

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
SPECIAL PROVISION

Project Number:

P.I. Number:

County

Add the following:

Section 927— Wireless Communications Installation

927.1 General Description

This work consists of furnishing materials and installing a wireless communications spread spectrum radio system with all necessary hardware in accordance with the plans and Special Provisions to provide a data link between field devices (i.e. Traffic Signal Controllers, Dynamic Message Signs, etc.). Provide radio system with bi-directional, full duplex communications between two “line-of sight” antennas using license free, spread spectrum technology operating in the 902-928 MHz frequency band.

It also includes all test periods, warranties and guarantees as designated in subsequent sections, and response to maintenance and operational issues as described in subsequent sections.

Apply for, obtain and pay for all utility services, communications services to, and pole attachment permits that are necessary for the wireless communications installation and operation required in the Plans. Maintain these utility services until final acceptance of the communications system.

Upon final acceptance, make an orderly and uninterrupted transfer of these services and permits to the local government or other jurisdiction that will be responsible for subsequent maintenance and operation.

927.1.01 Definitions

General Provisions 101 through 150.

927.1.02 Related References

A. Georgia Specifications

[Section 106—Control of Materials](#)

[Section 631—Changeable Message Signs](#)

[Section 639—Strain Poles for Overhead Sign and Signal Assemblies](#)

[Section 647—Traffic Signal Installation](#)

[Section 682—Electrical Wire, Cable, and Conduit](#)

[Section 915—Mast Arm Assemblies](#)

[Section 923—Electrical Conduit](#)

[Section 925—Traffic Signal Equipment](#)

[Section 926—Wireless Communications Equipment](#)

[Section 935—Fiber Optic System](#)

[Section 938—Detection](#)

[Section 939—Communications & Electronic Equipment](#)

B. Referenced Documents

National Electrical Manufacturers Association (NEMA) Traffic Control Systems Standards No. TS 1

NEMA Traffic Control Systems Standards No. TS 2

AASHTO Roadside Design Guide

The Manual on Uniform Traffic Control Devices (MUTCD), current edition

National Electrical Code (NEC)

National Electrical Safety Code (NESC)

[GDT 7](#)

[GDT 24a](#)

[GDT 24b](#)

[GDT 67](#)

927.1.03 Submittals

Submit to the Engineer material specifications information on all materials proposed for use on the project.

Written approval is required from the State Traffic Signal Engineer prior to beginning any work on the wireless communication installation.

A. Review

For all submittals, the State Traffic Safety and Design Engineer's review of the material should be completed within thirty (30) days from the date of receipt of the submission unless otherwise specified. The State Traffic Signal Engineer will advise in writing, as to the acceptability of the material submitted.

All material submittals for wireless communications equipment and materials used on the project will be reviewed by the Department's Traffic Signal Electrical Facility (TSEF). The material review should be completed within thirty (30) days from the date of receipt of the material submission unless otherwise specified. The State Traffic Signal Engineer will advise in writing as to acceptability of materials to be used on the project.

The State Traffic Signal Engineer may determine that the item is approved, in which case no further action is required; or the item may be partially or totally rejected in which case, modify the submittal as required and resubmit within fifteen (15) days. At this time, the review and approval cycle described above begins again.

The Department reserves the right to be reimbursed for reviewing any submittals after a second rejection.

B. Submittal Costs

No separate measurement or payment will be made for submittal costs.

C. Wireless Communications Item Certification

Submit six (6) copies of material catalog product numbers and descriptions to the Engineer. Reference the project number, P.I. number and include with submittal of all other traffic signal items.

- Spread Spectrum Wireless Communications Radio Unit
- Configuration and Diagnostic Software
- Antenna
- Site Survey Kit
- Configuration Cable
- Antenna Patch Cable

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- Connecting Cable

D. Test Results Submittal

Prior to installing any equipment perform a radio path Site Survey test and submit results of survey for approval.

