

June 30, 2014

Dear Members of the Board of Selectmen:

Attached are design plans, cut-sheets, and a system evaluation and recommendation by AECOM to install a solar-powered Rapid Rectangular Flashing Beacon (RRFB) at the new mid-block crosswalk between 525 Mass Ave and Gardner Field Playground. We feel this system is critical to providing pedestrian safety and visibility, and provides peace of mind that the appropriate measures have been taken at a crossing location where children are present and traffic moves at high speed.

When a pedestrian pushes the button to activate the system, the LED will flash for a programmed interval to alert drivers of the pedestrian crossing Mass Ave. It will also work in tandem with the crosswalk bump-outs to help slow the general flow of traffic entering West Acton Village.

If accepted by the Board, we will install the system at our cost. Once installed and operational, it will be handed over to the Town with the other improvements we are making in the right of way. AECOM has included information regarding the system's reliability, operations, maintenance schedule, and associated maintenance costs. This proposal has already been sent to the Engineering and Planning Departments. We have addressed their questions and they feel it is acceptable.

While the signage is standardized to conform to roadway guidelines, we are running the post color and post style through the HDC. I have presented them with post and color options, and they have told us they would give us an answer at their meeting on 7/10. We have shown a black standard post in our submittal. If they elect for something different, we will make the appropriate adjustment.

Due to construction scheduling, we hope this can be reviewed at your next meeting. If you have any questions, please do not hesitate to contact me at 617.765.4493, or Jeff Maxtutis of AECOM at 978.905.2309. Thank you for your consideration of our proposal. We hope you find it acceptable and look forward to improving the safety and walkability of West Acton Village.

Sincerely,

Mathias Rosenfeld
525-537 Mass Ave LLC

Jeff Maxtutis
AECOM

Memorandum

To Mathias Rosenfeld

CC _____

Subject West Acton Village Ecology Project

From Jeff Maxtutis

Date May 12, 2014

This Memorandum summarizes an evaluation AECOM conducted of pedestrian beacon systems for the West Acton Ecology (WAVE) project in Acton, Massachusetts. The evaluation included reviewing best industry practices; observations of the study area and similar devices; discussions with equipment manufacturers and distributors; phone surveys with other communities in Massachusetts who have installed similar devices; and review of conformity with national and state standards.

PEDESTRIAN CROSSING BEACON EVALUATION**EXECUTIVE SUMMARY**

The West Acton Village Ecology (WAVE) project has proposed to provide a new pedestrian crossing beacon on Massachusetts Avenue at a proposed crosswalk linking their project on the north side to the Town of Acton Gardner Field Playground on the south side. The pedestrian crossing beacon has been recommended to improve motorist visibility of the proposed crosswalk and safety for pedestrians.

AECOM reviewed the following four pedestrian beacon systems:

- Rapid Rectangular Flashing Beacon
- Flashing LED Sign
- Flashing LED Beacon
- Pedestrian Hybrid Beacon (HAWK)

Available information for each system was obtained and reviewed for appropriateness for the proposed location. AECOM conducted field visits to observe operating conditions of similar devices located in nearby towns. AECOM contacted a manufacturer (TAPCO) and a distributor (Ocean State Signal Co.) to ask about system reliability, durability, operations, maintenance, and cost. In addition, AECOM contacted other towns with similar systems to identify their experiences and satisfaction.

Based on our review of the four systems evaluated, AECOM recommends installing a Rapid Rectangular Flashing Beacon (RRFB) system manufactured by TAPCO (BlinkerSign) on Massachusetts Avenue as

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part of the WAVE project. The following summarizes the performance and cost history of the RRFB system.

Durability and Longevity

The TAPCO product is manufactured and tested in a four season climate in Wisconsin that is similar to Massachusetts. The product is currently being used in a wide range of climates including Florida, Arizona, Oregon, Washington, Alberta and British Columbia. The durability of the product appears good. Batteries need to be replaced every four-five years at a cost of \$150-\$200. The flashing beacons have a life of approximately 12 years and cost between \$500 and \$600 to replace.

Operations

The product can be powered by solar or AC power. The solar panels are sized according to the number of activations expected. A normal size solar panel will accommodate up to 300-400 activations per day, which is higher than is expected at the Massachusetts Avenue location. Given the expected number of activations at the West Acton location, we do not anticipate any issues powering this device using solar panels. At the Minute Man Trail in Arlington, MA, a normal size solar panel had to be replaced because of the high number of activations.

