reflect new technologies, materials, and safety research findings.

**Mobile to Mobile** Mobile to mobile communication refers to direct communication between two mobile devices. This can involve voice calls, text messages, or data transmission over cellular networks without the need for intermediate fixed

network infrastructure. In the context of LMR and public safety communications, mobile to mobile can also refer to direct mode operation (DMO) or talk-around, where users can communicate radio to radio, independently of a network or base station

**Multi-Carrier DAS** A Multi-Carrier Distributed Antenna System (DAS) is a network of spatially separated antenna nodes connected to a common source, designed to provide wireless service within a geographic area or structure. A multi-carrier DAS supports multiple wireless carriers or service providers, allowing them to share a common infrastructure to deliver their services. This approach is efficient for providing comprehensive coverage and capacity within large buildings, stadiums, and campuses, supporting a wide range of frequencies and technologies (e.g., LTE, 5G).

**Multimeter** A multimeter is an electronic measuring instrument that combines several measurement functions in one unit. It can measure voltage, current, and resistance, and more advanced models can measure capacitance, continuity, frequency, and temperature. Multimeters are essential tools for electricians, technicians, and engineers for troubleshooting and testing electrical circuits and devices.

**Multipath** Multipath refers to the phenomenon where radio frequency (RF) signals reach the receiving antenna by two or more paths. This occurs due to the reflection, diffraction, and scattering of signals as they encounter obstacles like buildings, trees, and terrain. While multipath can cause interference and signal degradation in some wireless communication systems, leading to fading and reduced signal quality, it is exploited in MIMO technology to increase signal robustness and throughput by transmitting multiple, separate streams of data simultaneously over the same channel.



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N

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**Narrowband** Narrowband refers to communication channels that use a relatively narrow band of frequencies. This technology is in contrast to wideband, which uses a broader range of frequencies. Narrowband is designed to conserve bandwidth and allow more channels to exist in the same frequency spectrum. It's particularly used in radio and telecommunication technologies, including cellular and land mobile radio systems, where spectrum efficiency is crucial. Narrowband systems are capable of providing reliable communication with lower data rates, which is particularly useful for voice communications and low-data-rate wireless applications.

**National Institute for Certification in Engineering Technologies (NICET)** The National Institute for Certification in Engineering Technologies (NICET) is a non-profit organization that offers certification programs for engineering technicians and technologists in various fields, including electrical, mechanical, construction, and fire protection. NICET certification is recognized throughout the industry and is often required by employers and government agencies to ensure that technicians have met specific standards of proficiency and knowledge in their specialty areas.

**National Public Safety Broadband Network (NPSBN)** The National Public Safety Broadband Network (NPSBN) is a wireless broadband network being developed in the United States to provide first responders and public safety agencies with a dedicated, reliable, and secure communication system. The NPSBN aims to improve interoperability and communication capabilities during emergencies and day-to-day operations. FirstNet, an independent authority within the National Telecommunications and Information Administration (NTIA), has been tasked with the deployment and operation of the NPSBN.

**Nationally Recognized Testing Laboratory (NRTL)** A Nationally Recognized Testing Laboratory (NRTL) is an independent laboratory recognized by the Occupational Safety and Health Administration (OSHA) to test and certify products to ensure they meet specific safety standards. Products that have been tested and certified by an NRTL are deemed to comply with the relevant safety standards for their use in the workplace. NRTLs play a critical role in consumer and worker safety by ensuring that a wide range of equipment, from electrical devices to protective gear, meets established safety criteria.

**NEC (National Electrical Code)** The National Electrical Code (NEC), or NFPA 70, is a widely adopted standard for the safe installation of electrical wiring and equipment in the United States. Published by the National Fire Protection Association (NFPA), the NEC covers the installation of electrical conductors, equipment, and raceways; signaling and communications conductors, equipment, and raceways; and optical fiber cables and raceways in commercial, residential, and industrial premises. The NEC is updated every three years to reflect the latest in electrical safety, technology, and knowledge.

**NEMA (National Electrical Manufacturers Association)** The National Electrical Manufacturers Association (NEMA) is an organization that sets standards for electrical equipment and medical imaging manufacturers. NEMA standards help to ensure the safety, efficiency, and interoperability of electrical products and systems. It covers a wide range of products, including power transmission and distribution equipment, lighting systems, wiring devices, and electrical enclosures.

