**ITEM 630 SIGNING, MISC.: SOLAR POWERED RECTANGULAR RAPID FLASHING BEACON (RRFB) PEDESTRIAN WARNING SYSTEM**

THIS WORK SHALL CONSIST OF FURNISHING AND INSTALLING PEDESTRIAN CROSSING WARNING SIGN ASSEMBLIES WITH CARMANAH MODEL R920-F SOLAR POWERED RECTANGULAR RAPID FLASHING BEACONS (RRFB). THE FLASHING UNITS SHALL BE LED, SOLAR POWERED, AND PEDESTRIAN ACTIVATED. MULTIPLE UNITS SHALL BE WIRELESSLY CONTROLLED AND SYNCHRONIZED.

PLAN AND SPECIFICATION COMPLIANCE

THE CONTRACTOR SHALL FURNISH AND INSTALL RECTANGULAR RAPID FLASHING BEACONS IN ACCORDANCE WITH THE STANDARDS SPECIFIED IN THE FOLLOWING DOCUMENTS. THE CITY OF COLUMBUS SHALL DETERMINE WHETHER THE SUPPLIED ITEMS MEET OR EXCEED THESE SPECIFICATIONS.

1. FHWA MUTCD INTERIM APPROVAL 21 – RECTANGULAR RAPID-FLASHING BEACONS AT CROSSWALKS (IA-21)
2. OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS
3. SPECIFICATIONS LISTED IN THIS PLAN
4. 2018 CITY OF COLUMBUS CONSTRUCTION AND MATERIAL SPECIFICATIONS
5. CITY OF COLUMBUS STANDARD CONSTRUCTION DRAWINGS

IN CASE OF A CONFLICTING SPECIFICATION STATEMENT, THE SPECIFICATION DOCUMENT HIERARCHY SHALL BE IN THE ORDER LISTED FROM (A) HIGHEST, TO (E) LOWEST.

GENERAL REQUIREMENTS

EACH RRFB LIGHT BAR UNIT SHALL CONSIST OF TWO RAPIDLY AND ALTERNATELY FLASHING RECTANGULAR YELLOW INDICATIONS HAVING LED ARRAY BASED PULSING LIGHT SOURCES. EACH PEDESTRIAN WARNING SYSTEM SHALL CONSIST OF, BUT NOT NECESSARILY BE LIMITED TO SIGNAGE, SIGN MOUNTING HARDWARE, PUSHBUTTONS, RRFB INDICATIONS, SOLAR PANELS, AND OTHER ELECTRICAL COMPONENTS (WIRING, SOLID-STATE CIRCUIT BOARDS, ETC.). SIGN SUPPORTS AND FOUNDATIONS ARE NOT INCLUDED IN THIS ITEM OF WORK AND SHALL BE PAID FOR SEPARATELY.

FUNCTIONAL REQUIREMENTS

EACH RRFB UNIT SHALL UTILIZE SOLAR POWER. RRFB UNITS SHALL BE ACTIVATED BY ADA-COMPLIANT PUSHBUTTONS. THE RRFB UNITS SHALL BE NORMALLY DARK AND SHALL INITIATE OPERATION ONLY UPON PEDESTRIAN ACTUATION.

RRFB FLASH DURATION SHALL BE SET TO *[fill in]* SECONDS.

*Designer note: calculate duration according to the procedures for the timing of pedestrian clearance times for pedestrian signals as stated in Section 4E.06 of the OMUTCD. Since a walk interval does not exist for RRFBs, the crossing distance shall be measured from the pushbutton to the far side of the traveled way and the walking speed used in the calculation shall be 3.0 feet per second. (4E.06 paragraph 14)*

EACH REMOTE RRFB UNIT (THE UNIT ON OPPOSITE SIDE OF STREET FROM EACH PUSHBUTTON) SHALL BE WIRELESSLY ACTIVATED. EACH UNIT SHALL BE LOW CURRENT/HIGH OUTPUT INCLUDING AUTOMATIC DIMMING CAPABILITIES FOR DAY AND NIGHT VISIBILITY. THE UNITS SHALL BE CAPABLE OF RUNNING UP TO 30 DAYS WITHOUT SUNLIGHT. IF VOLTAGES OVER 50V AC OR DC ARE PRESENT, GROUNDING AND BONDING REQUIREMENTS SPECIFIED IN THE CMSC SHALL BE FOLLOWED.

