

ITEM 10599.20M - TRAFFIC CONTROL EQUIPMENT

DESCRIPTION

- (a) The work shall consist of furnishing, installing, and placing in proper operating condition the gongs, warning gates, and bicycle/pedestrian gates, complete with all appurtenances, including anchor bolts, required for proper operation.
- (b) All apparatus for controlling the operation of the traffic signals and gates and all conduits, boxes, wiring, cables, and other equipment required to extend the necessary circuits from the control house to the traffic signals and gates will be furnished and installed under the item "Bridge Electrical Work." The traffic signals, platforms, brackets, and foundations for mounting the traffic control equipment are included under separate pay items.
- (c) It is the intent and purpose of these Specifications to cover and include all apparatus, appliances, material, and labor necessary to properly install, wire, connect, equip, test, adjust, and put in approved working order the respective portions of the work herein specified.
- (d) The electrical work for the traffic control equipment testing shall be in accordance with item "Bridge Electrical Testing".

Conformance

- (a) All equipment and its installation shall conform to the requirements of the latest revision of the Standard Specifications for Movable Highway Bridges of the American Association of State Highway and Transportation Officials, except as may be otherwise provided herein.
- (b) Materials and construction shall conform to the requirements of the current National Electrical Code and to any applicable local rules and ordinances. The Contractor shall obtain any required permits and approvals of all Departments or Agencies having jurisdiction.

MATERIALS

Equipment and Material Provisions

- (a) All equipment and materials shall be new. All equipment, materials, and workmanship shall be first-class in every particular and shall be manufactured and erected to the satisfaction of the Engineer. The Contractor shall warrant the in-service working of the traffic control equipment for one year following the date of project acceptance. If the Contractor has any objection to any feature of the equipment as designed and laid out, he must state his objection at once, in writing, to the Engineer; otherwise, his objection will be ignored if offered as an excuse for malfunctioning of the equipment or for defective or broken apparatus.
- (b) Each piece of electrical equipment and apparatus shall have a corrosion-resisting metal nameplate, on which is stamped the name of the manufacturer and the rating or capacity of the equipment or apparatus.

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- (c) All metal parts of the installation, except structural steel, shall be of corrosion-resisting material such as aluminum, bronze, or stainless steel. Cast-iron, malleable iron, or steel with a hot-dip galvanized finish shall be used where specified herein or permitted by the Engineer. Structural steel shall conform to the requirements given under the item "Structural Steel."
- (d) All mounting hardware and all wire and cable terminals shall be vibration-proof.
- (e) If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefor shall be submitted for approval as soon as practicable. No such departures shall be made without approval of the Engineer.
- (f) Material requirements for apparatus, equipment, and materials will be found in the articles under "Construction" in this item.

CONSTRUCTION

Working Drawings and Samples

- (a) The Contractor shall prepare and submit for review, within 90 days after the award of the Contract, the following working drawings executed in accordance with the provisions of the Contract:
 - i. Assembly drawings of the gate stands locating and identifying all apparatus and equipment inside.
 - ii. Arrangement and complete construction details of the gate operating machinery.
 - iii. Detail drawings showing the construction of gate arms, including provisions for guying and bracing.
 - iv. Wiring diagrams of all gate electrical equipment, including development diagrams for the gate limit switches. All wires shall be suitably numbered.
- 1. Certified dimension prints of apparatus shall state in the certification the name of the job, the application of the apparatus, device designation, number required, right-hand or left-hand assembly, electrical rating, number of poles or contacts, material, finish, and any other pertinent data to show that the apparatus meets the specified requirements.
- 2. The preparation and submission of the electrical working drawings shall meet the provisions for Shop Drawings given in the New York State Steel Construction Manual.
- 3. The Contractor shall also furnish seven copies of complete maintenance and servicing data for the warning gates and bicycle/pedestrian gates. This data shall be incorporated in the instruction books provided under the item "Bridge Electrical Work."