**NEMA Type 3R** NEMA Type 3R is a designation for enclosures defined by the National Electrical Manufacturers Association to provide protection against falling dirt, rain, sleet, and snow. Type 3R enclosures are typically used for outdoor applications where exposure to the elements is a concern, but they do not need to be waterproof or dustproof. They are suitable for protecting equipment such as switches, panel boards, and other electrical components from weather conditions while allowing for ventilation.

**NEMA Type 4** NEMA Type 4 enclosures are designed by the National Electrical Manufacturers Association to provide protection against the ingress of solid foreign objects (like windblown dust) and water (such as rain, sleet, snow, splashing water, and hose-directed water). These enclosures are constructed for either indoor or outdoor use to protect the enclosed equipment against corrosion, and they offer a degree of protection to personnel against incidental contact with the enclosed equipment.

**NEMA Type 4X** NEMA Type 4X enclosures offer the same protection as NEMA Type 4 enclosures, with the added feature of providing additional protection against corrosion. These enclosures are suitable for both indoor and outdoor applications where equipment might be exposed to harsh environments, including those found in industrial, marine, or coastal areas. The construction materials for Type 4X enclosures often include stainless steel, aluminum, or plastic, all of which offer high resistance to rust and corrosion.

**NENA (National Emergency Number Association)** The National Emergency Number Association (NENA) is an organization focused on 9-1-1 policy, technology, operations, and education issues. NENA's mission is to improve 9-1-1 service and emergency response through leadership in standards development, education, and advocacy. NENA works with public safety, government agencies, technology providers, and telecommunications companies to develop and promote best practices for the implementation and management of 9-1-1 systems.

**Neutral Host and Neutral Host DAS** A Neutral Host refers to an entity that owns or manages telecommunications infrastructure, such as Distributed Antenna Systems (DAS), and allows multiple service providers (carriers) to utilize this infrastructure to offer their services. A Neutral Host DAS is a shared wireless infrastructure within a building or venue that supports multiple wireless carriers. This approach allows for efficient use of space and resources, providing better coverage and capacity for

mobile users, regardless of their service provider, without requiring each carrier to install its own separate infrastructure.

**NFPA (National Fire Protection Association)** The National Fire Protection Association (NFPA) is an international nonprofit organization established to reduce the burden of fire and other hazards on the quality of life by providing and advocating consensus codes and standards, research, training, and education. The NFPA publishes widely adopted codes and standards intended to minimize the possibility and effects of fire and other risks, including the National Electrical Code (NEC) and standards for fire protection, emergency response, and life safety.

**NIOSH (National Institute for Occupational Safety and Health)** The National Institute for Occupational Safety and Health (NIOSH) is the United States federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. NIOSH is part of the Centers for Disease Control and Prevention (CDC) within the U.S. Department of Health and Human Services. The agency covers a wide range of occupational health and safety topics, from chemical hazards to ergonomic risks.

**Noise** In the context of electronics and telecommunications, noise refers to any unwanted electrical signal that interferes with the transmission, reception, or processing of the desired signal. Noise can originate from a variety of sources, both internal and external to the system, including thermal agitation in conductors, electromagnetic interference from other devices, and signal distortion during transmission. High levels of noise can degrade the quality of communication signals and reduce the efficiency of electronic systems.

**Noise Figure** The noise figure is a measure of the degradation of the signal-to-noise ratio (SNR) caused by components in a radio frequency (RF) signal chain. It quantifies the additional noise introduced by a device relative to an ideal noise-free device and is expressed in decibels (dB). The noise figure is a critical parameter in the design and analysis of communication systems, as it affects the overall sensitivity and performance of receivers and other RF systems. A lower noise figure indicates better performance, as it means the device adds less noise to the signal it processes.

**Noise Floor** The noise floor refers to the measure of the signal created from the sum of all the noise sources and unwanted signals within a measurement system, including the background electronic noise present in all electrical devices. In telecommunications, the noise floor is the level below which a signal cannot be isolated from the noise and, therefore, cannot be detected. The noise floor sets a limit on the minimum detectable signal level for communication systems, affecting system sensitivity and performance.

