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THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

DEPARTMENT OF
PUBLIC SERVICE

DESIGN MEMO 9.08

To: Designers, Contractors, and City Departments

Date: January 10, 2023

Subject: Rectangular Rapid-Flashing Beacons

Category: Traffic

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1 Purpose

A Rectangular Rapid-Flashing Beacon (RRFB) is a user-actuated, high-intensity yellow warning beacon that flashes in a rapidly repeating sequence to alert approaching road users of pedestrians and/or bicyclists using or waiting to use an uncontrolled crossing. The use of RRFBs is permitted under Federal Highway Administration (FHWA) Interim Approval 21. The State of Ohio has been granted an interim approval by FHWA, and the approval includes all local highway agencies in the state. As part of the statewide approval, the Division of Traffic Management maintains a list of all RRFB locations with the date of their activation and provides this list to the Ohio Department of Transportation (ODOT).

RRFBs are an effective treatment for reducing pedestrian crashes at uncontrolled marked crosswalks. At locations where crosswalks markings and signage alone do not provide high motorist yield rates, RRFBs may be installed to increase compliance.

2 Applicability

Until further notice, this direction will be used for scoping, design, and construction of RRFBs within the City of Columbus right-of-way.

RRFBs may be installed at uncontrolled crossings at intersections and mid-block locations.

Designers should follow guidance in Design Memo 6.41 Crosswalks to determine when an RRFB may be an appropriate treatment.

3 Standards and References

- FHWA Interim Approval 21 – Rectangular Rapid-Flashing Beacons at Crosswalks
- Ohio Manual of Uniform Traffic Control Devices (OMUTCD)
- City of Columbus ADA Rules and Regulations
- City of Columbus Traffic Signal Design Manual
- City of Columbus Design Memo 6.41: Crosswalks

4 Definitions

Definitions of key terms in this memo are provided in City of Columbus Design Memo 1.00: Introduction.

5 Design Guidance

The pavement marking and signing standards for an RRFB crossing will be similar to that for a crossing without an RRFB; see City of Columbus Design Memo 6.41: Crosswalks and OMUTCD Sections 2C and 7B for crossing sign types, sizes, and placement. RRFBs must also meet the requirements of FHWA Interim Approval 21. In addition to the standards specified therein, the following considerations are applicable to the design and installation of RRFBs.

5.1 RRFB Support Placement

Design considerations and requirements, including utility clearances, for RRFB supports and foundations shall follow the standards set forth in the City of Columbus *Traffic Signal Design Manual*, Chapter 4.

RRFBs should be pedestal-mounted on single lane approaches (see Section 5.4.1). On multi-lane approaches, RRFBs shall be mounted on an overhead mast arm in addition to the side-mounted displays (see Section 5.4.2).

Where RRFBs are installed at mid-block locations, the RRFB pedestal or mast arm support (and pushbutton) should be located at the downstream end of the crosswalk.

When feasible, the pedestal or mast arm support should be located to accommodate the pedestrian pushbutton positioned in accordance with Section 5.2. Should design considerations prevent the mast arm support from accommodating the pushbutton, a separate pedestal support may be used to locate the pushbutton and associated side-mounted RRFB unit and signs in an acceptable location.

Where a median is present, left-side RRFB units should be installed on the far left-hand side of the roadway rather than in the median, unless the location on the far left-hand side of the roadway is not feasible.

5.2 Pedestrian Pushbuttons

Pedestrian pushbuttons shall be located in accordance with the placement requirements outlined in the City of Columbus *ADA Rules and Regulations* and shall be installed in accordance with the installation requirements of the City of Columbus *Traffic Signal Design Manual*.

5.3 Sight Distance

Where stopping sight distance approaching a crosswalk with side-mounted RRFBs does not meet the criteria outlined in **Table 1**, overhead-mounted RRFBs at the crosswalk or side-mounted RRFBs in advance of the crosswalk may be installed to improve sight distance.