927.2 Materials

927.2.01 Delivery, Storage, and Handling

A. State-supplied Equipment

For projects where wireless equipment is to be supplied by the Georgia Department of Transportation, obtain State-supplied equipment from the Traffic Signal Electrical Facility (TSEF):

1. Contact the Engineer by phone or correspondence within one week after receiving the Notice to Proceed and arrange for a location to pick up the signal equipment.
2. Sign GDOT's Warehouse Issue Request Form 592 to accept delivery of the State-supplied equipment from GDOT's Traffic Signal Equipment Warehouse. Initial Form 592 if equipment is received from a GDOT District Field Office.
3. Inspect the equipment to ensure that it is operating properly and perform any operational tests within ten (10) calendar days after receiving the equipment.
4. Before installation, and within ten (10) calendar days, certify to the Engineer in writing that the State-supplied equipment was received in good condition.
5. Notify the Engineer in writing if the State-supplied equipment is defective. The State Signal Engineer will replace the defective State-supplied equipment.
6. If no written dissent is received after ten (10) calendar days or if equipment is installed in the field, the Engineer will consider this equipment to be satisfactory and accepted.
7. The Contractor shall supply new equipment to replace State-supplied equipment that is damaged by the Contractor.

B. Wireless Communications Equipment

See [Section 926](#) for wireless communications equipment specifications.

The wireless communications equipment, components, supplies, or materials used in the installation may be sampled and tested if not previously approved by the Department.

Test according to the Specifications and the Sampling, Testing, and Inspection Manual using one or more of the following methods:

- Have the Department use their own facilities.
- Have the supplier or manufacturer use their facilities with an authorized Department representative to witness the testing.
- Provide independent laboratory test results indicating compliance with Department Specifications referenced in [Subsection 602.1.02, "Related References"](#), of this document.
- When testing by the Department is required, supply the item to the Department. Acceptance of materials tested does not waive warranties and guarantees required by the Specifications.

C. Cables

Use cable conforming to [Section 680](#), [Section 925](#), and the appropriate IMSA, NEMA, or UL Specifications for the wire or cable.

Obtain pole attachment permits required by local utility companies or pole owners to allow joint use for signal cable, hardware, or other auxiliary devices.

927.3 Construction Requirements

Refer to [Subsection 107.07](#) of the Specifications regarding proper conduct of The Work.

927.3.01 Personnel

For the definition of a qualified electrician, see [Subsection 755.1.01](#).

927.3.02 Equipment

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Use machinery such as trucks, derricks, bucket vehicles, saws, trenchers, and other equipment necessary for the work and approved by the Engineer prior to installation operations.

927.3.03 Preparation

Utility Permits

A. Application

Apply for, obtain, and pay for utility services and pole attachment permits for wireless communications operation required in the Plans or required when the site survey is completed.

B. Maintenance

Maintain these utility services until Final Acceptance of each installation. After Final Acceptance, transfer these services and permits to the local government or jurisdiction responsible for maintenance and operation. Ensure that the transfer does not interrupt service.

C. Utility Location

When installing aerial cable of any type, ensure that overhead clearance and separation requirements conform to local utility company standards the NEC and the NESC. Refer to the Standard Details Drawings for further information on utility clearances.

927.3.04 Fabrication

General Provisions 101 through 150.

927.3.05 Construction

A. Acquiring and Disposing of Equipment

Do not modify the signal equipment, design, and operation without the District Traffic Engineer's written approval.

All communications equipment removed or replaced shall be returned to District Traffic Signal Shops unless otherwise noted in the Plans or as directed by the Engineer.

B. Communications Equipment Modification and Removal

Upon modification of any existing communications equipment, responsibilities for maintenance, operations and response to communications malfunction become the responsibility of the contractor and provisions of Section 647.3.07, "Contractor Warranty and Maintenance", apply.

Remove existing communications equipment that is not used in the final installation when the new communications is operational.

Carefully remove equipment to minimize damage and retain it in its original form. This equipment may include:

- Fiber Modems
- 2070 7A Modules
- 2070 6B Modules
- Connecting Cables

C. Site Survey

Prior to installing any equipment perform a radio path Site Survey test. Ensure the test evaluates the Signal Strength (dBm), Fade Margin (dB), Signal-to-Noise Ratio, Data Integrity (poll test), and a complete frequency spectrum scan. Ensure the radio path site survey test is performed using the supplied brand of radio equipment to be deployed. During the initial radio path signal strength test it may be determined that a repeater station may be necessary to complete the intended link. Provide the test results to the Engineer for review and approval. Submit copies of the test results and colored copies of the frequency spectrum scan along with an electronic copy of this information. Final locations and type of antennas and any necessary repeater stations are to be approved by the Engineer. Upon completion of the project provide site survey kit and software to maintaining agency.