**Noise Power** Noise power is the total power in a system generated by noise sources over a specified bandwidth. It is measured in watts (W) or decibels-milliwatts

(dBm) and is a key parameter in assessing the performance of communication systems. Noise power includes contributions from thermal noise, shot noise, and any other electronic noise present in the system. Understanding noise power is essential for designing systems with adequate signal-to-noise ratios (SNRs) to ensure reliable communication.

**Noise Rise** Noise rise refers to the increase in the noise floor of a system due to additional interference or noise sources. In wireless communication systems, for example, noise rise can result from the introduction of new transmitters within the same frequency band or from increased data traffic. Noise rise can degrade the quality of communication by reducing the clarity and integrity of the received signal, making it more difficult to distinguish the signal from the noise, thus impacting system capacity and performance.

**NPSTC (National Public Safety Telecommunications Council)** The National Public Safety Telecommunications Council (NPSTC) is a federation of organizations dedicated to improving public safety communications and interoperability through collaborative leadership. The NPSTC serves as a common platform for various public safety associations and government agencies to come together and address issues related to wireless communications and interoperability. By developing recommendations, policies, and solutions, NPSTC aims to promote efficient and effective communication systems to support the needs of public safety entities, ensuring that first responders have the reliable communications they require in emergencies.

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**Occupational Safety and Health Administration (OSHA)** The Occupational Safety and Health Administration (OSHA) is an agency of the United States Department of Labor. It was established under the Occupational Safety and Health Act, which was signed into law by President Richard Nixon on December 29, 1970. OSHA's mission is to ensure safe and healthy working conditions for workers by setting and enforcing standards and by providing training, outreach, education, and assistance. OSHA covers most private sector employers and their workers, along with some public sector employers and workers in the 50 states and certain territories and jurisdictions under federal authority.

**Optical Time Domain Reflectometer (OTDR)** An Optical Time Domain Reflectometer (OTDR) is a device used to analyze the integrity of fiber optic cables. It works by injecting a series of light pulses into the fiber and measuring the light that is scattered or reflected back from points along the fiber. The backscattered light is analyzed to identify faults, splices, bends, and other features within the fiber optic cable. The OTDR provides a graphical representation of the fiber's condition over its length, helping to pinpoint issues such as breaks or significant signal losses. This tool is essential for the installation, testing, maintenance, and troubleshooting of fiber optic networks, enabling technicians to verify splice quality, measure length, and locate faults accurately.



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**P25 (Project 25)** P25, or Project 25, is a suite of standards for digital radio communications used by federal, state/province, and local public safety agencies in North America to enable them to communicate with other agencies and mutual aid response teams in emergencies. P25 is designed to ensure interoperability among different public safety agencies' communication equipment, particularly for emergency services. The standards cover digital radio equipment for both land-based and airborne applications, specifying the modulation, voice coding, and digital transmission methods to be used.

**Part 90.219 Rules (FCC)** Part 90.219 of the FCC rules pertains to the use of signal boosters within the Private Land Mobile Radio Services and the Commercial Mobile Radio Services. These rules specify the conditions under which signal boosters can be used, including technical standards and requirements for authorization to ensure that their use does not cause interference with public safety communications or disrupt the normal operation of wireless networks.

**Passband** A passband is the range of frequencies or wavelengths that can pass through a filter or communication channel with minimal attenuation. In telecommunications, the passband is essential because it determines the bandwidth of the channel, which directly impacts the amount of data that can be transmitted over that channel. Filters with a specific passband are used to limit the frequency range of a signal to the desired band, eliminating unwanted frequencies outside this range.

**Passive Component** A passive component in electronics is a component that does not require an external source of energy to perform its function, in contrast to active components like transistors and integrated circuits. Examples of passive components include resistors, capacitors, inductors, and transformers. In telecommunications, passive components are used in various applications, including filters, impedance matching devices, and signal attenuators, without amplifying or actively modifying the signal.

**Passive DAS System** A Passive Distributed Antenna System (DAS) distributes cellular and radio frequency (RF) signals throughout a building or area using a network of antennas, cables, and splitters without active amplification. Passive DAS relies on the external signal strength and uses passive components like coaxial cables, couplers, and antennas to spread the signal. It is typically used in smaller buildings or areas where signal enhancement needs are modest and cost-effective solutions are desired.

**Path Loss Coefficient** The path loss coefficient is a parameter in wireless communications that quantifies the rate at which signal power decreases with distance. It is influenced by various factors, including the frequency of the signal, the characteristics of the transmission medium, and the presence of obstacles or reflectors in the environment. The path loss coefficient is critical for designing wireless networks, as it helps predict the coverage area of a transmitter and the required power levels for reliable communication.