The solar panels must have southern solar exposure for at least 50 percent of the day to be effective. Trees and shadows can reduce their effectiveness. A solar system in Lowell, MA had to be converted to AC because nearby buildings were blocking the solar exposure. The system can run for between 12 and 14 days with no sun.

The proposed locations of the solar panels on both sides of Massachusetts Avenue were evaluated for solar exposure. The solar panel on the north side would face south, would be unobstructed by trees, and would receive full solar exposure. The solar panel on the south side (playground) would be partially obstructed by nearby trees when leaves are present. Discussions with Ocean State Signal Co. indicated that they have implemented systems where one solar panel powers flashing beacons and batteries on both sides of the street, and that this configuration would be adequate for the Massachusetts Avenue location. The following is recommended:

- Identify appropriate size solar panel for north side to power both north and south side flashing beacons
- Connect flashing beacons on each side with a hard wire in a conduit beneath the crosswalk on Massachusetts Avenue
- Use extra large rectangular lights on both sides to provide maximum visibility

Maintenance

The only normal maintenance issues appear to be replacement of the battery and lights when needed.

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References

AECOM called the following nine Massachusetts communities to survey their experiences and satisfaction with RRFB devices:

- Amesbury¹
- Arlington
- Ashland
- Franklin (no response)
- Hopkinton
- Leominster (no response)
- Lowell
- Newton (no response)
- Northampton

The attached matrix summarizes the responses from the communities that replied.

Conformity

The TAPCO BlinkerSign system conforms to the *Manual on Uniform Traffic Control Devices, 2009*, FHWA. The MassDOT Highway Division has qualified this product for municipal use (March 26, 2013).

EVALUATION OF PEDESTRIAN CROSSING BEACON OPTIONS

The following summarizes four options researched for pedestrian crossing beacons.

Option 1: Rapid Rectangular Flashing Beacon

Rectangular Rapid Flash Beacons (RRFB) can enhance safety by reducing crashes between vehicles and pedestrians at unsignalized intersections and mid-block pedestrian crossings by increasing driver awareness of potential pedestrian conflicts. The RRFB has received an interim approval from the Federal Highway Administration and MassDOT. RRFBs are a lower cost alternative to traffic signals and hybrid signals that are shown to increase driver yielding behavior

¹ It is noted that Amesbury did not respond, but the Transportation Engineer for the City of Lowell lives in Amesbury and provided information on the device.

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at crosswalks significantly when supplementing standard pedestrian crossing warning signs and markings.



Features:

- Installs on new or existing poles
- High Intensity LEDs command attention throughout the day
- Can be activated stand alone or remote pushbutton
- The novelty and unique nature elicits a greater response from drivers leading to higher driver awareness and compliance than traditional methods
- FHWA approval for optional use of RRFB
- Increased visibility

Typical applications include: mid-block crossings, roundabouts, and school zones.

Specifications*:

- Housing: Powder coated aluminum
- LED Modules (2 per direction): 6 amber LED array, - 7" x 3" (Extra Large RRFB)
- Flash pattern: Meets FHWA regulations

Solar System Specifications

- Solar panel: 55 watt solar panel set at 40° or 60°
- Housing: NEMA 4 rated fiberglass cabinet with lockable clasps.
- Batteries (one per assembly): 12V, 40AH Sealed Gel battery requires no periodic watering
- Battery Life Span: 3-5 years
- Autonomy: Up to 30 days without sun

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- Control Circuit: IP-67 NEMA rated enclosure, dustproof and waterproof in water up to 3 feet for 30 minutes

* All specifications subject to change without notice.

Source: www.tapconet.com

Option 2: Flashing LED Sign

The Flashing LED sign conforms to the specifications of the FHWA set forth in the MUTCD. Using the latest advances in LED technology, the sign employs a set of synchronized high-intensity LEDs to extend the range of visibility of the sign during the day or night. Furthermore, the LEDs are flashed, which increases driver awareness of the sign and allows drivers to act sooner in advance of the crosswalk.



Features:

- Installs easily into new or existing sign post
- High Intensity LEDs command attention throughout the day
- Can be activated to operate continuously or triggered by optional pushbutton
- Heightened driver awareness
- Increased visibility

Typical applications include: mid-block crossings, new crosswalks, school zones, parks, playgrounds, shopping malls and hospitals.

