

**DIVISION 69**  
**TRAFFIC SIGNAL CONTROL CABINET**

This specification sets forth the minimum requirements for a control cabinet assembly. The cabinet assembly shall meet, as a minimum, all applicable sections of the NEMA Standard Publication No. TS-2 2003. All cabinets shall meet the requirements of a NEMA 3 R rating, and shall be U.L. listed as an entire unit. Where differences occur, this specification shall govern.

**69.0 CABINET DESIGN AND CONSTRUCTION**

**69.1 GENERAL**

69.1.1 The cabinet and door shall be constructed from type 5052-H32 aluminum with a minimum thickness of 0.125 inches. The top, door, and each side of the cabinet shall each be a single sheet of aluminum. Welding pieces together to form any of these surfaces shall not be permitted. External welds shall be made by using the Heliarc welding method, whereas internal welds will be made by the wire welding method. All welds shall be neatly formed and free of cracks, blowholes, and other irregularities.

69.1.2 All inside and outside edges of the cabinet shall be free of burrs. All sharp edges shall be made smooth.

69.1.3 The cabinet shall be designed and manufactured with materials that will allow ridged mounting, whether intended for pole, base or pedestal mounting. The cabinet must not flex on its mounting.

69.1.4 A rain channel shall be incorporated on all four (4) sides of the main door opening to prevent liquids from entering the enclosure. Cabinet door openings shall be double flanged outward on all four (4) sides to produce the rain channel.

69.1.5 The top of the cabinet shall incorporate a 1" (inch) slope toward the rear to prevent rain accumulation.

69.1.6.1 The cabinet shall be supplied with a natural aluminum finish on the exterior. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be cleaned of all oil residues and shall be free from weld flash.

69.1.7 All interior seams shall be sealed with RTV sealant or equivalent material.

69.1.8 All cabinets shall be supplied with three removable shelves manufactured from 5052-H32 aluminum having a minimum thickness of 0.125 inches. Shelves shall have a minimum depth of 10.5 inches.

69.1.9 One set of vertical "C" channels shall be mounted on each interior wall of the cabinet for the purpose of mounting the cabinet components. The mounting channels shall provide infinite horizontal and vertical adjustments of mounted equipment and shelves. The channels shall accommodate spring-mounted nuts or studs. All mounting rails shall extend to within four (4) inches of the top and bottom of the cabinets. Rivets or pop-rivets of any kinds shall not be used in the cabinet or on the main panel. No bolts or screws shall protrude through the outside walls, top, bottom, or sides of the cabinet.

69.1.10 The cabinet shall be supplied with four (4) anchor bolts to properly secure the cabinet to its base.

69.1.11 The cabinet shall have an open bottom that is surrounded by a heavy duty attachment flange (lip) made of double thickness material having a minimum thickness of 0.25 inches. Around the opening, the flange shall be three (3) inches wide, plus or minus one-half (2) inch. One inch slots shall be provided in all four corners for the anchor bolts.

69.1.12 Each cabinet shall be of sufficient size to accommodate all equipment without crowding. Each piece of equipment shall have its own space on a shelf. It shall not be necessary to move any other piece of equipment in order to service any component or unit. All auxiliary equipment shall be accessible for removal or installation without moving any other component in the cabinet. The maximum cabinet size is as follows: 54" H x 44" W x 26" D

69.1.13 All cabinets shall be equipped with a three (3) position alarm and light switch bracket. This bracket shall be attached to the top right corner of the door opening. One switch shall control the cabinet interior LED lights. One switch shall control power to a single outlet for monitor function that will be mounted on the right side of the interior of the cabinet. The final switch that is normally closed shall provide a logic ground input to the alarm 1 input on the traffic signal control upon opening the cabinet door.

69.1.14 The complete cabinet circuitry diagram shall be shown on a 24" x 36" drawing.

69.1.15 The diagram shall include the designated intersection location as specified on the plans or purchase order.

69.1.16 Included on the diagram shall be an intersection plan view with all poles, cabinet phases and detectors shown.

69.1.18 A listing indicating all terminal numbers with a description of its use shall be attached to the inside of the cabinet door and overlaid with a clear plastic covering. All edges of the plastic shall extend beyond the listing and be sealed with a clear weatherproofing compound.