**Pathway Survivability** Pathway survivability refers to the ability of communication system pathways (wiring, cables, and related components) to continue operating in the event of fire, disaster, or other emergencies. It involves using fire-resistant materials, protective enclosures, or redundant pathways to ensure that critical communications, such as those for emergency responder radio coverage systems, remain functional during and after an emergency. Standards and codes, such as those from the National Fire Protection Association (NFPA), often define the required levels of pathway survivability for different types of facilities.

Q

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R

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**Radiating Cable** A radiating cable, also known as a leaky feeder, is a coaxial cable designed to emit and receive radio waves along its length, functioning as a long antenna. This feature makes it especially useful in environments where conventional radio communication is difficult, such as tunnels, mines, large buildings, and underground transport systems. Radiating cables allow for continuous wireless coverage within these challenging environments.

**Radio Licensing Authority** A radio licensing authority is a regulatory body responsible for managing the radio frequency spectrum and issuing licenses to use specific frequencies within a country. This authority ensures that radio frequencies are used efficiently and without harmful interference between different users. Examples include the Federal Communications Commission (FCC) in the United States and the Office of Communications (Ofcom) in the United Kingdom.

**Reflection** In telecommunications, reflection occurs when a radio wave or signal bounces off a surface or object, which can alter the path of the wave. Reflections can cause multipath interference, where a receiver picks up multiple versions of the same signal arriving at different times, potentially causing signal degradation or loss. However, reflection can also be exploited in antenna design and signal propagation strategies to enhance coverage.

**Remote** In the context of telecommunications, "remote" refers to a device or a piece of equipment that operates at a distance from the main system or control unit. It can communicate wirelessly or via wired connections. Remotes are used for controlling, monitoring, or accessing systems from a distance, providing flexibility and extended functionality.

**Repeater** A repeater is an electronic device that receives a weak or low-level signal and retransmits it at a higher level or higher power, so the signal can cover longer distances without degradation. Repeaters are used in communication networks to extend the coverage area of a signal, including radio, television, and cellular communications.

**Return Loss** Return loss is a measure of the effectiveness of power transmission in a communication system, expressed in decibels (dB). It represents the amount of power that is lost to reflections from discontinuities in the transmission path (such as connectors, splices, or mismatches in impedance). A higher return loss indicates less signal reflection and better impedance matching, which is desirable for efficient signal transmission.

**RF (Radio Frequency)** RF stands for Radio Frequency, referring to the range of electromagnetic frequencies used in wireless communication, typically ranging from 3 kHz to 300 GHz. RF technology is utilized in various applications, including television, radio broadcasting, cell phones, satellite communication, and radar.

**RF Characterization** RF characterization involves measuring and analyzing the properties and performance of materials, devices, or systems at radio frequencies. This process includes assessing parameters such as signal strength, bandwidth, noise, and interference, which are critical for designing and optimizing wireless communication systems.

**RF Emitting Device** An RF emitting device is any equipment or apparatus that generates and releases radio frequency energy. This includes a wide range of products, from mobile phones and wireless routers to industrial transmitters and medical devices. RF emitting devices are regulated by national and international standards to ensure they do not cause harmful interference with other devices or pose health risks to users.

**Riser** In telecommunications, a riser is a vertical conduit or space used to route communication cables (such as fiber optic or Ethernet cables) between floors in a building. Risers are essential components of a building's communication infrastructure, providing a pathway for cabling that connects different floors and facilitates network connectivity throughout the structure.

**RSCP (Received Signal Code Power)** RSCP stands for Received Signal Code Power, a measurement used in 3G networks (UMTS) to quantify the signal strength of a specific code channel. RSCP is an essential indicator for assessing the quality of the connection between the mobile device and the base station, influencing handover decisions and overall network performance.

**RSRP (Reference Signal Received Power)** RSRP, or Reference Signal Received Power, is a measurement used in LTE networks to indicate the power level of the LTE reference signals received by a device. It provides a reliable indication of signal strength and is a key metric for determining the quality of the cellular connection, affecting cell selection and handover processes in LTE networks.