Specifications*:

- Sign MUTCD W11-2
- MUTCD Section 2A.07 and 2A.08 compliant
- White LEDs standard, Yellow LEDs optional
- LED Life Expectancy (Over 100,000 hours)

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Solar / AC / Battery Specifications**

- 15W solar cell
- AC - 120V, 240V, 277V; 120V battery maintainer
- DC - 6 volt 12AH SLA battery (3 to 5 year battery life)
- Up to 12 days in 24/7 operation

* All specifications subject to change without notice.

** Special configuration (wireless, etc.) signs will have 12 volt 22AH SLA battery with 20W solar cell (22.75" x 16.75" x 1.125", 4.5" depth with bracket).

Type IX Reflective Sheeting.

State-of-the-art sheeting is used for traffic control and guidance signs and devices. This highly reflective, durable, and visible sheeting meets a wide variety of sign visibility needs in all light and weather conditions.

Battery

	12 Volt 12 Volt 22000mAh SLA (12V22Ah)	6 Volt 6 Volt 12000mAh SLA (6V12Ah)
Dimensions	7.14" x 3.03" x 6.59"	5.95" x 2.00" x 3.70"
Weight	12.74 lb.	4.08 lb.
Terminal Connector	Nut/Bolt	T1 - Spade
Operating Temperature	-40°F to +156°F	-40°F to +156°F
Warranty	1 Year	1 Year

Solar panel

	15 Watt	20 Watt	30 Watt
Max Power	15W	20W	30W
Operating Voltage	8.0V	17.2V	17.4V
Operating Current	1.88A	1.16A	1.73A
Max Voltage	10.8V	21.6V	21.6V
Operating Temperature	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Dimensions	16.75" x 14.00" x 1.125"	22.75" x 16.75" x 1.125"	26.5" x 16.75" x 1.125"
Type	Polycrystalline	Polycrystalline	Polycrystalline

Source: www.xwalk.com

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Option 3: Flashing LED Beacon

Flashing LED beacons have been used as an enhancement or warning for busy crossings and heavy traffic areas. Recent LED improvement, new regulations for 12" lenses and solar power have made this device more effective and versatile.



Features:

- High Intensity LEDs command attention throughout the day
- Can be programmed to operate continuously or on solar time clocks, pushbuttons and/or motion detectors
- Proprietary AutoBright™ circuitry automatically adjusts light output for optimum battery efficiency
- Heightens driver awareness
- Increased visibility and safety

Typical applications include: Pedestrian crossings, Roadway warnings, work zones and school zones.

Specifications*:

- Solar panel: 26-55 watt
- Battery: 40 hours
- Beacon Lens: 12 inch amber
- Battery Lifespan: 3-5 years
- Flash Pattern: MUTCD compliant

* All specifications subject to change without notice.

Source: www.tapconet.com

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Option 4: Pedestrian Hybrid Beacon (HAWK)

The Pedestrian Hybrid Beacon or HAWK is used as an alternative to a traffic signal to assist pedestrians in crossing major streets. The HAWK conforms to the specifications of the Federal Highway Administration (FHWA) set forth in the MUTCD. The HAWK beacon signal consists of two RED signal indications above a YELLOW signal indication forming a beacon signal that remains dark until activated by a pedestrian. This option is considerably more expensive and is best used at wide mid-block locations with high vehicular volume. In this case, the pedestrians and the vehicular volume do not warrant the Pedestrian Hybrid Beacon.



Mike Cynecki, City of Phoenix, AZ

Memorandum

Recommendation

Based on the evaluation of the options, Option 1 - Rectangular Rapid Flash Beacon (RRFB) is recommended as a suitable crossing device for the Massachusetts Avenue crosswalk. Studies have shown that this device increases motorist yield rate to pedestrians at uncontrolled crosswalk locations and has received the interim approval from FHWA and MassDOT. This device can be activated by pushbuttons and powered by solar panels. Solar exposure on the north side of Massachusetts Avenue is more than adequate to power both the north and south side flashing beacons via a hard wire connection. The extra large LED flashing lights are recommended for this location. The RRFB provides enhanced visibility over other devices.

