

September 1, 2012

**TRAILER MOUNTED
AUTOMATED FLAGGER ASSISTANCE DEVICE SYSTEM
(AFAD)**

1. Description:

This specification details the minimum requirements of all Automated Flagger Assistance Device Systems (AFAD) utilized and placed into operation on the roadways of the state of South Carolina.

An automated flagger assistance device system is a temporary traffic control device system for controlling the flow of traffic through temporary traffic control areas, typically work zones, that generate the requirement for two-way traffic to share a single travel lane. An automated flagger assistance device system shall consist of no less than 2 individual AFAD units linked and remotely controlled by wireless communications. A flagger(s), who has successfully completed a flagger training course sponsored by a South Carolina Department of Transportation approved work zone traffic control training provider, shall operate the system. Install, operate and maintain each AFAD unit as designated by these Supplemental Specifications, the manufacturer's specifications, the Standard Drawings for Road Construction, the Plans and the Engineer.

An automated flagger assistance device system acceptable for use on the roadways of the state of South Carolina shall be either a Type I "RED / YELLOW" Lens system or a Type II "STOP / SLOW" Sign system.

The automated flagger assistance device system shall comply with all requirements for Automated Flagger Assistance Devices as specified and directed by the MUTCD, latest edition, and this supplemental specification. An automated flagger assistance device system shall operate and comply with all requirements for flagging operations as specified and directed by the latest editions of the MUTCD, the South Carolina Flagger's Handbook and the Standard Specifications for Highway Construction. Also, an automated flagger assistance device system shall operate and comply with all requirements for flagging operations as specified and directed by the Standard Drawings for Road Construction, the special provisions, the plans and the Engineer.

2. Operations Requirements:

A. General: Automated flagger assistance device systems are only permitted for use on two-lane two-way roadways where each single travel lane of opposing traffic is required to utilize and share one travel lane. An AFAD system is PROHIBITED for use on multilane roadways with reduced numbers of travel lanes. An AFAD is not a traffic control signal and shall not be used as a temporary traffic control signal or to control traffic at any location with more than 2 opposing single travel lanes seeking to share one travel lane.

B. Documentation: Provide documentation to the SCDOT to verify that each operator of an automated flagger assistance device system has successfully completed instruction in the operation of a system by the manufacturer of that system. Also, provide documentation to verify that each operator has successfully completed a flagger training course sponsored by a South Carolina Department of Transportation approved work zone traffic control training provider.

1. **Work Conducted under Contract to SCDOT** - Provide documentation of proof of successful completion of training in the proper operation of the AFAD system by the manufacturer of the system and successful completion of training as a flagger by a South Carolina Department of Transportation approved work zone traffic control training provider to the Resident Engineer no less than 7 days prior to placing an automated flagger assistance device into operation.

SUPPLEMENTAL SPECIFICATION

2. **Work Conducted under Encroachment Permit** - Provide documentation of proof of successful completion of training in the proper operation of the AFAD system by the manufacturer of the system and successful completion of training as a flagger by a South Carolina Department of Transportation approved work zone traffic control training provider along with submittal of the encroachment permit to the SCDOT.

C. Operator: The operator of the an automated flagger assistance device system shall be a recipient of and have successfully completed instruction in the operation of the system by the manufacturer of that system. The operator shall have successfully completed a flagger training course sponsored by a South Carolina Department of Transportation approved work zone traffic control training provider.

The South Carolina Department of Transportation only recognizes the following entities as acceptable providers of work zone traffic control training for organizations outside of the SCDOT who perform work activities within the highway rights-of-way in South Carolina under either contract to SCDOT or encroachment permit:

American Traffic Safety Services Association (ATSSA)
Institute for Transportation Research and Education at North Carolina State University (ITRE)
Carolinas Association of General Contractors (AGC)
National Safety Council South Carolina Chapter

The operator shall control the automated flagger assistance device system from a location with an unobstructed view of the AFAD unit as well as an unobstructed view of the approaching traffic. If a single operator is controlling more than one unit, the operator shall have an unobstructed view of traffic from both directions. At no time is the operator permitted to leave the AFAD unattended when the AFAD is operating.