**RSSI (Received Signal Strength Indicator)** RSSI, or Received Signal Strength Indicator, is a measurement used in wireless communication to indicate the power level of a received signal. RSSI is measured in decibels relative to a milliwatt (dBm) and is used to estimate how well a device can hear a signal from a specific source, impacting the quality of the communication link and influencing network management decisions such as handover and cell reselection.

S

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**Scattering (Fiber Optic)** In fiber optic communication, scattering refers to the phenomenon where light particles (photons) are dispersed in various directions as they travel through the fiber. This effect can be caused by irregularities and imperfections in the fiber material. Rayleigh scattering, caused by micro-scale variations in the material density, is the most common type of scattering in optical fibers. Scattering results in signal attenuation, limiting the distance over which the optical signal can be effectively transmitted without amplification.

**Scattering (RF)** In radio frequency (RF) communication, scattering occurs when an RF signal encounters irregularities in the transmission medium (such as atmospheric particles, buildings, or terrain features), causing the signal to spread out in different directions. Scattering can lead to signal fading and degradation, especially in environments with obstacles or inhomogeneous atmospheric conditions. However, it can also be exploited in certain technologies, such as radar and wireless communication systems, to extend coverage or detect objects.

**Scope** The scope in a project or study context refers to the extent or range of view, work, or influence. It outlines the boundaries of the project, including its objectives, deliverables, features, and functions that are to be included. The scope also identifies what is excluded, setting the limits of what the project is expected to accomplish.

**Signal Booster** A signal booster, also known as a repeater, is a device that amplifies weak wireless signals to extend coverage and improve signal strength in areas with poor connectivity. Signal boosters are used in both cellular and broadband wireless networks to enhance the quality of voice and data communication, especially in buildings, remote areas, and places where physical obstructions weaken signals.

**Signal Strength** Signal strength refers to the power level of a wireless communication signal, typically measured in decibels relative to a milliwatt (dBm). It indicates how well a device can receive the signal from a transmitter, affecting the quality of the communication. Higher signal strength usually translates to better communication quality and a more reliable connection.

**Simplex** Simplex communication is a transmission method where communication can occur in only one direction. Unlike duplex systems, which allow simultaneous two-way communication, a simplex system can only send signals from the transmitter to the receiver without the capability for the receiver to reply on the same channel. Examples include broadcast radio and television.

**SINR (Signal-to-Interference-plus-Noise Ratio)** SINR stands for Signal-to-Interference-plus-Noise Ratio, a measure used in wireless communication to quantify the quality of a wireless connection. It compares the level of the desired signal to the level of background noise and interference. A higher SINR indicates a better quality of connection, as it means the signal is stronger relative to the noise and interference levels.

**SISO (Single Input, Single Output)** SISO, or Single Input, Single Output, refers to a wireless communication system where both the transmitter and receiver have only one antenna. SISO systems are the simplest form of wireless transmission technology, contrasting with MIMO (Multiple Input, Multiple Output) systems, which use multiple antennas at both the transmitter and receiver ends to improve performance and increase data rates.

**SLED (State, Local, and Education)** SLED stands for State, Local, and Education, a term often used in the context of government and public sector markets in the United States. It encompasses a wide range of government and educational institutions at the state and local levels, including cities, counties, public schools, and state universities. The SLED market is significant for businesses providing products and services tailored to the needs of these entities.

**Sleeper** In telecommunications, a sleeper can refer to an inactive or dormant circuit, service, or feature that is installed and ready for use but is not currently active. Sleeper services can be quickly activated when needed, providing flexibility and scalability in network management and planning.

**Small Cell** A small cell is a type of low-power cellular base station designed to provide network coverage to a small geographic area. Small cells help increase the capacity of mobile networks in dense urban areas, inside buildings, or in areas where coverage is insufficient. They are an essential component of next-generation cellular networks, including 5G, facilitating higher data rates and reduced latency by bringing the network closer to the user.

**Spectrum** In telecommunications, the spectrum refers to the range of electromagnetic radio frequencies used for transmitting voice, data, and video across a distance. The radio spectrum is divided into bands, which are allocated for various uses, including mobile communications, broadcasting, satellite communications, and radar. Efficient management of the spectrum is vital for preventing interference between different communication services.