Survey of Communities Using Rapid Rectangular Flashing Beacon Device at Crosswalks
Evaluation Summary Matrix

Location	Solar Panel	Pushbutton	Manufacturer	Battery Life Span	Reliability	Maintenance	Installation	Issues	Comments
Amesbury	X	Motion sensor						Sometimes beacon was activated when no one was there	Installed about 1 year ago at Senior Center
Arlington	X	Motion sensor	TAPCO		Initially not enough power from solar panels		Dagle Electrical	Solar panel size was inadequate for number of calls. Sometimes only beacon on one side flashed	A larger solar was installed to improve power. Device is located at the Minute Man Bikeway at Mill Street
Ashland	X	-	-	-	Has been reliable for the past 2 years	No Maintenance	Contractor	No issues to date	Was installed because of limited visibility near intersections. Solar panels helped control costs . Accidents have gone down
Hopkinton					No issues			No issues	Hayden Rowe St near school
Lowell	X	X			Wireless connection between beacons work fine		Electric Light	The adjacent buildings blocked the sun, had to switch to AC power. Sometimes pedestrians do not push button	Installed August 2013 at Senior Center across from Market Basket.
Northampton	X	X	TAPCO	-	Has been reliable for the past 8 months	None, unless it breaks	Gomes	Setting up the sensitivity for the motion detectors took time. Prefers pushbutton detection.	Recommend using 5 point beacons. The 5 point is 2 flashing units on each side of the RRFB facing the traffic and one light facing towards the crosswalk so that peds could see the RRFB activated.

Source: AECOM phone interviews in April 2014.

LED Rectangular Rapid-Flash Beacon (RRFB) 3.0

Increased Conspicuity for Pedestrian Crossings and School Zone Crossings



- Provides clear & positive warning
- Driver yielding rates of 80% to 90%
- More effective than round beacons
- Solar = Zero operating costs
- No maintenance required
- Clean, uncomplicated installation
- LED Indicators for pedestrians
- BlinkSync™ wireless synchronization
- Certified SAE JA595-compliant LEDs

RRFB studies show a dramatic increase of driver compliance in yielding to pedestrians at high-risk uncontrolled crossings. RRFBs have produced 80% to 90% yielding rate, highest of all devices that do not feature a red display, and up to 4 times greater than a regular round beacon. RRFBs cost less than other devices that produce similar vehicular yield rates.

RRFB feature multiple arrays of brilliant LEDs that, when activated, flash a warning in a specified, alternating 'wig-wag' pattern, thereby commanding the attention of drivers by *Day And Night*. Additional side-mounted LED arrays flash concurrently to let pedestrians know that the unit is flashing. Optional self-powered remote pushbutton activation available.

TAPCO's RRFB feature aimable LEDs in a sturdy housing with a closed top and bottom, and no exposed wiring. See reverse for specifications.

APPLICATIONS

- School Crossings
- Pedestrian Crossings
- Shared Ped/Bicycle Crossings
- Roundabouts

BENEFITS

- Significantly higher driver awareness and compliance
- Hi-intensity Day-Viz™ LEDs command attention, both by day and by night
- Increased visibility

FEATURES

- Multiple units are wirelessly synchronized, flash in unison
- LED output automatically to maximize autonomy and battery efficiency
- Installation onto new or existing sign poles
- Stand-alone, self-powered remote pushbutton bollard available



Multiple Solar-Powered beacons flash in unison, wirelessly synchronized by BlinkSync™ technology



Left side of street



Right side of street

STANDARD SPECIFICATIONS FOR RRFB 3.0 SYSTEM†

Rectangular Rapid-Flash Beacon

FHWA Approval, Optional Use of RRFB	Interim FHWA Approval Memorandum (1A-11)
Light Bar Housing	Powder coated aluminum
LED Indications (2 per direction)	6 amber LED array, ~ 5" x 2", SAE J595 certified
Flash Pattern	MUTCD recommended 'wig-wag' flash pattern
Pedestrian LED Indication	4 amber LED array, ~ 4" x 1½"
Mounting Hardware (enclosed)	Stainless steel/aluminum; accommodates 2¾" to 4½" O.D. poles

Electronics System

Housing Cabinet	Rated NEMA 4x, 11 & 12 & UL508A polyester cabinet, lockable clasps
Solar Panel: Fully Rotatable 360° (25.75" x 25.25" x 1.4375")	55 watt solar panel set at 40° or 60°. Conforms to IP-67. Includes aluminum mounting bracket for 2¾" to 4½" O.D. pole.
Batteries (one per assembly)	12V, 40AH Sealed Gel battery requires no periodic watering. Sealed construction eliminates corrosive acid fumes and spills.
Battery Lifespan	Up to 3 years
Autonomy	Up to 30 days without sun

