

**SECTION 27 53 19
DISTRIBUTED ANTENNA SYSTEM**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: In-building Distributed Antenna System, to support multiple wireless services
- B. Related Sections
 - 1. Comply with the Related Sections requirements of Section 270000

1.2 REFERENCES

- A. Comply with the References requirements of Section 270000 (Basic Communications)
- B. In particular or addition to the codes and standards listed in Section 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
 - 1. FCC Regulations:
 - a. Part 22: 850 MHz cellular band services
 - b. Part 24: Personal Communications Server
 - c. Part 27: Miscellaneous Wireless Communications Services
 - d. Part 90: Specialized Mobile Radio Service

1.3 DEFINITIONS

- A. Definitions as described in Section 270000 shall apply to this section.
- B. In addition to those Definitions of Section 270000, the following list of terms as used in this specification defined as follows:
 - 1. "DAS": Distributed Antenna System (synonymous with in-building antenna system)
 - 2. "RSSI": Received signal strength indication
 - 3. "SMR": Specialized Mobile Radio (synonymous with trunked radio or public access mobile radio) is a land-based radio service that provides one-to-many and many-to-one communications. In terms of application, SMR systems are designed to help roaming field personnel stay in touch with the home office and are often called "dispatch services."

1.4 SYSTEM DESCRIPTION

- A. System Description
 - 1. The in-building antenna system, herein "System", shall distribute RF coverage throughout designated spaces within the building. The System shall support a broad range of wireless services operating (public safety/First Responder, two-way radio, and paging) within the System's specified frequency range. The System shall be implemented with proven state-of-the-art technology that can seamlessly integrate with the rapid evolution of wireless technologies and business applications.
 - 2. The DAS infrastructure will be comprised of a head end including a wide band transceiver. This head end subsystem will be a common interface node.

3. The System shall reliably distribute signal levels as specified per frequency and/or wireless services throughout the specified coverage area. The System shall be flexible and shall easily accommodate additional wireless services within the System's frequency bands without requiring significant upgrades or system modifications.
 4. The DAS shall include a head end subsystem. The head end shall include a wideband transceiver and be a common interface node.
- B. Work Covered Under Other Sections
1. Power
- C. Design Criteria
1. The System shall distribute RF coverage at levels outlined below in the following areas of the building(s) – herein specified coverage areas:
 - a. Floor areas
 - b. Patient Rooms
 - c. Office Space
 - d. Basement
 - e. Stairwells
 - f. Elevators
 - g. General Use spaces
 - h. Restrooms
 - i. Mechanical, Electrical and IT Spaces
 - j. Tunnel
 2. The System shall consist of separate sets of infrastructure supporting the following systems:
 - a. IWN with multiple frequencies in the range of 173 MHz \pm 5MHz (encrypted).
 - 1) System is supported by the Department of Justice. All correspondence shall be coordinated with the VA Resident Engineer.
 - 2) The IWN will connect to the existing system on campus with fiber or copper at the 8th floor Radio Cage in building 100. Refer to project plans for pathway details.
 - b. First Responder Radio
 - 1) The First Responder Radio shall consist of a new off-air BDA and roof mounted antenna.
 - 2) Coordinate frequency requirements and coverage with the local AHJ and the VA Resident Engineer.
 - c. Existing Campus systems
 - 1) UHF 408-417 MHz
 - 2) VHF 166.25 MHz
 - 3) 932 MHz pagers

- 4) Connection to the existing campus systems is at the 8th floor Radio Cage in building 100. Refer to project plans for pathway details.
3. The System shall support multiple services in a modular architecture so services can be added or removed without requiring new infrastructure, without readjustment of signal power levels, or disturbing existing services.
4. The System shall enable services to be added without requiring additional cable plant or antenna systems.
5. The System shall not impede any management features or functionality of any attached network and/or device management system. The System shall allow for proactive management and end-to-end alarming of active electronics. The System shall be able to engage with 3rd party SNMP-based element management systems and provide fault management information.
6. The transport medium for DAS can take many forms, from traditional off-air repeater, or Base Transceiver Station (BTS) to a tethered architecture consisting of coaxial, fiber optic, or hybrid fiber/coaxial base solution. The DAS shall extend the services from the head end system by interfacing to either a passive or active DAS that is deployed in each of the building structures. The following system solution designs are meant to be typical only. Bidders are expected to describe their proposed system solution.
7. Public safety channels should be -95 dBm or stronger as specified by any local ordinance. Public safety includes local and city police, county sheriff, and Fire departments. The DAS shall support existing legacy mission critical 2-way communication that is non-IP based radio systems.
8. The System must be FCC certified with the specific access points that are to be deployed.
9. The DAS System and the associated wireless devices must be in compliance with FCC's and Regional regulatory authorities Emission rules for wireless devices.
 - a. Refer to: FCC advisory: "A Local Government Official's Guide to Transmitting Antenna RF Emission Safety Rules, Procedures, and Practical Guidance", FCC's OET Bulletin 65, FCC Rule 47-part 17 and (ANSI/IEEE C95.1-1992) Hazardous Emission document.