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Factory Inspection and Testing

1. The warning gates and bicycle/pedestrian gates shall be subject to inspection and witnessed testing at the plant of the manufacturer by the Engineer's representative to demonstrate proper operation and adjustment. The equipment shall not be shipped from the plant until it has been sealed and tagged with the approval of the Engineer or his representative.
2. The manufacturer of the warning and bicycle/pedestrian gates shall perform an insulation resistance test per NEMA Standard MG-1, Section Nos. 12.02 and 12.03 for both the motor and brake in each warning and barrier gate. Test reports shall be reported on the standard forms for induction motors of the National Electrical Manufacturers Association. All test reports shall be certified by the manufacturer and five copies of each shall be submitted.
3. The Contractor shall arrange for and provide all necessary field tests, as directed by the Engineer, to demonstrate that all traffic control equipment is in proper working order and in accordance with the Plans and Specifications. Should the tests show that any piece of equipment or apparatus, in the judgement of the Engineer, is defective or functions improperly, such adjustments or replacements shall be made by the Contractor as to make the installation satisfactory to the Engineer and at no extra cost to the Department.
4. During the field testing period, the Contractor shall arrange to have at the site a representative of the manufacturer of the gates. This representative shall be capable of supervising all adjustments to the equipment; of locating faults or defects and correcting them if possible; and of obtaining from the manufacturer, without delay, new parts or replacements for apparatus which, in the opinion of the Engineer, does not perform satisfactorily.
5. Field operational testing of the gates shall demonstrate the balance condition of the gate arms such that a stationery arm remains in the same position when the brake is released, proper manual operation and operational features specified herein.

Warning Gates and Gongs

- a) New electric motors and rotary limit switches for operation of the new warning gates are to be installed. Single arm, warning gates of the railway grade-crossing type, shall be furnished and installed at the approach roadways for the bridge where shown on the Plans. Final motor horsepower shall be determined by the gate manufacturer according to arm length, accessories and other requirements as stipulated by this specification. Each gate shall be B&B Electromatic Model VT-40 or Engineer approved equal manufactured by Roadway Manufacturing or Federal Signal Corporation.
- b) The warning gates shall be the standard rotation type with a pedestrian arm. Access into the gate stand shall be from front and back of the housing.
- c) Each warning gate shall have an arm of the length shown on the Plans, which shall open through an angle of 90 degrees from the horizontal to the vertical. Each warning gate shall have a welded steel stand arranged to provide a watertight housing for the motor, disconnect switch, gear train, limit switch, and fuses for warning lights. The warning gate stands shall be hot-dip galvanized after fabrication. Gear reducers for driving the arms shall be totally

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enclosed in oil-tight steel housings and shall be automatically lubricated. Oil sight gages shall be provided. Watertight, gasketed doors shall be provided for access to the operating equipment. A hand crank shall be provided for manual operation of each warning gate and stored inside the warning gate housing.

- d) The warning gate arms shall be made of a pair of high strength 6061-T6 aluminum tubes, spaced 279mm apart in a vertical plain. Each warning gate arm shall be adequately braced transverse to its motion to resist wind loads and to reduce whipping and shall be guyed to prevent sagging. Each assembled warning gate arm shall be designed for a 161 kilometer-per-hour wind load. A bumper rod with compression spring shall be provided near the end of each warning gate arm to stop the travel at the closed position without undue shock. Warning gate arms shall be equipped with guy wires configured in such a way that they do not project beyond the warning gate housing into the sidewalk when the warning gate is in the vertical position.
- e) All bolts, screws, or other fastenings used in the warning gate arm assembly and for connection to the warning gate stand shall be of corrosion-resisting metal or shall be hot-dip galvanized.
- f) Gate arms shall be striped with alternate red and white reflectorized stripes 406mm wide measured parallel to the edge of the warning gate arm. The stripes shall slope downward at an angle of 45 degrees toward the center line of the roadway.
- g) The number of warning lights on the warning gate arms shall be as shown on the Plans. Each warning light shall be a weatherproof, two-way, cast-aluminum unit with red Fresnel lenses, front and back. The lights shall be interconnected and grounded with four-conductor portable cord using watertight connectors at the fixtures. A 120 volt, 67-watt, clear traffic signal lamp shall be installed in each fixture. The lights shall be connected so that adjacent units will flash alternately. Fuses for the warning lights shall be 10-ampere midget cartridge fuses installed in molded rubber connection kits.
- h) The flasher shall be B & B Model AW25-400, or Engineer approved equal, manufactured by Roadway Manufacturing. It shall be a 120 VAC solid state flasher having two alternately flashing circuits and one steady burn circuit. The flasher shall be designed for heavy duty applications.
- i) The flasher assembly shall include mounting hardware as required, solid state flasher circuitry, a terminal block, silicon heat sink compound, and a transformer when required. The flasher assembly shall be fully wired at the factory. The flasher base plate compound shall be anodized for corrosion protection. All components shall be of industrial quality. The terminal block shall be clearly marked for field connections. The flash rate for the two alternately flashing circuits shall be .50 seconds on, .50 seconds off. An additional steady burn circuit shall be provided for the lamp farthest from the gate stand drive unit
- j) During the opening and closing cycles, the warning gate arm shall begin with zero velocity and accelerate smoothly reaching maximum velocity at mid stroke (45 degrees). The arm shall then decelerate smoothly to zero velocity at full stroke (90 degrees) preventing bounce or whip of the arm. Standard operating time to open or close the gate shall be 13 seconds.
- k) An 8-circuit limit switch shall be provided in each warning gate operated by the warning gate mechanism. Each limit switch shall be a rotary, cam-type, switch; and it shall be gear