69.1.19 A 2" X 4" (minimum size) identification plate with the intersection name, the City of Chesapeake, and cabinet circuitry diagram number shall be permanently affixed to the inside of the main cabinet door in the upper right hand corner. An engraved plastic plate is preferred.

## 69.2 DOORS and HARDWARE

69.2.1 A stiffener plate shall be welded across the inside of the main door to prevent flexing. The stiffener plate shall not cover nor prevent access to any door component(s).

69.2.2 The lower section of the cabinet door shall be equipped with a louvered air entrance. The air inlet shall be large enough to allow sufficient airflow per the rated fan capacity. Louvers must satisfy the NEMA rod entry test for 3R ventilated enclosures. A removable, fiberglass air filter shall be supplied with each cabinet. The filter shall be secured to the air entrance in such fashion as to maintain close contact, at all times, to the louvered air entrance. The filter retainer shall be a slide fit design with no bolts or springs utilized to secure the filter to the door opening. The filter shall be 14" X 20" X 1".

69.2.3 The roof of the cabinet shall incorporate an exhaust plenum with a vent screen. Perforations in the vent screen shall not exceed 0.125 inches in diameter.

69.2.4 The main door shall be equipped with a three-point draw roller type latching mechanism. The push rods shall be turned edgewise at the outward supports and shall be 0.250 inch by 0.750 inch aluminum minimum. The push rods shall maintain a uniform thickness along their entire length. A reduction in thickness at the center latch point shall not be accepted.

69.2.4.1 Rollers shall have a minimum diameter of 0.875 inches and will be made of nylon. The center catch shall be fabricated from 0.187 aluminum minimum.

69.2.5 The handle on the door shall utilize a stainless steel shank of 5/8 inches minimum diameter. The handle shall include a hasp for the attachment of an optional padlock. The cabinet door handle shall rotate counter-clockwise to open. The handle shall not extend beyond the perimeter of the main door at any time. The lock assembly shall be positioned so that the handle shall not cause any interference with the key when opening the cabinet door. When the door is closed and latched, the door shall automatically lock. It shall not be necessary to use a key in order to lock the door.

69.2.6 The cabinet door and police panel door hinges shall be a one-piece, continuous piano hinge. The hinge shall be located on the right side of the door when viewed from the front. The hinge and pin shall run the entire length of the door. All cabinet and police panel door hinge pins shall be capped at the top and bottom by weld to render the pin tamper proof.

69.2.6.1 The hinges shall be made of 0.078-inch thick stainless and shall have a 2-inch open width with a 0.250-inch diameter stainless steel hinge pin. Door hinge shall be bolted to the cabinet and door with a 1/4-20 stainless steel carriage bolts and ny-lock nuts.

69.2.7 The door and shall be equipped with a mechanism to automatically hold the door open at approximately 90, 125, and 150 degrees, in windy conditions. The mechanism shall be pinned to prevent separation from the track. The door holding track shall be reinforced and continuously welded along its top and bottom. Manual placement of the mechanism shall not be required by the field technician. A manual door holding mechanism shall be provided at the opposite end of the door from the above noted system for use in high wind conditions.

69.2.8 The door shall be equipped with a Corbin tumbler lock number 15481RS or approved equivalent. The lock shall be of brass construction, and shall have a swing-away cover. Two Virginia No. 2 keys shall be supplied and attached to each cabinet door upon shipment.

### 69.3 POLICE SWITCH COMPARTMENT

69.3 A switch compartment shall be provided on the main door.

69.3.1 The opening for the switch compartment door shall be double flanged on all four sides and shall incorporate a rain channel on all four sides.

69.3.2 The police door-in-door shall be provided with a treasury type lock Corbin No. R357SGS series, or approved equivalent. The lock shall be of brass construction, and shall have a swing away cover. All cabinets shall have a police panel door that utilizes a slam shut type latching mechanism. Two police keys shall be supplied and attached to each cabinet door upon shipment.

69.3.3 The door hinge for the switch compartment shall be 0.063-inch stainless steel with a 0.120-inch diameter stainless steel hinge pin.