D. Base Bid Work

1. The Work under this section includes furnishing materials, installation, and coordination through the General Contractor with other trades and the VA resident engineer for a complete, operational, and balanced System. Furnish necessary materials, accessories, fasteners, etc., and the labor and associated services required to provide the System specified herein.
2. Reflected Ceiling Plan coordination with the VA Resident Engineer for modeling and placement of, Antennas.
3. The Work of this Section includes the following (described in greater detail in Part 3):
 - a. Project management services
 - b. Detailed System Design
 - c. Installation and system balancing
 - d. Manage integration with existing systems on campus
 - e. Manage integration with local AHJ

- f. Manage integration with VA Resident Engineer
 - g. Frequency coordination and conflict resolution
 - h. Manage FCC Licensing
 - i. System acceptance testing and turn over to VA Resident Engineer
4. The work of this section requires particular attention to the following:
- a. Ceiling Types: The installer shall fully understand every ceiling type and its interaction with the System. For example, some ceiling types may impede RF signals and, subsequently, System performance.
 - b. Pathways: The work of this section requires the installer fully understand the pathways and to coordinate placement of cables within those pathways.
 - 1) Contractor shall provide additional pathways as required to support system. Refer to 27xxxx series project specifications for installation requirements.
5. Work Provided Under Another Section
- a. Primary Communications Pathways, such as backbone conduits, risers and cable tray
 - b. Communications Rooms, including equipment support, power, cooling, and grounding

1.5 SUBMITTALS

- A. Comply with Submittal procedural, quantity, and format requirements of Section 270000.
- B. Submittal Requirements Prior To Start Of Construction:
 - 1. Product Data Submittal
 - 2. Shop Drawings Submittal: Shop drawings shall include the following information:
 - a. System or functional block/line diagrams
 - b. Plans indicating equipment, antenna, and/or component locations, cable routes, and other installation information
 - c. Coverage plans, showing the design RF coverage (signal strength) for each frequency band
 - d. Equipment and/or wall / rack elevations, showing equipment layout, space requirements and integration with other systems (outside the scope of the DAS)
 - e. Installation details for antenna mounting, specialty cable hangers, and other components unique to the System, and other information that depicts the intended installation
 - f. Seismic engineering of anchoring requirements for equipment, cabling and antennas.
- C. Submittal Requirements Prior To Acceptance Testing:
 - 1. Acceptance Testing Procedures Submittal: describes in detail the procedure for testing the System's performance and balancing the System's signal strength, including a description of the test data (or an example of the test report). The Contractor shall demonstrate the desired services have been successfully deployed and tested. Specifically, the DAS must be deployed with the Wireless Operators criteria and approval.
- D. Submittal Requirements at Close Out:
 - 1. As-Built Drawings Submittal

2. Operations and Maintenance Manual (refer to Section 270000 for contents)

1.6 QUALITY ASSURANCE

- A. Comply with Quality Assurance requirements of Section 270000.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Delivery, Storage and Handling requirements of Section 270000.

1.8 WARRANTY

- A. Warrant Work and System to perform as described within this Section for a period of 5 year(s), including components, electronics, etc., and coverage. Correct deficiencies within 24 hours of notification.

PART 2 - PRODUCTS

A. Manufacturer:

1. Motorola Integrated Wireless Network Systems antennas, transmitters, and other associated devices, to be installed by Day Wireless, 2415 S 200th St, SeaTac, WA 98198 (206-878-3750).