MATERIALS

FURNISH A COMPLETE CARMANAH MODEL R920-F SYSTEM FOR EACH PEDESTRIAN CROSSING INDICATED IN THE PLANS. THE SYSTEM INCLUDES THE FOLLOWING ITEMS:

1. RRFB INDICATIONS
2. EACH RRFB INDICATION LENS SHALL BE A MINIMUM SIZE OF APPROXIMATELY 5” WIDE X 2” HIGH.
3. THE TWO RRFB INDICATIONS FOR EACH UNIT SHALL BE ALIGNED HORIZONTALLY, WITH THE LONGER DIMENSION OF THE INDICATION HORIZONTAL. THERE SHALL BE TWO INDICATIONS ON THE FRONT AND TWO INDICATIONS ON THE BACK.
4. EACH RRFB SHALL BE SUPPLIED WITH ALL REQUIRED HARDWARE TO INSTALL THE ASSEMBLY. ALL EXPOSED HARDWARE SHALL BE ANTI-VANDAL.
5. EACH RRFB UNIT SHALL BE LOCATED BETWEEN THE BOTTOM OF THE CROSSING WARNING SIGN AND THE TOP OF THE SUPPLEMENTAL DOWNWARD DIAGONAL ARROW PLAQUE OR THE AHEAD PLAQUE IF USED ON AN ADVANCE SIGN ASSEMBLY.
6. THE LIGHT INTENSITY OF THE YELLOW INDICATIONS SHALL MEET THE MINIMUM SPECIFICATIONS FOR CLASS 1 YELLOW PEAK LUMINOUS INTENSITY OF SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) STANDARD J595 (DIRECTIONAL FLASHING OPTICAL WARNING DEVICES FOR AUTHORIZED EMERGENCY, MAINTENANCE, AND SERVICE VEHICLES) DATED JANUARY 2005.
7. A SMALL CONFIRMATION LIGHT DIRECTED AT AND VISIBLE TO PEDESTRIANS IN THE CROSSWALK SHALL BE INSTALLED INTEGRAL TO THE RRFB OR PUSHBUTTON TO GIVE CONFIRMATION THAT THE RRFB IS IN OPERATION.
8. SIGNS
9. ALL SIGN ASSEMBLIES SHALL USE ANTI-VANDAL FASTENERS TO MOUNT COMPONENTS TO SIGN AND SIGN TO FIXTURE.
10. SIGNS SHALL BE REQUIRED FOR VIEW FROM EACH APPROACH AS SHOWN ON THE PLAN.
11. UNLESS MOUNTED BACK-TO-BACK WITH ANOTHER SIGN, THE BACK OF EACH SIGN AND ALL VISIBLE ELEMENTS OF SIGN MOUNTING HARDWARE, EXCLUDING THE BANDING, SHALL BE COATED TO MATCH ITS RESPECTIVE SUPPORT. NUTS AND BOLTS NEED NOT BE PAINTED. ALL PAINTING SHALL BE PERFORMED UNDER CONTROLLED ENVIRONMENTAL CONDITIONS, AND IN ACCORDANCE WITH ALL MANUFACTURER RECOMMENDATIONS PERTAINING TO SURFACE PREPARATION, MATERIAL HANDLING, AND APPLICATION. PRIOR TO PAINTING, A PAINT SAMPLE SHALL BE SUBMITTED FOR REVIEW.
12. CONTROL CIRCUIT
13. WHEN ACTIVATED, THE TWO YELLOW INDICATIONS IN EACH RRFB SHALL FLASH IN A RAPIDLY ALTERNATING “WIG-WAG” SEQUENCE.
14. ALL RRFB UNITS ASSOCIATED WITH A GIVEN CROSSING (INCLUDING ADVANCE UNITS IF APPLICABLE) SHALL, UPON ACTIVATION, SIMULTANEOUSLY COMMENCE FLASHING AND SHALL SIMULTANEOUSLY CEASE FLASHING.
15. THE CONTROL CIRCUIT SHALL HAVE THE CAPABILITY OF INDEPENDENTLY FLASHING UP TO TWO INDEPENDENT OUTPUTS. THE LED LIGHT OUTPUTS AND FLASH PATTERN SHALL BE COMPLETELY PROGRAMMABLE.
16. THE FLASH PATTERN AND DURATION OF THE RRFB INDICATIONS SHALL MEET THE REQUIREMENTS OF FHWA MUTCD INTERIM APPROVAL 21.
17. THE CONTROL CIRCUIT SHALL BE SEALED WATERTIGHT TO ELIMINATE DIRT CONTAMINATION AND ALLOW SAFE HANDLING IN ALL WEATHER CONDITIONS.
18. THE LEDS SHALL BE SEALED AGAINST DUST AND MOISTURE INTRUSION AS PER THE REQUIREMENTS OF NEMA STANDARD 250-1991 FOR TYPE 4 ENCLOSURES AND TO PROTECT ALL INTERNAL LED AND ELECTRICAL COMPONENTS.
19. BATTERY AND SOLAR PANELS
20. THE SOLAR PANEL AND CONTROLLER MANUFACTURER WILL PROVIDE SIGNED COPIES OF CALCULATIONS USED TO SIZE THE SOLAR PANEL AND BATTERIES. INCLUDED IN THESE CALCULATIONS WILL BE THE INSOLATION VALUE USED AND ITS SOURCE, THE SOLAR PANEL EFFICIENCY, PROPOSED LED LAMP LOAD, AND A FIGURE REPRESENTING ANTICIPATED MISCELLANEOUS LOSSES.
21. THE SOLAR PANEL MANUFACTURER MUST TEST EACH PANEL ACCORDING TO IEC6215 OR EQUIVALENT APPROVED STANDARD. SOLAR PANEL MOUNTING MUST BE RATED FOR 90 MPH DESIGN WIND.
22. EACH BATTERY UNIT SHALL BE A 12 VDC, 36 AHR MINIMUM, SEALED GEL OR AGM LEAD ACID BATTERY. BATTERIES SHALL HAVE WRITTEN TWO-YEAR FULL REPLACEMENT WARRANTY.
23. FOUR (4) BATTERIES SHALL BE PROVIDED PER SOLAR ENGINE.
24. THE SOLAR PANEL SHALL PROVIDE A MINIMUM OF 30 WATTS PEAK TOTAL OUTPUT.
25. THE SOLAR PANEL SHALL BE MOUNTED TO AN ALUMINUM PLATE AND BRACKET (COATED TO MATCH THE SUPPORT POLE) AND ANGLED TO PROVIDE MAXIMUM OUTPUT.
26. ALL FASTENERS USED SHALL BE ANTI-VANDAL.
27. WIRELESS RADIO
    1. RADIO CONTROL SHALL OPERATE ON A 900 MHZ FREQUENCY HOPPING SPREAD SPECTRUM NETWORK, WI-FI, OR APPROVED EQUAL.
    2. RADIO SHALL INTEGRATE COMMUNICATION OF RRFB CONTROL CIRCUIT TO ACTIVATE SIGN FROM PUSHBUTTON INPUT.
    3. THE RADIO SHALL BE SYNCHRONIZED SO ALL OF THE REMOTE RRFB LIGHT INDICATIONS WILL TURN ON WITHIN 120 MSEC OF EACH OTHER AND REMAIN SYNCHRONIZED THROUGHOUT THE DURATION OF THE FLASHING CYCLE.
28. PUSHBUTTON AND PUSHBUTTON SIGNS
    1. PUSHBUTTONS SHALL BE PER CMSC 732.06 AND THE CITY’S TRAFFIC QUALIFIED PRODUCTS LIST. ONE SIGN (R10-25-9) SHALL BE SUPPLIED AND MOUNTED WITH EACH PUSHBUTTON. THE BOTTOM OF THE SIGN SHALL BE MOUNTED JUST ABOVE THE TOP OF THE PUSHBUTTON. MOUNT THE CENTER OF THE PUSHBUTTON 42" ABOVE THE PEDESTRIAN PATHWAY SURFACE.