D. Antenna

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Provide and install antenna in such a manner that avoids conflicts with other utilities (separation distances in accordance with the guidelines of the National Electrical Safety Code) and as specified in the antenna manufacturer's recommendations. Secure the antenna mounting hardware to the pole and route the coaxial cable such that no strain is placed on the coaxial connectors. On wood pole installations, bond the antenna mounting hardware to the pole ground using # 6 AWG bare copper wire using split bolt or decompression type fitting.

E. Power Divider

Provide and install antenna power divider at locations determined by site survey to require two antennas. Provide power divider and cables in accordance with Section 926. Ensure all weather exposed RF connectors are sealed with a self sealing rubberized tape.

F. Coaxial Cable

Provide and install Coaxial cable as specified in section 926. Do not exceed the 1 inch (25.4) bend radius of the coaxial cable as it transverses from the cabinet to the antenna assembly. Connect the lightning arrestor to the coaxial cable in the equipment cabinet.

G. Lightning Arrestor

Provide and install the lightning arrestor as specified in section 926. Properly ground and secure the arrestor in the cabinet.

H. Power & Cabling

Permanently label all cables in the cabinet. Ensure the power supply for the radio system is not connected to the GFCI receptacle circuitry located in the cabinet. Ensure the appropriate radio connecting cables, configuration cable and radio antenna patch cable are provided and installed correctly.

I. Self Contained Radio Cabinets

Provide and install any self contained radio cabinet units as shown on the plans or determined by the site survey. Provide radio cabinet units as specified in section 926. Install cabinet units at top of pole in accordance with utility locations and site survey. Provide electrical service to cabinet.

J. Documentation

Place a copy of all manufacturers' equipment specifications, instruction and maintenance manual in the equipment cabinet.

927.3.06 Quality Acceptance

Upon completion of the installation check to ensure that communications are established. If communications are not established, use configuration and diagnostic software to determine and correct the problem.

927.3.07 Contractor Warranty and Maintenance

A. Warranties

Provide manufacturer's warranties or guarantees on electrical, electronic, or mechanical equipment furnished, except state-supplied equipment.

Ensure that warranties and/or guarantees are consistent with those provided as customary trade and industry standard practices; or as otherwise specified in the Plans, Standard Specifications, or Special Provisions.

Upon Final Acceptance, transfer the manufacturer and Contractor warranties or guarantees to the Engineer. Ensure that warranties are continuous and state that they are subject to transfer.

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Acceptance or approval of the Work does not waive warranties or guarantees where required by the Specifications. Final Acceptance will not be granted until all warranties and guarantees are received.

B. Guaranties

Repair and/or replace all equipment and material supplied under these Contract Documents which has been determined by the Engineer to not meet Specifications.

The Engineer reserves the sole right to determine suitability or unsuitability of the supplied equipment and material. The contractor shall bear the total cost of delivery and transportation related to the repair and replacement of equipment and material throughout the duration of the Contract unless otherwise approved by the Engineer.

927.4 Measurement

Wireless Communications items complete, in place, and accepted of the kind, size, and type specified are measured as follows:

A. Shelf Mount Spread Spectrum Wireless Radio Transceiver Unit with FSK and RS 232 Connection

Shelf Mount Spread Spectrum Wireless Radio Transceiver Unit with FSK and RS 232 Connection are measured for payment by the actual number installed as complete functional and accepted. This item is to be supplied complete with power supply, power supply cable, configuration cable, antenna patch cable, antenna lightning arrestor, and appropriate connecting cable for communications with the device. There shall be no other separate cost to the department for supply, testing and installation of this item.

B. Shelf Mount Spread Spectrum Wireless Radio Transceiver Unit with RS 232 Connection

Shelf Mount Spread Spectrum Wireless Radio Transceiver Unit with RS 232 Connection are measured for payment by the actual number installed as complete functional and accepted. This item is to be supplied complete with power supply, power supply cable, configuration cable, Antenna patch cable, antenna lightning arrestor, and appropriate connecting cable for communications with the device. There shall be no other separate cost to the department for supply testing and installation of this item.