D. Site Location: When sufficient shoulder space is available, place and position the AFAD unit on the shoulder of the roadway no closer than 1 foot from either the near edge line or the near edge of pavement when an edge line is absent to the near edge of the trailer when the gate arm is in the upright position. When sufficient shoulder space to attain the minimum 1 foot requirement is unavailable, minimal encroachment of the unit upon the adjacent travel lane is permitted.

Place and position the AFAD unit to allow the end of the gate arm, when in the down position, to reach the center of the adjacent travel lane being controlled by the unit. Encroachment by the gate arm when in the down position to a point less than to the center of the adjacent travel lane or into the opposing travel lane beyond the center of the roadway is PROHIBITED.

Install the advance warning signs required for typical flagging operations on each approach. In addition to the typical flagging operations sign array, also include and install a "Be Prepared To Stop" sign (W3-4-48) between the "Flagger" symbol sign (W20-7-48) and the AFAD unit on each approach. Therefore, the required advance warning signs for each approach are, "Be Prepared To Stop" (W3-4-48), "Flagger" symbol (W20-7-48), "One Lane Road Ahead" (W20-4-48-A) and "Road Work Ahead" (W20-1-48-A).

E. Nighttime AFAD Flagging Operations: During nighttime operations, illuminate each AFAD unit station with any combination of portable lights, standard electric lights, existing street lights, etc., that will provide a minimum illumination level of 108 Lx or 10 fc.

During nighttime operations, operators shall wear a safety vest and safety pants that comply with the requirements of ANSI / ISEA 107 standard performance for Class 3 risk exposure, latest revision, and a fluorescent hard hat. The safety vest and the safety pants shall be retroreflectorized and the color of the background material of the safety vest and safety pants shall be fluorescent orange-red or fluorescent yellow-green.

Supplement the array of advance warning signs with a changeable message sign for each approach during nighttime AFAD flagging operations. These changeable message signs are not required during daytime operations. Install the changeable message signs 500' in advance of the advance warning sign arrays. Messages should be "Flagger Ahead" and "Prepare To Stop".

3. System Requirements:

A. General: An automated flagger assistance device system shall consist of a Main AFAD unit and a Remote AFAD unit, linked and remotely controlled by wireless communications. The individual trailer-mounted units shall have nesting capabilities to permit towing of both units in a single trailer configuration. When nested, all lights including stop, tail and turn signal lights of both units shall operate uniformly.

B. Power Source: The electrical power for operation of the sign shall be supplied by a 12 VDC power source or a 110 VAC or a 120 VAC power source. Provide and mount a D/C power source for the unit on the trailer. An adaptable 110 VAC or 120 VAC power source may be used when available and selected for use.

1. **D/C Powered:** Power the unit by means of a battery bank charged by photovoltaic solar panels and/or a built-in 110 VAC 10 amp battery charger. House the battery bank in a lockable heavy duty weatherproof box or cabinet. The battery bank shall have the capability to provide sufficient operating power to the unit for no less than 7 continuous days.

2. **A/C Powered:** Power the unit by means of a 110 VAC or 120 VAC power source. Equip the unit with ground fault circuit interrupter circuit breakers. Conduct all A/C power adaptations with UL approved equipment and methods.

C. Remote Control: Equip each AFAD unit with a controller capable of receiving and implementing instructions through wireless communications from a handheld transceiver. Also, equip each AFAD unit with a handheld transceiver that provides wireless communication with the unit controller to permit operation of the individual unit or the system by an operator or operators from remote locations. The system shall provide the capability for total system operation and control of both units by one operator from a primary handheld transceiver as well as allow independent unit operation by one operator per unit from unit specific handheld transceivers.

Monitor and verify data transmissions utilized to control the AFAD units. Digitally encode signal transmissions to minimize interference. Comply with all applicable requirements of the Federal Communications Commission. In the event communications are disrupted or lost, the system shall go into a "fail safe" mode and display the "Circular Red" / "STOP" indications and lower the gate arms.

D. Gate Arm: Equip each AFAD unit with an automated gate arm that descends to a down position across the travel lane that approaching traffic is operating in when the AFAD unit displays the condition for approaching traffic to stop. The automated gate arm shall ascend to an upright position when the AFAD unit displays the condition to allow stopped traffic to proceed past the location of the AFAD unit.