69.3.4 The police panel shall be furnished with two toggle switches, each labeled for its purpose. One switch will be used to place the signal in flashing operation and shall not affect the power being supplied to the controller and the conflict monitor. Upon placement of the switch from the automatic position to the flash position, the intersection shall immediately be placed in flashing operation and stop timing shall be applied to the

controller. Upon placement of the switch from the flash position to the automatic position, the signals shall immediately be placed in automatic operation in the major street through phase green interval and stop timing to the controller shall be canceled. The second switch shall be used to allow manual operation of the controller phasing. A ¼" phone jack shall be installed for connection of a corded pushbutton control. The pushbutton control is required to be provided. Both toggle switches shall be installed so the normal mode of operation is when the switches are in their "up" position

69.3.5 Cabinet to include the following alarms:

- 1 – Cabinet Door Open
- 2 – Surge Arrestor Failure
- 3 – Technician Flash
- 4 – Police Flash
- 5 – UPS Status
- 6 – UPS Low Battery
- 7 – UPS Timer
- 8 – UPS Service
- 9 – UPS Bypass Activation

69.4.0 TYPE 1 TERMINALS AND FACILITIES MAIN PANEL DESIGN

69.4.1 The main panel shall be constructed from 5052-H32 brushed aluminum of 0.090 inches minimum thickness and formed so as to minimize any flexing when plug-in components are installed.

69.4.2 All main panels shall be hinged at the bottom to allow easy access to all wiring on the rear of the panel. The cabinet back panel conductors shall be arranged to allow the top of the panel to be tilted out through the main cabinet door. Removal or disconnecting of any conductors or equipment mounted on the side walls of the cabinet shall not be necessary.

69.4.3 The main panels shall be fully wired in the following configuration:

→ Type 1 Configuration 4 - Sixteen load switch sockets, (eight vehicle sockets, four pedestrian sockets and four overlap sockets) eight flash transfer relay sockets, one flasher socket and two main panel BIU rack positions.

69.4.4 Reference designators for all load switches, flash transfer relay sockets, and other back panel terminals shall be silk-screen labeled on the front and rear of the main panel. The labeling

shall also include each terminal function and channel number. Phase and channel numbers shall also include the appropriate color code for the signal indication or pedestrian indication.

All load switch sockets may be positioned horizontally or stacked in two rows on the main panel. All load switch sockets and flash transfer sockets shall be mounted on the main panel only.

69.4.5 A support located at approximately 2/3 the length of the load switch shall support all load switches. This support must be rigidly mounted to the main panel and be removable for maintenance without the use of hand tools.

69.4.5.1 In Type 1 Main Panels, rack style mounting shall be provided to accommodate the required BIU's per the configuration listed in section 3.3 above. A dual-row, 64-pin female din 41612 Type B connector shall be provided for each BIU rack position. Card guides shall be provided for both edges of the BIU. Terminal and facilities BIU mounting shall be an integral part of the main panel. Detector rack BIU mounting shall be an integral part of the detector rack.

69.4.5.2 In Type 1 Main Panels all BIU rack connectors shall have pre-wired address pins corresponding to the requirements of the TS 2 Specification. The address pins shall control the BIU mode of operation. BIU's shall be capable of being interchanged with no additional programming. The BIU pin outs shall be as shown in Appendix D.

69.4.6 All sixteen position main panels shall have all field wires terminated within one or two rows of horizontally mounted terminal blocks. If two rows are used, the upper row shall be wired for the pedestrian and overlap field terminations. The lower row shall be reserved for phase one through eight vehicle field terminations.

69.4.6.1 A loading resistor having a nominal value of 2,000 ohms - 11 watt, shall be installed between the ground buss and each green and yellow signal output field connection terminal for vehicle phases one through eight, each overlap movement, and each pedestrian walk movement.

69.4.6.2 A loading resistor having a nominal value of 2,000 ohms - 11 watt, shall be installed between the ground buss and red signal output field connection terminal for vehicle phases 1, 3, 5, 7, each overlap movement and each pedestrian don't walk movement.