BlinkerBeam® Wireless Communication System

Frequency	900 MHz FHSS
Range	Up to 3 miles with optional external antennas. For system separation over 900', a site survey is recommended for optimal performance.
Radio	Operates on 900 MHz frequency hopping spread spectrum network. Operating range from 3.6vdc to 15vdc
Programmability	Up to 50 systems in one network
Push-button Activation*	ADA pushbutton, typical (<120 millisecond)

*Optional remote, stand-alone pushbutton including self-contained, replaceable battery with typical two-year life

Programming

RS232 Communications Port

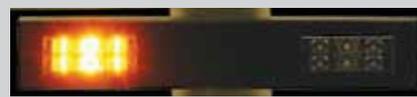
Programming via Windows basic software: Optional wireless cellular or internet programming

W11-2 Ped, W11-15 Ped/Bike & S1-1 School Xing Signs; W1 6-7P & W16-9P Plaques

Sign Substrate (30" or 36" signs)	.080" Highway grade aluminum
Reflective Sheeting	3M™ DG ³ FYG 4083 with anti-graffiti overlay
Hardware	Zinc-plated steel anti-vandal fasteners for signs and RRFB units
MUTCD Compliance	MUTCD Section 2A Compliant

BlinkSync™ Wireless, Synchronized Device Activation Systems

Multiple units in one system will flash in synchronized patterns to avoid light noise of system operation. Ideal for multiple units flashing in the same direction, without the need for wiring.



Aimable LED arrays

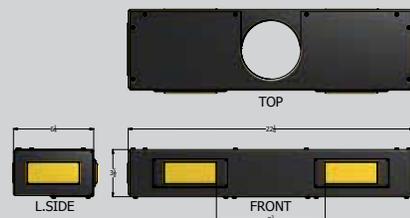


GSA

Contract Holder

FSS Contract GS-07F-8924R

GS-07F-0234U



† Specifications are subject to change without notice. For additional specifications and details, please contact us!

TAPCO®

TRAFFIC & PARKING CONTROL CO., INC.

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Distributed By:

RRFB Installation Instructions

RRFBs, Control Boxes, and Solar Panels are pre-assembled

Package should include:

- Control Box
- 12VDC Battery
- 55 Watt Solar Panel
- RRFB
- Pushbutton
- Solar Cable
- RRFB Cable
- Pushbutton Cable
- BEA Sensor

Mechanical Assembly

1. Drill holes into pole for solar panel, RRFB, control box, and pushbutton.
2. Install solar panel to top of pole and run wires to control box hole.

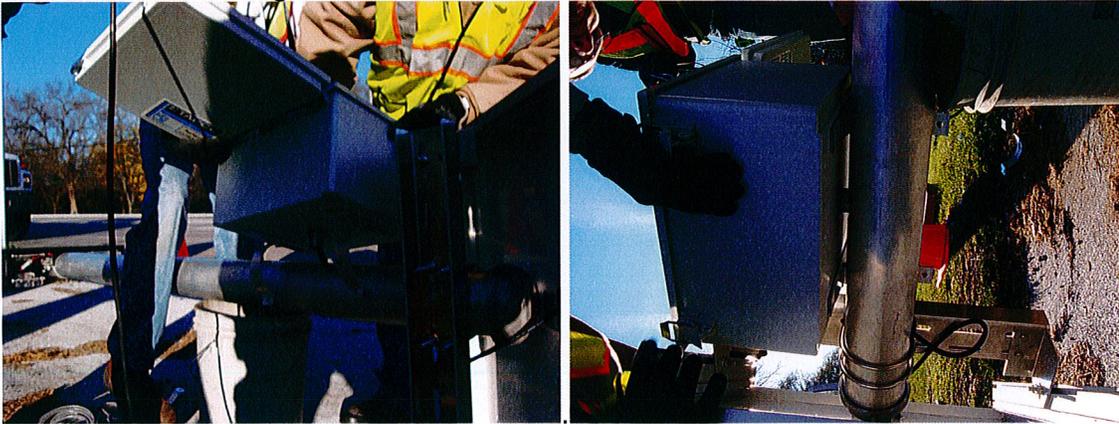


3. Install RRFB light bar and run wires up to control box hole.



4. Install pushbutton and feed wires to the control box hole
5. Install BEA sensor and push button and run wires to the control box.