C. Rack Mount Spread Spectrum Wireless Radio Transceiver Unit with FSK and RS 232 Connection

Shelf Mount Spread Spectrum Wireless Radio Transceiver Unit with FSK and RS 232 Connection are measured for payment by the actual number installed as complete functional and accepted. This item is to be supplied complete with power supply, power supply cable, configuration cable, Antenna patch cable, antenna lightning arrestor, and appropriate connecting cable for communications with the device. There shall be no other separate cost to the department for supply, testing and installation of this item.

D. 2070 Mount Spread Spectrum Wireless Radio Transceiver Unit with RS 232 Connection

2070 Mount Spread Spectrum Wireless Radio Transceiver Unit with RS 232 Connection are measured for payment by the actual number installed as complete functional and accepted. This item is to be supplied complete with power supply, power supply cable, configuration cable, Antenna patch cable, antenna lightning arrestor, and appropriate connecting cable for communications with the device. There shall be no other separate cost to the department for supply, testing and installation of this item.

E. Self Contained Spread Spectrum Wireless Radio Repeater Station

Self Contained Spread Spectrum Wireless Radio Repeater Stations are measured for payment by the actual number installed as complete functional and accepted. This item is to be supplied complete with power supply, power supply cable, configuration cable, antenna lightning arrestor, antenna, mounting hardware, cabinet and appropriate connecting cable for extending the communications network. There shall be no other separate cost to the department for supply, testing and installation of this item.

F. Directional Radio Antenna (Yagi) and Connecting Cable

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Directional Radio Antenna (Yagi) and connecting cable are measured for payment by the actual number of antennas installed as complete functional and accepted. This item is to be supplied complete with connecting cable and mounting hardware for the appropriate mounting. There shall be no other separate cost to the department for supply, testing and installation of this item.

G. Omni Directional Radio Antenna and Connecting Cable

Omni Directional Radio Antenna and connecting cable are measured for payment by the actual number of antennas installed as complete functional and accepted. This item is to be supplied complete with connecting cable and mounting hardware for the appropriate mounting. There shall be no other separate cost to the department for supply, testing and installation of this item.

H. Antenna Power Divider and Connecting Cables

Antenna Power Divider and connecting cables are measured for payment by the actual number of antenna power dividers installed as complete functional and accepted. This item is to be supplied complete with connecting cables. There shall be no other separate cost to the department for supply, testing and installation of this item.

I. Shelf Mount Spread Spectrum Wireless Radio Transceiver Unit with Ethernet Connection

Shelf Mount Spread Spectrum Wireless Radio Transceiver Units with Ethernet connection are measured for payment by the actual number installed as complete functional and accepted. This item is to be supplied complete with power supply, power supply cable, configuration cable, Antenna patch cable, antenna lightning arrestor, and appropriate connecting cable for communications with the device. There shall be no other separate cost to the department for supply and installation of this item.

J. Spread Spectrum Wireless Radio Survey

Spread Spectrum Wireless Radio Surveys are measured for payment by the actual number of radio installation surveys completed and accepted. There shall be no other separate cost to the department for conducting a site survey and completed report.

K. Spread Spectrum Wireless Training

Spread Spectrum Wireless Radio Training is measured as a lump sum for all supplies equipment, materials, handouts, travel and subsistence necessary to conduct the training.

927.4.01 Limits

Not Applicable.

927.5 Payment

Payment is full compensation for furnishing and installing the items complete in place according to this specification. Payment includes all compensation for furnishing labor, materials, tools, equipment, and incidentals required to complete the work.

No payment will be made for individual items unless a pay item is included in the plans for the specific item.

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Payment will be made under:

Item No. 927	Shelf Mount Spread Spectrum Wireless Transceiver with FSK & RS 232 connection	Per each
Item No. 927	Shelf Mount Spread Spectrum Wireless Transceiver with RS 232 connection	Per each
Item No. 927	Rack Mount Spread Spectrum Wireless Transceiver with FSK & RS 232 connection	Per each
Item No. 927	2070 Mount Spread Spectrum Wireless Transceiver with RS 232 connection	Per each
Item No. 927	Self Contained Spread Spectrum Wireless Radio Repeater Station	Per each
Item No. 927	Directional Radio Antenna and Connecting Cable	Per each
Item No. 927	Omni Directional Radio Antenna and Connecting Cable	Per each
Item No. 927	Antenna Power Divider	Per each
Item No. 927	Spread Spectrum Wireless Radio Survey	Per each
Item No. 927	Spread Spectrum Wireless Training	Lump Sum

Office of Traffic Safety and Design