Acceptable operation of the gate arm shall require the gate arm to begin descent to the down position no less than 2 seconds or more than 4 seconds after the AFAD unit displays the condition for approaching traffic to stop. The gate arm shall begin ascent to the upright position not less than 1 second or more than 2 seconds prior to display of the condition to allow stopped traffic to proceed.

The gate arm shall measure no less than 8 feet in length and shall have a minimum vertical height of 4 inches when placed in the down position. Reflectorize both sides of the gate arm with a Type III Microprismatic retroreflective sheeting with vertical alternating red and white stripes at 16 inch intervals.

The gate arm shall deflect in the event an errant vehicle drives through and strikes the gate arm and then return to a functional position after the errant vehicle clears the gate arm.

E. Trailer: Fabricate and equip each trailer with a single axle, springs, support assembly and four (4) leveling or stabilizer jacks. Properly equip the trailer to comply with South Carolina Law governing motor vehicles. The minimum requirement for lights and reflectors shall include turn signals, dual tail lights, and brake lights. Equip each trailer with Safety chains meeting SAE J-697 standards and paint each trailer with Federal Standard No. 595, Orange No. 12246.

Each trailer mounted AFAD unit shall have the capability to withstand winds up to 80 MPH without overturning when in the operating configuration or position.

4. Type I “RED / YELLOW” Lens System:

A Type I “RED / YELLOW” Lens AFAD system shall alternately display a steadily illuminated Circular RED lens and a flashing Circular YELLOW lens to control traffic without the need for a “human flagger” in the immediate vicinity of the AFAD unit. The steadily illuminated Circular RED lens shall illuminate when approaching traffic is required to stop and the flashing Circular YELLOW lens shall illuminate when stopped or approaching traffic is permitted to proceed pass the location of the AFAD unit.

A RED / YELLOW Lens AFAD unit shall have no less than one set of Circular RED and Circular YELLOW lenses in a vertical configuration that have diameters of no less than 12 inches. Arrange the lenses to place the Circular RED above the Circular YELLOW and provide a minimum height of no less than 7 feet from the bottom of the apparatus housing the Circular YELLOW lens to the grade elevation of the travel lane under control of the AFAD unit. However, if the lenses are located over any portion of a travel lane in which traffic is operating and may pass underneath the lenses, the minimum mounting height shall be no less than 15 feet from the bottom of the apparatus housing the YELLOW lens to the grade elevation of the travel lane under control of the AFAD unit in which traffic is operating.

The gate arm shall begin its descent to the down position not less than 2 seconds or more than 4 seconds after the Circular RED lens is illuminated. The automated gate arm shall begin its ascent to the upright position not less than 1 second or more than 2 seconds prior to illumination of the flashing Circular YELLOW lens.

Install a “Stop Here On Red” sign (R10-6-36) or (R10-6a-30) on the right side of the approach at the point at which motorists are expected to stop when the Circular RED lens is illuminated.

Transition Between RED and YELLOW Conditions -

Transition to Circular RED condition - The flashing Circular YELLOW lens shall enter into a minimum 5 second steady illumination phase prior to transitioning to the steadily illuminated Circular RED condition. The gate arm shall begin its descent not less than 2 seconds or more than 4 seconds after the Circular RED lens is illuminated.

Transition to Circular YELLOW condition - The gate arm shall complete its ascent to the upright position not less than 1 second or more than 2 seconds prior to illumination of the flashing Circular YELLOW lens. The steadily illuminated Circular RED lens shall transition to the flashing Circular YELLOW lens.

The Type I “RED / YELLOW” Lens AFAD system shall include a fail-safe system with a conflict monitor or similar device to prevent display of conflicting indications between units. Also, the system shall provide indicators to notify the operators of power loss that may impede proper operation of the system.