6. Feed wires through back of control box and mount it.



7. Strip off several inches of cable insulation.

8. Install connectors on the ends of the wires

Warning!

Solar panels have live current, be very careful with the wires from the solar panel! Hook up wires inside the solar panel junction box LAST! Attach all wires in the order listed below. Failure to do so will void Tapco warranty.

A. Attach pushbutton and RRFB light bar wires first

1. Attach pushbutton common (COM) to PB- on the terminal block
2. Attach pushbutton normally open (N/O) to PB+ on the terminal block
3. Attach the white wire from RRFB to LED1+ on terminal block
4. Attach the black wire from RRFB to LED1- on terminal block
5. Attach the brown wire from RRFB to LED2+ on terminal block
6. Attach the blue wire from RRFB to LED2- on the terminal block

B. Attach the battery

1. Place battery centered on the bottom of control box
2. Take velcro strap and secure around battery
3. Tighten velcro strap until snug around battery and close
4. Attach the black wire with ring terminal to (-) on battery
5. Attach the white wire with ring terminal to (+) on battery

C. Attach the solar panel last

1. Attach the black wire from solar panel to SLR- on terminal block
2. Attach the white wire from solar panel to SLR+ on terminal block

Warning! These steps to be performed LAST!

In the control box there will be two terminals with screws connected by diodes
Left terminal with screw is negative
Right terminal with screw is positive
Attach ring terminals to the ends of wires

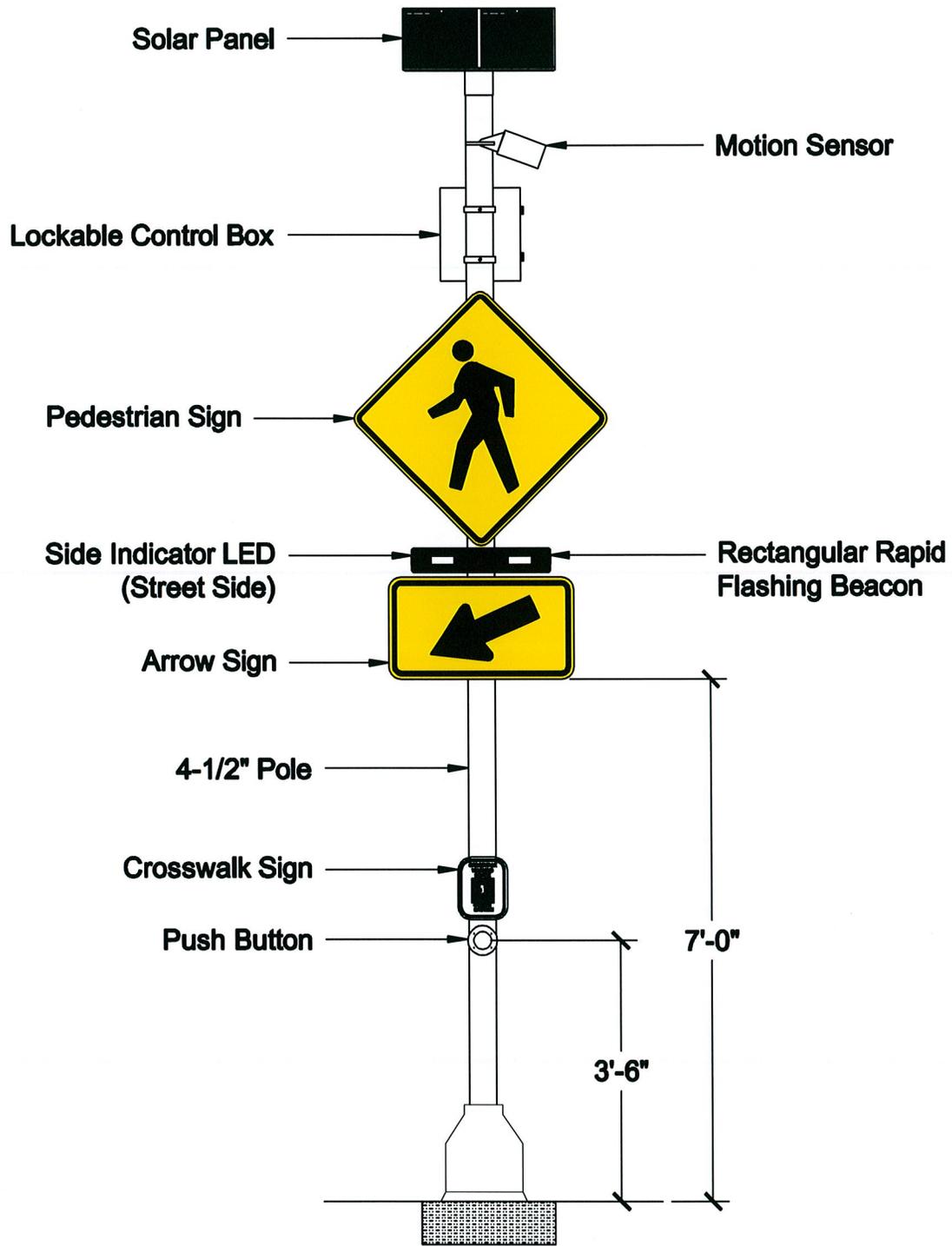
Attach black wire (labeled negative) to left terminal with screw
Attach white wire (labeled positive) to right terminal with screw