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driven from the transmission. The contacts shall be quick-break with silver alloy buttons. The limit switch shaft shall be stainless steel, and cams shall be secured thereto with set screws. A hand crank limit switch with 1 NO and 1 NC contacts shall be provided to prevent electrical operation of warning gates while hand cranking. Insertion of the crank shall release the brake and make the electrical controls inoperative.

- l) The transmission shall be a fully enclosed, all gear, direct drive unit running in an oil bath. The drive train shall not use belts or chains and shall be connected to the arm shaft with an adjustable connecting rod having self-aligning ball ends. The connecting rod shall be constructed of ASTM A311 Class B high strength, fatigue resistant steel.

During the opening and closing cycles, the gate arm shall begin with zero velocity and accelerate smoothly reaching maximum velocity at mid stroke (45 degrees). The arm shall then decelerate smoothly to zero velocity at full stroke (90 degrees) preventing bounce or whip of the arm. Standard operating time to open or close the gate shall be 13 seconds.

- m) The motor shall be furnished as part of the warning gate by the warning gate manufacturer. Each motor shall be a totally-enclosed, 460-volt, three-phase, 60-cycle, ball-bearing induction motor and shall be capable of withstanding instant reversal when running at full speed. Each motor and gear train shall be capable of opening and closing the warning gate in about 13 seconds. A motor-mounted, spring-set, 460 VAC, solenoid-release, disc brake shall be provided for stopping and holding the mechanism. Drum type brakes shall not be accepted. The drive mechanism and motor brake shall be capable of holding the gate vertical against a wind load of 161 kilometers-per-hour. The brake shall automatically release when the handcrank is inserted to manually operate the warning gate. A watertight disconnect switch shall be provided to permit disconnecting the motor and brake from the incoming power. The switch shall be Pass & Seymour Cat. No. 7813-EX, or Engineer approved equal manufactured by O-Z/Gedney or Crouse Hinds.
- n) Each warning gate motor shall be controlled by a magnetic reversing contactor, electrically and mechanically interlocked, and shall be protected by a three-element, thermal overload relay, with automatic reset to be provided under this item. This equipment shall be mounted in the motor control center under item "Bridge Electrical Work."
- o) All internal wiring for each warning gate shall be brought to numbered terminal blocks inside the housing for the connection of external circuits.
- p) Each warning gate shall be bolted to its concrete or steel base as indicated on the Plans. In erecting the warning gates, the double rail aluminum arms shall be carefully attached to the supporting members so as to make a rigid connection. The arms shall be counterbalanced and the limit switches and crank arms adjusted so that the arms are stopped in a truly vertical or horizontal position, within 1 degree.
- q) All components of the warning gate operating mechanism shall be housed in a welded steel housing, hot-dip galvanized inside and out after fabrication. Doors shall be provided on the housing, large enough for convenient removal of the largest component of the operating mechanism. Doors shall be provided with neoprene gaskets, stainless steel swing bolts and catches, and safety interlock switches.
- r) Each warning gate housing shall be equipped with a thermostatically controlled heater; switched service light; and duplex, 15-ampere, 120-volt, Specification Grade GFI receptacle.

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A 15-ampere circuit breaker shall protect the above units and be mounted in the warning gate housing. Provisions for hand cranking, including crank, and limit switch, shall be furnished.