5. Type II “STOP / SLOW” Sign System:

A Type II “STOP / SLOW” Sign AFAD system shall have a STOP / SLOW sign that alternately displays the STOP (R1-1-36) face and the SLOW (W20-8-36) face of a STOP / SLOW paddle to control traffic without the need for a “human flagger” in the immediate vicinity of the AFAD unit. The STOP sign face shall display when approaching traffic is required to stop and the SLOW sign face shall display when stopped or approaching traffic is permitted to proceed pass the location of the AFAD unit.

The STOP / SLOW sign, fabricated from a rigid material, shall have an octagonal shape with a minimum face size of 36 inches by 36 inches. Reflectorize each face of the sign with a Type VII, Type VIII or Type IX Prismatic Retroreflective sheeting included on the latest edition of the *SCDOT Qualified Products List 20*. The STOP sign face shall have a red background with white letters and border and the SLOW sign face shall have a diamond shaped orange background with black letters and border. The letters shall have a

SUPPLEMENTAL SPECIFICATION

minimum height of 8 inches. The sign faces shall have a minimum mounting height of 7 feet from the bottom of the sign to the grade elevation of the travel lane under control of the AFAD unit.

Supplement the Type II "STOP / SLOW" Sign AFAD unit with active conspicuity devices. Include a steadily illuminated RED lens beacon to illuminate when the STOP sign face is displayed and a flashing YELLOW lens beacon to illuminate when the SLOW sign face is displayed. Each beacon shall have a 12 inch signal lens. Mount the RED lens beacon no more than 24 inches above the top of the STOP sign face and YELLOW lens beacon no more than 24 inches above the top or to the side of the SLOW sign face.

Type B warning lights are PROHIBITED as alternatives to the 12 inch signal lens beacons.

The gate arm shall begin its descent to the down position 2 seconds or more than 4 seconds after the transition to a complete display of the STOP sign face is accomplished and the illumination of the steadily illuminated RED lens beacon. The automated gate arm shall begin its ascent to the upright position not less than 1 second or more than 2 seconds prior to the initiation of the transition from the STOP sign face to the SLOW sign face.

Install a "Wait On Stop" sign (R1-7-30) and a "Go On Slow" sign (R1-8-30) either on the same support structure as the AFAD unit or immediately adjacent to the AFAD unit.

Transition Between STOP and SLOW Conditions -

Transition to STOP condition - The RED lens beacon shall enter into a "flashing mode" no less than 5 seconds prior to transitioning from the SLOW sign face to the STOP sign face. Immediately upon completion of the transition to complete display of the STOP sign face, the "flashing mode" of the RED lens beacon shall transition to a steadily illuminated condition. The gate arm shall begin its descent in not less than 2 seconds or more than 4 seconds after completion of the transition to a complete display of the STOP sign face and illumination of the steadily illuminated RED lens beacon.

Transition to SLOW condition - The STOP sign face shall begin the transition to the SLOW sign face. The gate arm shall begin its ascent to the upright position not less than 1 second prior to the initiation of the transition from the STOP sign face to the SLOW sign face. The RED lens beacon shall cease to illuminate and the flashing YELLOW lens beacon shall begin to illuminate immediately upon completion of the transition of the STOP sign face to the SLOW sign face and the ascent of the gate arm to its completed upright position.

The Type II "STOP / SLOW" Sign AFAD system shall include a fail-safe system with a conflict monitor or similar device to prevent display of conflicting indications between units. Also, the system shall provide indicators to notify the operators of power loss that may impede proper operation of the system.

3. Method of Measurement: Unless otherwise specified, Automated Flagger Assistance Device Systems (AFAD's) are not measured for separate payment but are included in the contract lump sum bid price item Traffic Control as specified in Subsections 107.12 and 601.5 of the *2007 Standard Specifications for Highway Construction*.

4. Basis of Payment: Unless otherwise specified, payment for an Automated Flagger Assistance Device System (AFAD) is included in the contract lump sum bid price item Traffic Control as specified in Subsections 107.12 and 601.5 of the *2007 Standard Specifications for Highway Construction*. The payment shall be full compensation for providing, installing, removing, and relocating as necessary, operating, and maintaining an Automated Flagger Assistance Device System (AFAD). Payment shall include furnishing all labor, hardware, equipment, tools, incidentals, and any miscellaneous items necessary for installing, operating, and maintaining the system.