- B. Provide products, components, electronics, cable, hardware and support systems necessary to provide a complete and functional system based on the design criteria listed in Part 1 of this specification. Including but not limited to the following:

1. Base Transceiver Station
2. Bi-Directional Amplifier
3. Donor Antenna
4. In-Building Antenna
5. Backbone Distribution Cable
6. Horizontal Distribution Cable
7. Couplers, Splitters, Combiners
8. Antenna Anchoring and Supports
9. Cable Hanger Supports

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the Execution requirements of Section 270000.

3.2 EXAMINATION AND PREPARATION

- A. Prior to the start of this Section's installation Work, examine Communications Rooms and Pathways for completeness, compatibility with the Work of this section, and readiness for connections with the Work of this section.

3.3 INSTALLATION

- A. Project Management Services: The Contractor shall assign a single-point-of-contact to this project with overall responsibility for communications and ultimate delivery of contracted materials, installation, performance criteria, and services – "PM". This PM shall be responsible for interfacing with the VA Resident Engineer, General Contractor, Engineer, and their own

subcontractors. The PM shall present the design iterations to the VA Resident Engineer, coordinate cable routes with the Engineer, coordinate on-site construction activities with the General Contractor, shall manage the process to coordinate bringing wireless operators into the facility, and shall close out the project with the VA Resident Engineer.

- B. Detailed System Design: The Contractor shall use the requirements of this Section to complete the detailed design of the System. Design shall include computer RF modeling and site surveys. The detailed design shall deliver the pre-construction submittals, including iterations for the VA Resident Engineer's review and sign-off. The Contractor shall be able to show design RF signal levels to sub-room precision for all rooms within the defined coverage areas.
- C. Installation: The Contractor shall coordinate the installation and schedule with the VA Resident Engineer and General Contractor prior to the start of installation activities. Once the VA Resident Engineer and General Contractor have accepted the coordination and schedule, the Contractor may proceed with installation.
- D. System Balancing: The Contractor shall balance the System component (e.g., antenna) signal strength to the device signal levels.
- E. Active Survey: The Contractor shall perform an active wireless survey demonstrating performance according to the design criteria of Part 1 (above). From this survey, produce an active survey report, including floor plans.

3.4 CONNECTIONS TO SYSTEM

- A. Manage Wireless Operators' Connection to System: The Contractor shall coordinate site preparation, assist VA Resident Engineer with integration of existing systems. The Wireless Operator integration shall be turn-key. Integration includes cable, Bi-Directional Amplifier (BDA), antenna, and update to telecommunication drawings.
- B. Manage FCC License: The Contractor shall represent the VA Resident Engineer to obtain required licenses for operation under FCC Regulations.

3.5 LABELING

- A. General Requirements
 - 1. Labeling, identifier assignment, and label colors shall conform to TIA/EIA-606-A Administration Standard and as approved by VA Resident Engineer before installation.
 - 2. Permanently label equipment, components, and cables. Affix label as close as practical to each end of cables.
 - 3. Coordinate labeling and identifier assignment with the Engineer or VA Resident Engineer. Submit a labeling plan to the Engineer for approval prior to labeling work.
- B. Label Format
 - 1. Provide permanent labels with machine-generated text; hand written labels will not be accepted.
 - 2. Labels on cables shall fully wrap around conductors with a self-laminating feature to provide permanent marking.

3.6 SYSTEM ACCEPTANCE TESTING AND TURN OVER TO VA RESIDENT ENGINEER

- A. Complete the acceptance testing as prescribed in the accepted Testing Procedures submittal.

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- B. Present the completed System and wireless services to the VA Resident Engineer, including functionality, features, ongoing maintenance, and warranty procedures. Demonstrate to VA Resident Engineer and Engineer system operation, including signal strength at select locations.
- C. Provide one set of electronic records and printed records.

3.7 EXTENDED SUPPORT SERVICES

- A. Provide support services for 12 months following the VA Resident Engineer's acceptance of the System (for services such as integration of additional wireless operators).

3.8 FINAL INSPECTION AND CERTIFICATION

- A. Punch the Work of this Section compliant to the requirements of Section 270000.
- B. Comply with system acceptance and certification requirements of Section 270000.

3.9 SYSTEM TRAINING

- A. Comply with training requirements of Section 270000.
- B. For this System, provide 40 hours of training for VA Resident Engineer.

END OF SECTION