CHAPTER 3

TRAFFIC SIGNAL DESIGN – CABINETS AND EQUIPMENT

3.1 Traffic Signal Cabinet

The traffic signal cabinet houses the control equipment at an individual intersection. The traffic signal cabinet equipment shall be in accordance with current TDOT standards and specifications, the *NEC* and the *NESC*. The following information should be considered in regards to traffic signal cabinets:

- **Location:** Traffic signal cabinets should be located as far as practical off the edge of the roadway and in the same intersection quadrant as the power source whenever possible. Traffic signal cabinets shall not be placed within the pedestrian walkway portion of a sidewalk if it obstructs ADA pathway and protection requirements. Traffic signal cabinets should have easy access for parking of maintenance vehicles and should be oriented for maintenance personnel to simultaneously see the inside of the cabinet and traffic signal displays for several phases, thus making troubleshooting and field observations more effective. In other words, the traffic signal cabinet door should not be facing the roadway. Consideration should also be given to the effect of cabinet placement on sight distance.
- **Cabinet Mounting:** There are two types of mounting for traffic signal cabinets:
  - Pole-Mounted Cabinets
  - Ground-Mounted Cabinets
- **Service Pads:** All ground-mounted controller cabinet installations not immediately adjacent to a sidewalk shall be provided with a service pad in front of the cabinet door for use by maintenance personnel.
- **Cabinet Construction:** Cabinets shall be constructed of aluminum. Standard cabinet sizes are shown in TDOT *Standard Drawing T-SG-5*.
- **Bonding and Grounding Requirements:** All bonding and grounding shall be in accordance with the NEC. Bonding is defined in the NEC as the permanent joining of metallic parts required to be electrically connected. Grounding is defined in the NEC as a conducting connection between an electrical circuit or equipment and the earth, or to some conductive body that serves in place of earth. The NEC requires all traffic signal cabinets to be grounded to equipment ground.
- **Interconnect/Communications:** Where installed in a system, the traffic signal cabinet shall have facilities for the appropriate communications.

3.2 Traffic Signal Controllers

The controller is the piece of equipment in the signal cabinet that translates input information from the detectors into output information for the displays. Signal timing parameters (programmed into the controller software) determine how the controller interprets the detector and display information. The standard controller to be used at all new signalized intersections is an ATC traffic signal controller that meets current TDOT standards and specifications.

3.3 Traffic Signal Detector Cards

Detector cards (i.e. detector amplifiers) when used with inductive loops, identify user actuations from the field detectors and pass the information along to the signal controller. Most detector cards can handle between one and four detector channels and various modes of operation. Adequate detector rack space should be provided to allow for near-term and possible long-term needs.

3.4 Traffic Signal Load Switches and Flasher

Load switches are relay devices that allow the controller, which operates in a 12/24-volt DC environment, to direct a 120-volt AC current to various signal displays. Each load switch (and associated wiring) plugs into the back panel of the cabinet into load switch bays. The number of load switch bays will dictate the number of output channels that the signal designer has to work with at the intersection. Ensuring that there are enough load switch bays for existing and future phasing is recommended. A load switch is typically required for each vehicle signal phase, each pedestrian phase, and each overlap. Similar to a load switch, a flasher controls the signal displays when the intersection is in flashing mode.

3.5 Traffic Signal Monitor

The NEMA MMU and the older CMU are traffic signal monitors that work completely independent from the traffic signal controller and serve to ensure intersection safety. Invalid signal voltage levels, burnt lamps, conflicting green movements, improper sequencing, incorrect timing, and several other features are monitored by the equipment. Traffic signal monitors will identify the type of fault (e.g., conflict, red fail, clearance fail, dual indication), which signal faces were active at the time of the fault, and can retrieve historical data about the fault. The monitors will remain in fault mode until reset.

3.6 Traffic Signal Power Supply

Power supply to traffic signal cabinets shall adhere to local utility company requirements. The source power service location through coordination with the local utility company may support the location of new traffic signal cabinets, but that information is not to be detailed on the traffic signal plans or associated bid documents.

The traffic signal power supply is an electrical device in the cabinet that converts AC to correct DC voltage for various devices in the traffic signal cabinet. If the power supply cable travels underground, it shall be run in a separate RGS conduit from detector, signal, and communications cables. If it travels overhead, it shall be run on a separate messenger cable above all other signal cables. Where street lights are installed on traffic signal poles, they shall have their own circuit breaker on the service pole and the power conductor routing shall not pass through the controller cabinet.

When utility power is disrupted and not available at times, a back-up power supply unit (i.e. BBS or UPS) can be utilized to provide emergency power to connected equipment by supplying power from a separate source (i.e. batteries). The *MUTCD Section 4F.19* recommends that traffic control signals that are adjacent to highway-rail grade crossings and that are coordinated with the flashing-light signals or that include railroad preemption features be provided with a back-up power supply unit. The use of a back-up power supply unit is also recommended on high-volume intersections where maintenance of traffic signal operations during power outages is critical to traffic flow.

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