Last step before RRFB install is complete

At this point all RRFBs should have power and be connected to a solar panel
Check green LED on solar controller marked charging. It should be lit
Check display screen on radio. It should be flashing text and numbers

D. Binding the wireless radios

1. Identify master radio which will be identified as J-XXXXXX-101.
2. Press the right button on the radio 3 times
 - Display screen will read *BINDING* *MASTER*
3. On the other control boxes press the right button to bind radios.
 - Display screen will briefly read *BINDING* *SLAVE*
4. When the radio reads *BOUND* *SLAVE* return to the master control box and press the button on right 2 time which will terminate binding mode.
 - All radios in the system will be synchronized in a minute or two.
5. Now press all pushbuttons to see if system is functioning properly.

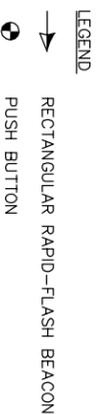


ELEVATION



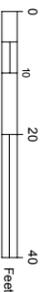
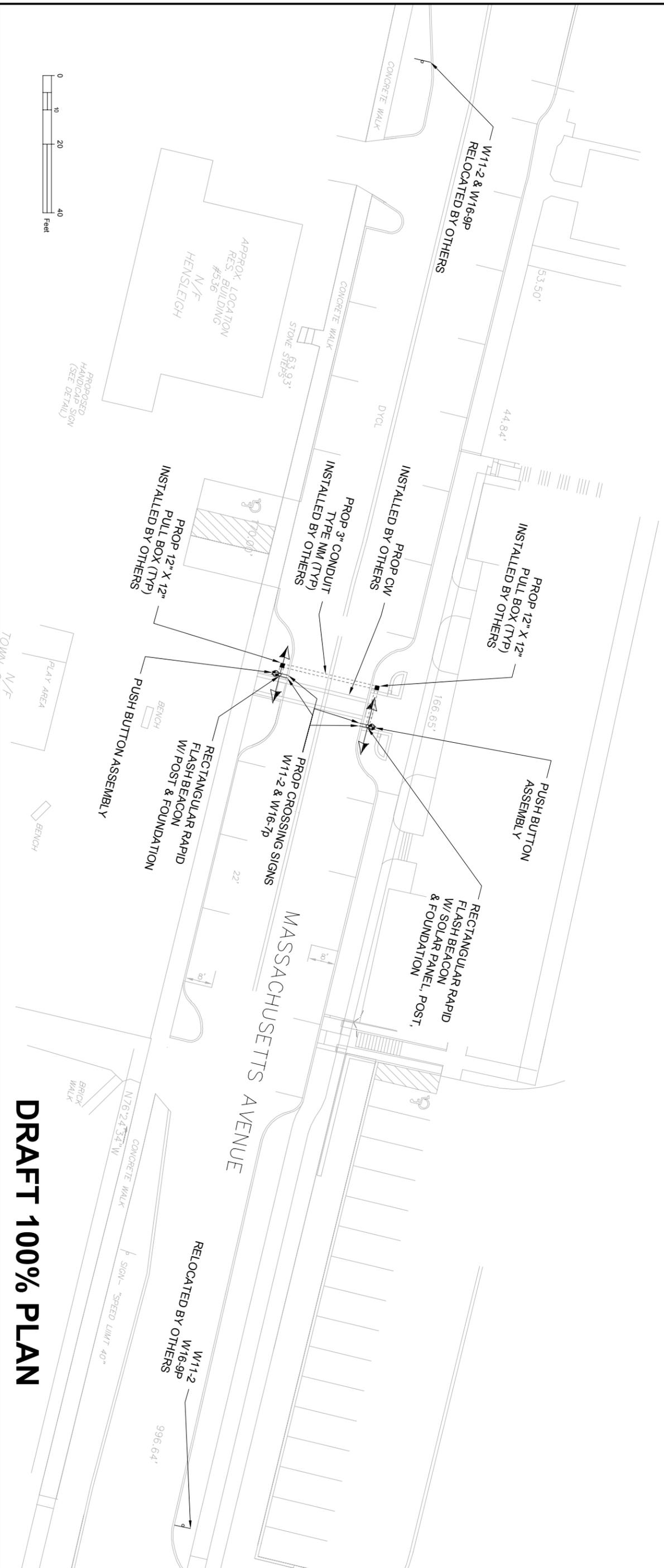
MAJOR ITEMS REQUIRED	
QUANTITY	ITEM
4	RECTANGULAR RAPID-FLASH BEACON-XL, ALL DIRECTION
2	PUSH BUTTON W/ 9x12 FRAME & R10-25 SIGN
2	SIGNAL POST & BASE - W/FND - 14' - PAINTED BLACK (FLAT)
1	85W SOLAR CABINET W/ 99 AHR BATTERY
1	SOFTWARE KIT
4	W1-2 PEDESTRIAN CROSSING SIGN (30" x 30")
2	W6-7PL DOWN LEFT ARROW SIGN (24" x 12")
2	W6-7PR DOWN RIGHT ARROW SIGN (24" x 12")