**Spectrum Analyzer** A spectrum analyzer is an electronic device that measures the magnitude of an input signal versus frequency within the full frequency range of the instrument. It is used to observe the detailed structure of a signal, identifying its frequency, amplitude, and bandwidth. Spectrum analyzers are essential tools in the design, testing, and troubleshooting of devices that utilize radio frequencies, providing insights into the composition of signals and the presence of interference and noise.

**Slice (Fiber)** The term "slice" in the context of fiber optics is likely a typographical error or misunderstanding, commonly meant to be "splice." Splicing in fiber optics refers to the method of joining two fiber ends together to form a continuous optical path. There are two main types of splicing: fusion splicing, where fibers are welded together using an electric arc, and mechanical splicing, where fibers are aligned and

held together by a mechanical fixture. Splicing is essential for repairing broken fibers and extending fiber optic networks.

**Splice Enclosure** A splice enclosure is a protective case or housing designed to enclose and protect fiber optic splices. These enclosures provide mechanical protection and environmental shielding for spliced fiber optic cables, ensuring the integrity and reliability of the splice points, especially where cables are exposed to harsh environmental conditions or where additional splices may be required in the future. Splice enclosures are used in both aerial and underground fiber optic installations.

**Splitter** In fiber optic communications, a splitter is a device that divides one optical signal into multiple signals, typically to distribute the signal to multiple endpoints. Splitters are used in networks to route signals to various locations without requiring individual sources for each. They are key components in Passive Optical Networks (PONs), enabling one single fiber to serve multiple premises, significantly reducing the amount of fiber and central office equipment needed.

**Squelch** Squelch is a circuit function used in radio receivers to suppress the noise when no signal is being received. It mutes the output of the receiver when the signal strength falls below a certain threshold, preventing the listener from hearing the static or background noise. The squelch control allows the user to adjust the threshold level at which the squelch circuit activates, optimizing the balance between silencing unwanted noise and receiving weak signals.

**Sweep Test** A sweep test is a procedure used to evaluate the frequency response of a cable, antenna system, or network to ensure it is operating within the specified parameters across a given frequency range. It measures signal loss and return loss over the frequency band, identifying issues such as impedance mismatches, signal degradation, and other factors that can affect performance. Sweep tests are critical in the installation and maintenance of telecommunications and broadcasting infrastructure to guarantee optimal system performance.

**System Integrator (SI)** A System Integrator (SI) is a professional entity or company that specializes in bringing together various subsystems or components into a whole, ensuring that those subsystems function together effectively. In the context of telecommunications and IT, a system integrator might combine hardware, software, networking, and storage products from multiple vendors into a cohesive system that meets the client's business goals. SIs play a crucial role in designing and implementing complex solutions that require a deep understanding of different technologies and their interoperability.

T

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**Telecommunicator** A telecommunicator is a professional responsible for handling incoming and outgoing communication in emergency call centers, dispatch centers, or communication departments. They are trained to manage emergency calls, dispatching the appropriate services (such as police, fire, and medical services), and providing critical information to first responders.

Telecommunicators are a vital link between the public and emergency services.

**Temporary Certificate of Occupancy (TCO)** A Temporary Certificate of Occupancy (TCO) is issued by building authorities to allow partial or temporary occupancy of a building project before the entire project is completed and a final Certificate of Occupancy (CO) is granted. A TCO is typically issued when a building is safe to occupy but still requires some final work or when certain areas are completed while others are still under construction.

**Tentative Interim Amendment (TIA)** A Tentative Interim Amendment (TIA) is a temporary amendment to a standard or code that addresses urgent, unforeseen, or emergent issues. TIAs are issued by standards development organizations, such as the National Fire Protection Association (NFPA), to update existing standards between regular revision cycles, ensuring that the standards remain relevant and address current safety concerns.

**Third Party Operator (3PO)** A Third Party Operator (3PO) in telecommunications refers to an entity that operates communication services or infrastructure on behalf of another organization. This arrangement can include managing network equipment, handling customer service, or providing specific technical services. 3POs allow companies to leverage specialized expertise and infrastructure without the need for direct ownership or operation.

**Trunked Radio** Trunked radio systems are advanced two-way radio systems that use a control channel to dynamically allocate radio channels for more efficient use of radio spectrum. Unlike conventional systems where channels are dedicated to specific groups, trunked systems allow multiple groups to share a

pool of channels, significantly increasing capacity and reducing the chance of channel congestion.