INSTALLATION

THE RECTANGULAR RAPID FLASHING BEACONS, SIGNS, AND PUSHBUTTONS SHALL REMAIN COVERED UNTIL THE INSTALLATION HAS BEEN INSPECTED BY THE CITY OF COLUMBUS DIVISION OF TRAFFIC MANAGEMENT FOR INSTALLATION DEFECTS, CONFLICTS, AND SAFETY HAZARDS. ANYTIME THE RRFB IS OUT OF OPERATION, THE CROSSWALK SHALL BE CLOSED USING SIGNS, DETOURS, AND BARRICADES TO PREVENT USE OF THE CROSSWALK. UPON APPROVAL BY THE DIVISION OF TRAFFIC MANAGEMENT, THE CONTRACTOR SHALL UNCOVER THE RRFB UNITS, SIGNS, AND PUSHBUTTONS AND OPEN THE CROSSWALK FOR USE.

PAYMENT SHALL BE PER THE UNIT PRICE BID FOR ITEM 630 SIGNING, MISC.: SOLAR POWERED RECTANGULAR RAPID FLASHING BEACON (RRFB) PEDESTRIAN WARNING SYSTEM AND SHALL INCLUDE THE PEDESTRIAN CROSSING SIGNS, PUSHBUTTONS AND PUSHBUTTON SIGNS, ALL EQUIPMENT RELATED TO THE RECTANGULAR RAPID FLASHING BEACONS, ALL COVERINGS AS SPECIFIED ABOVE, AND ALL LABOR NECESSARY TO CONSTRUCT AND INSTALL A FULLY FUNCTIONING RRFB SYSTEM PER EACH PEDESTRIAN CROSSING INDICATED IN THE PLANS. *9/18/23*