69.4.7 All field output circuits shall be terminated on a non-fused terminal block with a minimum rating of 20 amps.

69.4.8 Permanent alphanumeric labels shall identify all field input / output (I/O) terminals. All labels shall use standard nomenclature per the NEMA TS 2 Specification. Phase and channel numbers shall also include the appropriate color code for the signal indication or pedestrian indication.

69.4.9 Type 1 Main Panels shall have as a minimum, terminals provided for the input / output signals listed in table 5.3.1 - 2 for terminal facilities configurations 3 and 4 of NEMA TS 2 - 2003 Standard.

69.4.10 All flash color selection shall be accomplished at a terminal block located just above the field terminals with the use of a screwdriver only. It shall also be possible to select through terminal connections which of the two flasher circuits is connected to each phase. All cabinets shall be wired so that flasher circuit output #1 shall be wired for phases 2, 3, 6, and 7, overlap B and overlap D. Flasher output circuit #2 shall be wired for phases 1, 4, 5, and 8, overlap A and overlap C. Unless otherwise specified on plans, purchase order or request for bid, all cabinets shall be pre-wired to flash phases 2 and 6 yellow and all other phases and overlaps red.

69.4.11 Field terminal blocks shall be wired to use three positions per vehicle, pedestrian and overlap phase. All bolts and screws used for electrical connections shall be stainless steel. All equipment grounds shall run directly and independently to the Earth ground bus bar. All neutral conductors shall be carried throughout the cabinet without a break, splice, or fuse unless otherwise noted. A separate insulated Neutral Bus Bar with a minimum of twenty positions sized to allow three #12 wires per terminal shall be mounted to the lower portion of the cabinet wall on each side of the cabinet. A separate Earth Ground Bus Bar with a minimum of ten positions sized to allow three #12 wires per terminal shall be mounted to the lower portion of the cabinet wall on each side of the cabinet. The mounting of each bus bar shall be ridged with minimal flexing at all points on the bar.

69.4.11.1 Signal output terminals shall be screw type, Compression type termination shall not be acceptable.

69.4.12 The power panel shall contain a flasher socket capable of operating a 15-amp, 2-pole, NEMA solid state flasher. A bracket that extends at least half its length shall support the flasher.

69.4.13 As a minimum, a RC network shall be wired in parallel with each group of three flash-transfer relay coils. A RC network shall be installed on all other relay coils.

69.4.14 All logic-level, NEMA Controller Unit and Malfunction Management Unit input and output terminations on the main panel shall be permanently labeled. Cabinet prints shall identify the function of each terminal position. All screws and terminals shall be made of stainless steel.

69.4.15 Type 1 Main Panel terminal blocks for DC signal interfacing shall have a number 6-32 x 7/32-inch screw as a minimum. All screws and terminals shall be made of stainless steel. Functions to be terminated shall be as specified in the listing of input / output Terminals in the NEMA TS 2 - 2003 Standard document (Section 5).

69.4.16 Cabinet to include:

- 1- Type 16 Malfunction Management Unit (MMU-2) with Integral Ethernet Port
- 1- Power Supply
- 4- Bus Interface Units (BIUs)
- 16- Load Switches
- 4- Flash Transfer Relays
- 2- Solid State Flashers
- 1 – Cabinet Display Panel – 171-1910-504
- 3 – 6 ft. Ethernet Cables
- TimeSync-GPS to allow controller time sync redundancy (installed)

HESCORLS HE1700RS Surge Protector

- 1- COMNET / CNGE3FE7MS3 Environmentally Hardened Managed Ethernet Switch with (7) 10/100TX + (3) configurable 10/100/1000TX / 100/1000FX Ports

Emergency Pre-emption shall be GTT Opticom System Intersection Equipment, to include Model 764 Multimode Phase Selector and (4) sensors.

The Detection System shall be the Sensys Mag Flex (Roadway Embedded Magnetometers) and all associated cables, repeaters and processors)

Cellular Modem- Model TELIG E-1500 with external antenna (SIM CARD provided by the City).

Manual Pushbutton with 15' cable for intersection Police control

- 4- 3/4"x11" galvanized anchor bolts with 5" L bend and 8 each nuts and flat washers

MEASUREMENT OF PAYMENT: This item will not be measured as a separate pay item but will be paid for under the lump sum price of the traffic signal shown on the unit price table as traffic signal.