PLUS ALL NECESSARY CABLE, LABOR, CLAMPS, MISCELLANEOUS MATERIAL, AND EQUIPMENT TO COMPLETE THE INSTALLATION.



- OPERATION NOTES:**
1. BEACONS SHALL BE ACTIVATED UPON PUSH BUTTON AND FLASH FOR A DURATION OF 10 SECONDS.

- GENERAL NOTES:**
1. ALL TRAFFIC CONTROL DEVICES SHALL BE IN COMPLIANCE WITH THE 2009 MUTCD.
 2. ALL TEMPORARY TRAFFIC CONTROL REQUIRED ON MASSACHUSETTS AVENUE SHALL BE IN COMPLIANCE WITH THE LATEST MASSDOT STANDARDS.
 3. PROPOSED POSTS SHALL BE INSTALLED 1.5' TO 2' FROM THE FACE OF CURB.
 4. SIGN HEIGHT, MEASURED VERTICALLY FROM THE BOTTOM OF SIGN TO THE TOP OF CURB OR NEAR EDGE OF TRAVELED WAY, SHALL BE 7'.
 5. PROPOSED FOUNDATIONS SHALL BE AS DETAILED IN THE 1988 MASSDOT STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND FORMED AND Poured AS PER SD3-030 OR MAY BE PRE-CAST UNITS W/ SLOTTED SIDE OPENINGS FOR EASE OF CONDUIT.
 6. INSTALLATION OF SYSTEMS SHALL BE AS SHOWN IN ATTACHED DETAIL.
 7. INSTALLATION SHALL INCLUDE SINGLE SOLAR PANEL AS SHOWN, WITH HARD-WIRE CONNECTION UNDER ROADWAY TO SECOND SYSTEM.



DRAFT 100% PLAN

**WEST ACTON VILLAGE ECOLOGY
RECTANGULAR RAPID FLASH BEACON PLAN
MASSACHUSETTS AVE & GARDENER FIELD PLAYGROUND
TOWN OF ACTION, MA**

DESIGNED BY	JM	DWG SCALE	1" = 20'
DRAWN BY	CC	CONTRACT NO.	60319B00
CHECKED BY	DF	DATE	6/27/14

FULL SIZE DRAWING = 4"			
NO.	REVISIONS	BY	DATE

TRANSPORTATION

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