If an RRFB is installed on the approach in advance of the crosswalk, it shall be supplemental to and not a replacement for the RRFBs at the crosswalk itself.

Table 1: Minimum Crosswalk Sight Distance

Posted Speed Limit	Stopping Sight Distance (ft)
20	115
25	155
30	200
35	250
40[1]	305

[1] RRFBs may not be sufficient on roads with speeds 40 mph and greater.

(Source: ODOT Location & Design Manual Volume 1, Figure 201-1)

In locations with on-street parking, parking shall be prohibited within 30 feet of a crosswalk with RRFBs (both upstream and downstream) as parking is prohibited within 30 feet of flashing beacons under Columbus City Code Section 2151.01. Additional parking prohibitions may be necessary to provide adequate stopping sight distance. The installation of curb extensions should be considered to shorten the crossing distance for pedestrians and to increase visibility between pedestrians and other road users. For more information, see City of Columbus Design Memo 6.04: Curb Extensions.

5.4 Signing

A Pedestrian Crossing (W11-2), School (S1-1), or Bicycle/Pedestrian Crossing (W11-15) sign shall be provided at RRFBs.

For side-mounted RRFBs at a crosswalk, the crossing warning sign shall be supplemented with a diagonal downward arrow plaque (W16-7P). Supplemental plaques shall not be used with RRFBs that are mounted overhead on a mast arm at a crosswalk.

Where used, crossing warning signs for advance RRFBs shall be supplemented with an AHEAD (W16-9P) plaque.

Pushbuttons at RRFBs shall be accompanied by a PUSH BUTTON TO TURN ON WARNING LIGHTS (R10-25) sign.

The signs used at RRFBs are shown in **Figure 1**.

Figure 1: Signs used at RRFBs

5.4.1 Pedestal-Mounted RRFBs

For any approach on which RRFBs are pedestal-mounted, at least two W11-2, S1-1, or W11-15 crossing warning signs (each with an RRFB unit and a W16-7P plaque) shall be installed at the crosswalk, one on the right-hand side of the roadway and one on the left-hand side of the roadway.

5.4.2 Overhead-Mounted RRFBs

For any approach on which RRFBs are overhead-mounted, at least one W11-2, S1-1, or W11-15 crossing warning sign (without a W16-7P plaque) located approximately over the center of the lanes of the approach (or where optimum visibility can be achieved) shall be installed at the crosswalk.

For approaches with overhead-mounted RRFBs, an RRFB assembly on the right-hand side of the roadway should also be provided where feasible. An RRFB assembly on the left-hand side of the roadway may be provided but is not required.

6 Timing

The duration of a predetermined period of operation of an RRFB following each actuation shall be sufficient to allow a pedestrian crossing in the crosswalk who left the pedestrian pushbutton after actuation to travel at a walking speed of 3 feet per second to the far side detectable warning.

7 Equipment

7.1 Supports and Foundations

RRFB supports and foundations shall be furnished in accordance with Sections 632 and 732 of the current versions of the City of Columbus Construction and Material Specifications and applicable Standard Construction Drawings.

Supports for RRFB assemblies shall also be in accordance with the City of Columbus Traffic Qualified Products List.

Approved RRFB support types include the following:

- 15.1-foot Pedestal – A 15.1-foot pedestal is used when an RRFB and pushbutton are installed at the side of the roadway (City of Columbus Standard Construction Drawing 2187).
- Standard Mast Arm Support – Standard mast arm supports are used to provide an overhead mounting location for an RRFB (City of Columbus Standard Construction Drawing 4120).
- Decorative Mast Arm Support – Decorative mast arm supports are used to provide an overhead mounting location for an RRFB in the Downtown District (City of Columbus Standard Construction Drawing 4121).
- Temporary Installations – Where RRFBs are installed on a temporary basis as part of a maintenance of traffic plan, temporary signal supports meeting the requirements of City of Columbus Traffic Signal Design Manual Section 3.2 may be used. See City of Columbus Design Memo 9.01: Maintenance of Traffic for more information on crossing requirements.