- s) Each warning gate housing shall be furnished with lockable doors and chain-attached bronze padlocks. All locks shall be keyed alike.
- t) A warning gong shall be mounted on the top of the warning gate housings. Each warning gong shall be a weatherproof, motor-operated, vandal-proof, 305mm gong mounted in a heavy-duty, cast-aluminum housing with hinged back door. The gong shall be of cast-bronze, fire alarm metal. Each gong shall be approved equal to the Type Z-555BR Warning Gong as made by the B&B Electromatic Corporation, the Western-Cullen No. 555, or the Security Products Division of Federal Signal Corporation Type 555. Gongs shall be painted and mounted with hardware in such a way as to prevent theft.
- u) Each warning gate shall be operated from individual selector switch stations on the control desk. The raise and lower circuitry shall be arranged such that the warning gate will stop immediately when the selector switch is released. In addition, the warning gates shall be provided with a group raising and selector switch station. After a momentary contact of the selector switch, all gates shall travel to their fully raised limits. The group shall stop immediately upon momentary contact of the group's stop pushbutton.
- v) New control equipment, conduit, and wiring for the new warning gates shall be installed under item "Bridge Electrical Work." Under this item, the warning gate motors, rotary limit switches, space heater, and accessories installed inside the new warning gate housings shall be adjusted by the Contractor as required to provide the specified operation of the warning gates as shown on the Plans and as called for in these specifications.
- w) All electrical work for the connection, operation and control of the new gates including the control apparatus, switches, conduits, boxes cables and other equipment shall be furnished and installed under this item. The work shall also include adjustment of all apparatus and overload devices to provide proper functioning of the equipment.

Bicycle/Pedestrian Gates

- a) New electric motors and rotary limit switches for operation of the new gates are to be installed. Single panel bicycle/pedestrian gates shall be furnished and installed on the approach roadway where shown on the Plans. Each gate shall be B&B Electromatic Model SWP-7010 or Engineer approved equal manufactured by Roadway Manufacturing.
- b) The gates shall be horizontal swing. Access into the gate stand shall be front and back of the housing.
- c) The operating mechanism shall move the gate arm through 90 degrees of travel in about 15 seconds against a wind load of 161 kilometer- per-hour. The motor for each gate shall be a 460-volt, three-phase, 60-cycle, high-slip, NEMA Design C, ball-bearing, totally-enclosed, non-ventilated, weatherproof, squirrel-cage motor. Final motor horsepower shall be determined by the gate manufacturer according to arm length, accessories and other requirements as stipulated by this specification. The gate shall be held at each end of travel by a 460 VAC, mechanically-set, electrically-released, motor-mounted brake. The drive mechanism and motor brake shall be capable of holding the gate horizontally against a wind load of 161 kilometers per hour.

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- d) Each gate motor shall be controlled by a magnetic reversing contactor, electrically and mechanically interlocked, and shall be protected by a three-element, thermal overload relay, with automatic reset to be provided under this item. This equipment shall be mounted in the motor control center under item "Bridge Electrical Work".
- e) Gear reducers for driving the arms shall be totally enclosed in oil-tight steel housings and shall be automatically lubricated. Oil sight gages shall be provided. All driving components shall be proportioned so that the maximum stress in any part does not exceed 50 percent of the yield point of the material at the stalled torque of the motor.
- f) An 8-circuit limit switch with adjustable cams, driven by the gear train, shall be provided for control of the barrier gate and for interlocking. A motor disconnect switch shall be installed in the gate housing. Reversing contactors shall be mounted on the motor control Center under "Bridge Electrical Work".
- g) The transmission shall be a fully enclosed, all gear, direct drive unit running in an oil bath. The drive train shall not use belts or chains and shall be connected to the arm shaft with an adjustable connecting rod having self-aligning ball ends. The connecting rod material shall be ASTM A311 Class B high strength, fatigue resistant steel.
- h) During the opening and closing cycles, the gate panel shall begin with zero velocity and accelerate smoothly reaching maximum velocity at mid stroke (45 degrees). The arm shall then decelerate smoothly to zero velocity at full stroke (90 degrees) preventing bounce or whip of the arm. Standard operating time to open or close the gate shall be 13 seconds.
- i) Provisions shall be made for hand operation, and a hand crank shall be furnished for each gate.
- j) All conductors shall be brought to numbered terminal blocks for connection of incoming wiring.
- k) All components of the operating mechanism shall be housed in a welded steel housing having a minimum plate thickness of 6mm. The entire housing shall be hot-dip galvanized inside and out after fabrication.
- l) Doors shall be provided in the housing, large enough for the convenient removal of the largest component of the operating mechanism. Doors shall be equipped with neoprene gaskets, silicon bronze hinges with stainless steel pins, stainless steel catches and bolts, and chain-attached padlocks with common keys.
- m) An opening shall be provided for inserting the hand crank. Insertion of the crank shall release the brake and make the electrical controls inoperative.
- n) Each gate housing shall be equipped with a thermostatically controlled heater, switched service light, duplex, 15-ampere, 120-volt, Specifications Grade GFI receptacle. A 15-ampere circuit breaker shall protect the above units and be mounted in the barrier gate housing.
- o) Gate panels shall be fabricated of high strength 6061-T6 rectangular aluminum tubing as shown on the Plans. Welding shall meet the requirements of the American Welding Society's Structural Welding Code - Aluminum D1.2.

