MICHIGAN

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

FOR

**RECTANGULAR RAPID FLASHING BEACON**

JAK:JRP 1 of 3 APPR:EMS:DBP:05-03-21

**a. Description.** This work consists of furnishing and installing a permanently powered, rectangular rapid flashing beacon (RRFB) (one way or two way as indicated on plans).

As applicable, this work includes installation of the RRFB with housing, radio, antenna, battery(s), control box, mounting hardware, and all associated material required to complete the work.

**b. Materials.** Provide materials in accordance with sections 918 and 921 of the Standard Specifications for Construction and the following requirements of this special provision:

1. Beacon. Provide an RRFB meeting the following requirements:

A. A one-way RRFB consisting of two rectangular shaped amber indications, each with a high-intensity, LED-array pulsing class 1 light source in accordance with *SAE* *standard J595*.

B. Each amber indication must have minimum dimensions of 3 inches high by 7 inches wide, with the 7 inch dimension oriented horizontally and the 3 inch dimension oriented vertically.

C. Ensure a minimum of 7 inches measured horizontally between the inside edges of the amber indications.

D. Ensure a maximum of 36 inches measured horizontally between the outside edges of the amber indications.

E. Place the RRFB indications in a powder-coated (black or Federal yellow) aluminum housing.

F. A two-way RRFB consisting of four rectangular shaped amber indications (two facing in one direction, and two facing the opposite direction), each with a high-intensity amber LED-array pulsing class 1 light source in accordance with *SAE* *standard J595*, in addition to subsections b.1.B thru b.1.E of this special provision.

G. Use an RRFB that has an additional LED indication facing in the direction of pedestrian travel to provide notice to the pedestrian when the RRFB is operating.

2. Beacon Flashing Requirements. Provide a beacon meeting the following flashing requirements:

A. When activated, flash the two amber indications (facing the same direction in each RRFB) in a rapidly alternating "wig-wag" flashing sequence (indication #1 on, then indication #2 on).

B. For the two amber indications facing the same direction, provide 70 to 80 periods per minute. Each period consists of two rapid pulses of light emitted by amber indicator #1 (while amber indication #2 is dark), followed by three rapid pulses of light emitted from amber indication #2 (while amber indication #1 is dark). This is a specific exception to the *MUTCD* *Section 4L.01* requirements for the flash rate of flashing beacons.

C. To avoid frequencies that might cause seizures, do not use flash rates between 5 and 30 hertz (flashes per second) for each amber indication.

3. Beacon Operation. Provide beacon operation meeting the following requirements:

A. The RRFB is dark until pedestrian actuation.

B. Initiate operation upon pedestrian actuation and cease operation at a predetermined time after actuation. Set this predetermined duration of operation as indicated on the plans or as determined by the Engineer.

C. Simultaneously begin (upon actuation) and end (after the predetermined duration) the operation of all RRFB's associated with a given crosswalk.

D. Ability to synchronize all RRFBs associated with a given crosswalk using one of the following methods as indicated on the plans:

(1) 900 megahertz (MHz) radios that turn on within 120 milliseconds and remain synchronized throughout the duration of the flashing cycle; or

(2) Hardwire interconnect.

E. Capability of automatically dim during nighttime operation.

4. Control Box. Provide a *NEMA 4X* enclosure IP-67-rated control box with locking clasps that include an 8-position terminal block and the control circuit.

5. Control Circuit. Provide a control circuit meeting the following requirements:

A. Independently flashes up to 2 separate LED light outputs.

B. Programmable light outputs and flash patterns.

C. Flash output of 70 to 80 periods of flashing per minute with a 100 millisecond duration on time.

D. Circuit connectors must conform to IP-67 rating, dust proof and protected from temporary immersion in water up to 3 feet deep for 30 minutes.

6. Radios. When RRFBs are not interconnected with hard wire, provide radios meeting the following requirements:

A. Communications integrated with the RRFB control circuit to activate the system from a pushbutton input.

B. Radios synchronize all of the RRFBs at a crosswalk.

C. Radios capable of initiating operation of RRFBs within 120 milliseconds and maintaining synchronized operation throughout the duration of the flashing cycle.

D. Operates on a 900 MHz frequency hopping spread spectrum network from 3.6 to 15 VDC.

7. Permanent Power System. Provide permanent power operating on 120 VAC, 60 hertz (Hz) single phase electrical system.

8. Warranty. Provide a manufacturer’s warranty, transferable to MDOT, that the supplied materials are free from all defects in material and workmanship. Furnish the warranty, other applicable documents from the manufacturer, and a copy of the invoice showing date of shipment to the Engineer prior to acceptance.

**c. Construction.** Complete this work in accordance with sections 819, 820, and 919 of the Standard Specifications for Construction, per the plans, and this special provision.

1. Set the predetermined duration of operation of the RRFBs as indicated on the plans or as determined by the Engineer.

2. Mount the RRFB to the support as indicated on the plans using *AISI 300* series stainless steel U-bolts and associated hardware.

3. Terminate wiring connections in the RRFB and in the control box.

4 Obtain shop drawing approval from the Engineer prior to installation of units.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

**Pay Item** **Pay Unit**

Flsh Beacon, Rectangular Rapid Each