Overhead-mounted units should be centered over their respective approach. Mast arms shall be sized such that the arm extends 2 feet past the furthest RRFB assembly attachment point.

7.1.1 Pole Orientation and Fabrication Data

A pole fabrication chart, orientation diagram, and elevation view shall be provided detailing the pole identification number, pole color, foundation elevations, pole design number, pole height, span attachments, mast arm lengths, field orientation angles, and pole item installation angles. Sample diagrams are provided in **Figure 2** and **Figure 3**.

7.2 Power Supply

RRFBs should be solar powered unless site specific constraints necessitate a 120V installation. Solar panels cannot be in full shade. Up to four RRFB units may be powered off a single solar controller.

7.3 Lighting

The designer should ensure proper overhead lighting is present at the crossing. Refer to the City of Columbus Division of Power *Street Lighting Design Guide* for more information.

8 Plan Requirements

RRFBs shall be shown and detailed in the pavement markings and signing (traffic control) section of the plans on the plan view sheet(s) and a details sheet as necessary.

8.1 Stage 1 Submittal Checklist

All items listed below shall be included on the Stage 1 pavement markings and signing plan when an RRFB is used, at a minimum, in addition to pavement markings and signing plans requirements.

Existing infrastructure:

- Underground and overhead utilities
- Curb ramps
- Landscaping and other features which could obstruct visibility of RRFB and crosswalk
- Bus stops and shelters

Proposed infrastructure:

- Underground and overhead utilities
- Curb ramps
- Landscaping and other features which could obstruct visibility of RRFB and crosswalk
- Bus stops and shelters
- RRFB pedestals and supports
- RRFB pushbuttons
- RRFB signs

A sight distance analysis exhibit shall also be submitted.

8.2 Stage 2 Submittal Checklist

In addition to the items outlined in the Stage 1 checklist, the items listed below shall be included on the pavement markings and signing plan for the Stage 2 submittal, at a minimum:

- Detailed callout information for RRFB pedestals and supports (station and offset, etc.)
- Typical sign support elevation detail and orientation detail
- RRFB pedestal/support pole fabrication, orientation, and data chart (if applicable)

8.3 Stage 3 Submittal Checklist

In addition to the items outlined in the Stage 1 and 2 checklists, items listed below shall be included on the pavement markings and signing plan for the Stage 3 submittal, at a minimum:

- RRFB and pedestal/support plan notes (“Misc.” and “As Per Plan” notes, etc.)
- Estimate of quantities
- Standard Drawing references on Title Sheet