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- p) Gate lights shall be two-way, cast-aluminum units with red Fresnel lenses, front and back, and provided with 120-volt traffic signal lamps. The lights shall be interconnected and grounded with four-conductor flexible cables, using watertight connectors at the fixtures. The lights shall be of the same type as specified for the warning gates, and they shall be connected to flash alternately.
- q) The gate housings shall be set first. Before the anchor bolts are tightened and the housings permanently set, their position shall be verified by checking that the axis of rotation is parallel to the bridge center line and that the support arms are correctly spaced apart for mounting the gate panels.
- r) After the housings are set, the gate panels shall be attached using the nominal shim thicknesses. The shims shall be adjusted so that the panels are truly horizontal in the open position.
- s) When the gates are electrically operable, they shall be operated as in normal use and the limit switches adjusted so that each arm is stopped within 1 degree of the vertical or horizontal position.
- t) Gate panels shall be striped with alternate red and white reflectorized stripes 406mm wide measured parallel to the edge of the barrier gate arm. The stripes shall slope downward at an angle of 45 degrees toward the center line of the roadway.
- u) Each gate shall be operated from individual selector switch stations on the control desk. The open and close selector switch circuitry shall be arranged such that the gate will stop immediately when the lower or raise selector switch is released. In addition, the two gates shall be provided with a group opening and closing selector switch station. After a momentary contact of the selector switch, all gates shall travel to their fully opened limits. The group shall stop immediately upon momentary contact of the group's stop pushbutton.
- v) New control equipment, conduit and wiring for the gates shall be installed under item "Bridge Electrical Work". Under this item, the gate motors, rotary limit switches, space heaters, and accessories installed inside the new housings shall also be adjusted by the Contractor as required to provide the specified operation of the gates as shown on the Plans and as called for in these Special Provisions.
- w) All electrical work to provide for the connection, operation, and control of the new gates including control apparatus, switches, conduits, boxes, cables, and other equipment, shall be furnished and installed under this item. The work shall also include adjustment of all apparatus and overload devices to provide proper functioning of the equipment.

Concrete Foundations

- (a) Anchor bolts shall be as indicated on the Plans. Electrical conduits shall be as hereinbefore specified under the item of "Bridge Electrical Work." Galvanizing shall be in accordance with ASTM A153.

Spare Parts

- (a) Spare parts shall be furnished and packed in suitable cartons for storage. They shall include, but not be limited to the following:

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For the warning gates:

1. 1 motor, complete with motor pinion.
2. 1 limit switch with operating mechanism.
3. 6 warning light fixtures, complete with lamps.
4. 12 lamps for warning lights.
5. 2 gate arms

For the bicycle/pedestrian gates:

1. 1 motor, complete with motor pinion.
2. 1 limit switch with operating mechanism
3. 6 warning light fixtures with lamps.
4. 1 gate panel.

For the traffic lights:

1. 2 of each color traffic light lens installed including gaskets.
 2. 12 traffic signal lamps.
- (x) The Contractor shall arrange the spare parts in uniform size cartons of substantial construction, with typed and clearly varnished labels to indicate their contents. The cartons shall be stored where directed by NYSDOT.
- (y) The cost of supplying the spare parts listed above shall be included in the lump sum price bid for the "Traffic Control Equipment."

METHOD OF MEASUREMENT

Payment will be made on a lump sum basis.

BASIS OF PAYMENT

- (a) The Contractor shall submit to the Engineer a detailed breakdown of his costs under this item within 30 days of award of the Contract. This breakdown will be evaluated by the Engineer, and an equitable basis of payment will be established. A minimum of 5 percent of the bid will be retained by the State until final acceptance of the traffic control equipment.
- (b) The lump sum bid for "Traffic Control Equipment" shall include the cost of all labor, materials, and equipment necessary for a complete installation, ready for operation.

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- (c) Progress payments for work satisfactorily completed will be made in accordance with the pre-established breakdown.