**Twisted Pair** Twisted pair cabling is a type of wiring in which two conductors of a single circuit are twisted together for the purposes of canceling out electromagnetic interference (EMI) from external sources and crosstalk from neighboring pairs. It is widely used in telecommunications for transmitting data and voice signals, with Cat5e and Cat6 cables being common examples for Ethernet and other network connections.

**Two-Way Radio** A two-way radio is a device that can both transmit and receive voice communication, unlike a broadcast receiver which only receives content. It allows for bidirectional, real-time communication between users. Two-way radios are used in a variety of settings, including public safety, business operations, and recreational activities, allowing users to communicate over short to medium distances without relying on a cellular network

U

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**UHF (Ultra High Frequency)** UHF stands for Ultra High Frequency, a range of electromagnetic waves typically between 300 MHz and 3 GHz. UHF frequencies are widely used for television broadcasting, cellular phones, satellite communication, and two-way land mobile radios, including police and fire department radios. The UHF band offers a good balance between range and penetration through obstacles, making it suitable for both outdoor and indoor wireless communication systems.

**UL (Underwriters Laboratories)** Underwriters Laboratories (UL) is an independent safety certification organization that tests and certifies products for safety compliance. Established in 1894, UL develops standards and test procedures for products, materials, systems, and services with a focus on public safety. UL certification is recognized globally as a symbol of safety and reliability, and it covers a broad range of product categories, including electrical devices, building materials, and fire safety equipment.

**UL 2524** UL 2524 is a standard developed by Underwriters Laboratories specifically for in-building 2-way emergency radio communication enhancement systems. It sets forth the requirements for the design, installation, operation, and maintenance of these systems to ensure they perform reliably during emergencies. Systems that meet the UL 2524 certification provide first responders with enhanced communication capabilities within buildings, improving operational effectiveness and safety during emergency situations.

**Uninterruptible Power Supply (UPS)** An uninterruptible power supply (UPS) is a device that provides emergency power to a load when the input power source or mains power fails. A UPS differs from an auxiliary or emergency power system in that it provides near-instantaneous protection from input power interruptions by supplying energy stored in batteries or a flywheel. UPS units are used to protect critical equipment such as computers, data centers, telecommunication equipment, and other electrical equipment where an



unexpected power disruption could cause injuries, fatalities, serious business disruption, or data loss.

**Uplink** The uplink is the part of a communication link used for sending data from a ground-based transmitter to a satellite or airborne platform, or from a user's device to a network. In cellular networks, the uplink refers to the transmission path from the mobile device to the base station. Uplink frequencies are specifically allocated for this purpose, and managing uplink performance is crucial for ensuring reliable and efficient communication in wireless systems.

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**VHF (Very High Frequency)** VHF stands for Very High Frequency, referring to the radio frequency range from 30 MHz to 300 MHz. This band is used for various applications, including FM radio broadcasting, television broadcasts, two-way land mobile radios for public safety and commercial purposes, and marine and aviation communications. VHF signals are known for their ability to propagate through obstacles and cover longer distances than higher frequency signals, making them suitable for outdoor communication systems.

**Vocoder** A vocoder (voice encoder) is a category of voice codec that analyzes and synthesizes the human voice signal for audio data compression, multiplexing, voice encryption, voice transformation, etc. In telecommunications, vocoders are used to reduce the bandwidth of voice signals to encode speech for digital transmission, enabling more efficient use of network resources in cellular networks and VoIP (Voice over Internet Protocol) applications. Vocoders work by capturing the essential components of speech, allowing for clear communication at lower bit rates.

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**Walk Test** A walk test, also known as a field test or site survey, is conducted to assess the coverage and performance of a wireless network within a specific area. During a walk test, technicians use specialized equipment to measure various parameters, including signal strength, signal quality, interference levels, and data rates, as they move throughout the area. Walk tests are essential for optimizing wireless networks, including cellular, Wi-Fi, and public safety communication systems, ensuring consistent and reliable service.

**Wavelength** Wavelength is a fundamental concept in physics and telecommunications, representing the distance between identical points in the adjacent cycles of a waveform signal propagated in space or along a wire. It is inversely proportional to frequency, meaning higher frequency signals have shorter wavelengths, and vice versa. In telecommunications, understanding the wavelength of a signal is crucial for designing antennas, analyzing signal propagation, and optimizing communication systems for different frequencies.

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