

WARNING GATE SYSTEM.
(REV 11-27-18)

The following new Section is inserted after Section 654:

SECTION 655
WARNING GATE SYSTEM

655-1 Description.

Furnish and install a Warning Gate System (WGS) for highway traffic operations as shown in the plans.

Automated warning signs must only be visible to motorists when the system is activated. Ensure that signs and gates can be activated individually, in sequence, and in groups. System communication must allow signs and gates to be configured, operated, monitored, and sequenced. The WGS must allow manual, local, and remote operation.

655-2 Materials.

WGS shall consist of one or more warning sign(s) and/or warning gate(s), and communication hardware.

655-2.1 Automated Advance Warning Sign: An automated advance warning sign includes a sign in accordance with Section 700, mounting and assembly hardware, electrical actuator, power supply, and associated electrical enclosures.

655-2.1.1 Automated Advanced Warning Sign Post and Sign Assembly:

Provide a sign post capable of supporting a 48 x 48 inch sign panel unless otherwise shown in the plans. The advanced warning sign must be able to accommodate a flashing beacon, LEDs, or other methods to enhance conspicuity.

655-2.1.2 Warning Sign Base Support Frame with Pivoting Arm: Automated sign bases that utilize a pivoting mechanical arm must be centered on the base support frame. The base support frame must include a built-in anchoring plate. The base must include pre-drilled holes for anchoring to concrete barrier wall. Optional anchoring adaptor plates may be used for mounting to special foundations, bridge railings or other elements. The base support frame must allow for installation on the right and on the left side of the roadway.

655-2.2 Warning Gate Assembly: Provide a warning gate assembly consisting of the warning gate arm, mounting and assembly hardware, electrical actuator, power supply, electronics for control and communication, and associated electrical enclosures.

655-2.2.1 Warning Gate Arm: The warning gate arm must be available in lengths ranging from 2 to 40 feet. The gate arm must be field replaceable without removing the warning gate assembly. Replacement of damaged gate arms must take less than 30 minutes.

Provide gate arms with a minimum height of 16 inches. Gate arms must be retroreflectorized with Type XI sheeting meeting the requirements of Section 994. Shheeting must be alternately red and white at 12 to 24 inch intervals. The face of the gate arm must have a minimum reflective area of 80 square inches per linear foot to the approaching traffic.

The warning gate arm must remain secured in position when open and closed. Gate arms must not sag. The gate arm must be able to move between its open and closed limits within 50 seconds.

655-2.2.2 Warning Gate Base Support Frame with Swing Arm: Provide a gate base support frame including a horizontal mechanical swing arm for warning gate arm support. The base support frame must include a built-in anchoring plate. The base must include pre-drilled holes for anchoring to concrete barrier wall. Optional anchoring adaptor plates may be used for mounting to special foundations, bridge railings, and other elements. The base support frame must allow for installation on the right and on the left side of the roadway.

655-2.3 Electrical Actuators: Pivoting signs and gate arms must be driven by weatherproof electrical actuators. The electrical actuator must be equipped with a system that indicates whether the signage is deployed or retracted. The electrical actuator must include a mechanical or electrical overload protection, such as slip clutch, current (torque) limiter device, or other means. The electrical actuator must be self-locking to provide integrated brake. The electrical actuator must have a hand crank manual override to allow for manual operation of the automated signage during emergencies.

655-2.4 Configuration and Management: Ensure that the system is provided with firmware or software from its manufacturer that allows a user to program, operate, exercise, and diagnose the system. The system must be capable of local configuration, including access to all user-programmable features. The system must also be capable of local and remote operation and device monitoring.

The system must allow a user to save configuration settings to a file and reload configuration settings to the system from a saved file. Programmed parameters for the system must be stored in non-volatile memory.

655-2.5 Communication: The Warning Gate System (WGS) must be remotely controllable using wireless and wired communications.

655-2.5.1 Serial Interface: Ensure that the WGS includes at least one serial data interface that supports EIA/TIA-232 with error detection utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2).

655-2.5.2 Network Interface: Ensure that the WGS includes a copper-based network interface port that utilizes RJ-45 connectors. The network interface must support the requirements detailed in the IEEE 802.3 standard for Ethernet connections.

655-2.5.3 Digital Inputs and Outputs: The WGS must include digital inputs and outputs for contact closure functions.

655-2.6 Cabinets and Small Equipment Enclosures: Cabinets and small equipment enclosures must be currently listed on the APL or meet the applicable criteria of Section 676.

655-2.7 Mechanical: Equipment must be permanently marked with manufacturer name or trademark, part number, date of manufacture or serial number. Do not use self-tapping screws on the exterior of the assembly.

Ensure that all parts are made of corrosion-resistant materials, such as plastic, stainless steel, galvanized steel (ASTM A123-13), anodized aluminum, brass, or gold-plated metal. Ensure that all assembly hardware, including nuts, bolts, external screws and locking washers less than 5/8 inch in diameter, is Type 304 or 316 passivated stainless steel. Stainless steel bolts, screws and studs must meet ASTM F593. Nuts must meet ASTM F594. All assembly hardware greater than or equal to 5/8 inch in diameter must be galvanized. Bolts, studs, and threaded rod must meet ASTM A307. Structural bolts must meet ASTM A325.

655-2.8 Electrical: The system must be able to operate using solar power as well as a nominal voltage of 120 volts alternating current (VAC). Supply an appropriate voltage converter for devices that require operating voltages of less than 120_{VAC}. All power inputs must be fuse

and reverse polarity protected. Systems that operate on 120_{VAC} must include a battery back-up system. The system must be able to recover from power loss and return to an operational state without user intervention.

655-2.8.1 Solar Power: Solar powered systems must be capable of fully autonomous operation 24 hours per day, 365 days per year. Batteries must be suitable for the application and operating environment. Flooded lead-acid batteries are prohibited. Batteries must be capable of providing enough power for warning gates to extend and retract at least 20 times without sunlight. Charging system must use a solar charge controller with temperature compensation. The system must provide for automatic battery charging, overcharge protection, and have indications that display current status and faults.

655-2.9 Environmental: Ensure equipment performs all required functions during and after being subjected to the environmental testing procedures described in NEMA TS2, Sections 2.2.7, 2.2.8, and 2.2.9.

The system must comply with all applicable Federal Communications Commission (FCC) requirements.

655-2.10 Crashworthiness: Ensure the equipment has been crash tested in accordance with NCHRP 350 Test Level 3 or MASH Test Level 3 requirements by an accredited laboratory and found acceptable for use on the National Highway System (NHS) by the FHWA.

655-3 Installation Requirements.

Install the WGS according to the manufacturer's recommendations. Use the size and type of power cables as required by the local electrical code. Power and communication cables (when required) must be placed in conduit. Restore any areas impacted by the installation of the WGS to original condition unless otherwise shown in the Plans.

655-4 Warranty.

Ensure the WGS assembly has a manufacturer's warranty covering defects for a minimum of 3 years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608. Ensure the warranty includes providing replacements, within 10 calendar days of notification, for defective parts and equipment during the warranty period at no cost to the Department or the maintaining agency.

The manufacturer must provide technical support, including software and firmware updates, for the system during the warranty period at no cost to the Department or the maintaining agency.

655-5 Method of Measurement.

The Contract unit price for each WGS furnished and installed, will include furnishing, placement, and testing of all equipment and materials, and for all tools, labor, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, documentation, and incidentals necessary to complete the work.

655-6 Basis of Payment.

Price and Payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 655-	Warning Gate System – each.
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