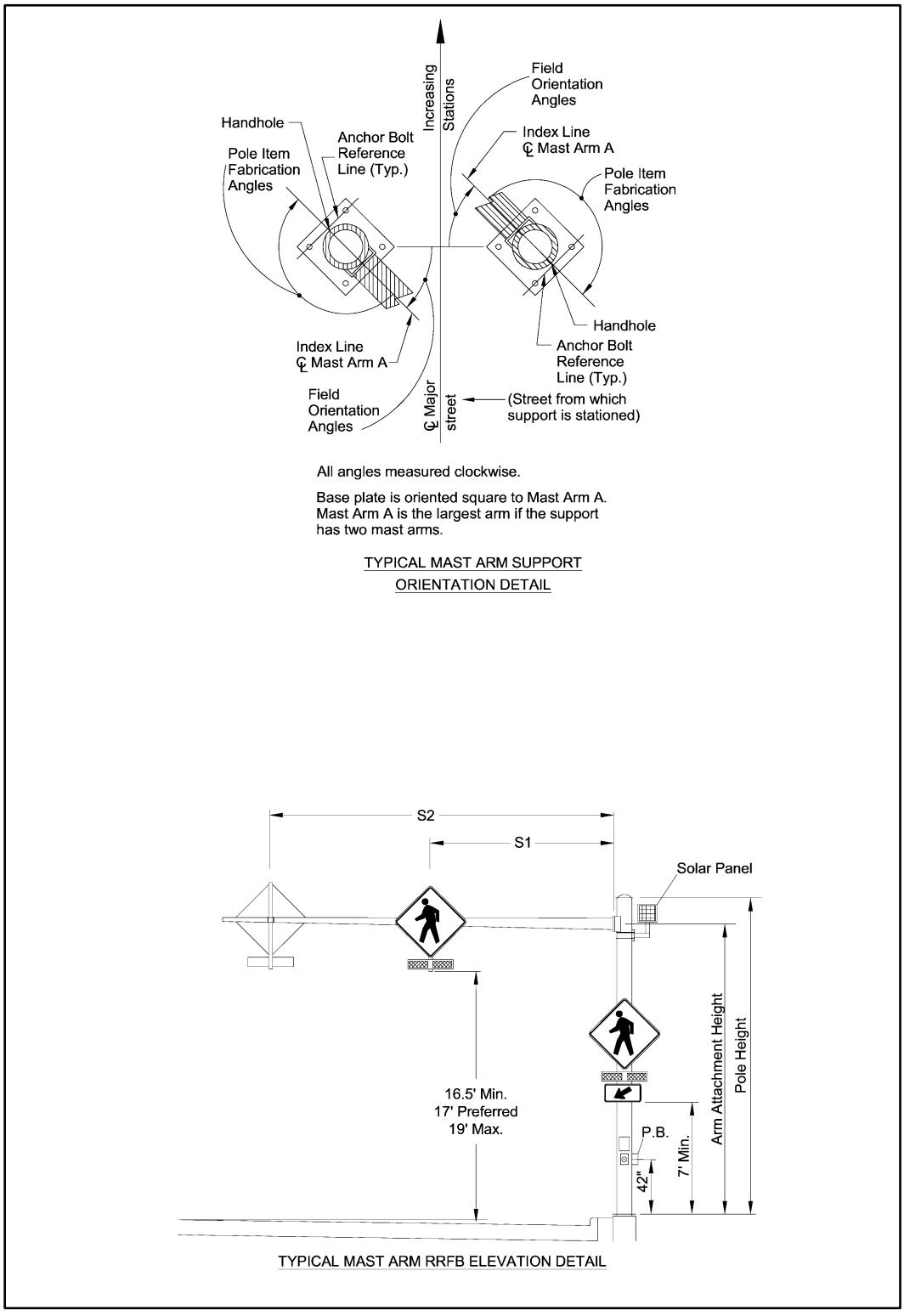

Figure 2: Typical RRFB Mast Arm Fabrication and Orientation Details

LOCATION	SHEET NO.	SUPPORT DESIGNATION	POLE COLOR/ FEDERAL STANDARD 595B	POLE DESIGN NO.	POLE HT. (FT.)	MAST ARM LENGTH (FT.)	MAST ARM ATTCH. HEIGHT (FT.)	DIST. FROM BUTT PLATE (FT.)		POLE FAB. DATA-CLOCKWISE FROM MAST ARM A AT 0°			FIELD ORIENTATION		
								S1	S2	ANCHOR BOLT REFERENCE LINE	PED. PUSH BUTTON	HANDHOLE	INDEX LINE ANGLE MAST ARM A	ANCHOR BOLT REF. LINE	FOUNDATION ELEVATION *
INTERSECTION		S/E-1		4	21.5	18	20	16	-	90°	-	180°	0°	90°	723.87
OR	##		SEMI-GLOSS												
MIDBLOCK		N/E-1	BLACK	12	21.5	41	20	15	39	90°	90°	180°	0°	90°	723.61
CROSSWALK			#27038												
STATIONING		N/E-2		4	21.5	20.5	20	18.5	-	90°	-	180°	0°	90°	723.62

* The designer may list a "See Sheet #" in this column containing the sheet # of the detailed elevations on the Intersection Detail and/or Curb Ramp Detail Sheets.

Figure 3: Typical RRFB Mast Arm Fabrication and Orientation Data Chart