UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF FLORIDA

CASE NO. _____

R.D. JONES, STOP EXPERTS, INC., and RRFB GLOBAL, INC.,

JURY TRIAL DEMANDED

Plaintiffs,

v.

CARMANAH TECHNOLOGIES CORPORATION; CARMANAH TECHNOLOGIES (US) CORPORATION; and SPOT DEVICES, INC.,

Defendants.
_____/

VERIFIED COMPLAINT FOR INUNCTIVE RELIEF AND DAMAGES AND DEMAND FOR JURY TRIAL

Plaintiffs, R.D. JONES, STOP EXPERTS, INC. and RRFB GLOBAL, INC., by their undersigned counsel, hereby sue the Defendants, CARMANAH TECHNOLOGIES CORPORATION, CARMANAH TECHNOLOGIES (US) CORPORATION and SPOT DEVICES, INC., and allege as follows:

PARTIES, JURISDICTION AND VENUE

1. Plaintiff, R.D. JONES, STOP EXPERTS, INC. ("RDJ STOP EXPERTS"), is a corporation organized and existing under the laws of State of Florida and having a principal place of business at 225 Center Court, Venice, Florida.

2. Plaintiff, RRFB GLOBAL, INC. ("RRFB GLOBAL"), is a corporation organized and existing under the laws of the State of Florida, and having a principal place of business at 225 Center Court, Venice, Florida.

3. Defendant, CARMANAH TECHNOLOGIES CORPORATION, is a foreign corporation, having a principal place of business at 250 Bay Street, Victoria, British Columbia, Canada.

4. Defendant, CARMANAH TECHNOLOGIES (US) CORPORATION, is a foreign corporation organized and existing under the laws of the State of Nevada. (CARMANAH TECHNOLOGIES CORPORATION and CARMANAH TECHNOLOGIES (US) CORPORATION are hereinafter collectively referred to as "CARMANAH").

5. Defendant, SPOT DEVICES, INC. ("SPOT DEVICES"), is a foreign corporation having a principal place of business at 1455 Kleppe Lane, Sparks, Nevada. SPOT DEVICES was acquired by CARMANAH in January 2013. (SPOT DEVICES, INC., and CARMANAH are hereinafter collectively referred to as "Defendants").

6. On or about January 2013, SPOT DEVICES was acquired by CARMANAH.

7. Defendants, SPOT DEVICES, INC. and CARMANAH, are direct commercial competitors to Plaintiff, RRFB GLOBAL.

8. This Court has subject matter jurisdiction over Count I (patent infringement) pursuant to 28 U.S.C. § 1331 and 28 U.S.C. §1338(a). This Court also has subject matter jurisdiction over Counts II and III pursuant to 28 U.S.C. §§ 1331, 1332 and 1338(b) This Court may exercise supplemental jurisdiction over all related state law claims under 28 U.S.C. § 1367.

9. This Court has personal jurisdiction over the Defendants pursuant to §§48.193(1) and/or 48.193(2), Fla. Stat. in that: (1) Defendants continuously and systematically engaged in business in the State of Florida; (2) through sales of their infringing Rectangular Rapid Flashing Beacon ("RRFB") systems, engaged substantial and not isolated activities within the State of

Florida; (3) Defendants advertised their products for sale in State of Florida with false statements which were intended to mislead the public; (4) Defendants sold their products to Florida consumers and municipalities; and (5) Defendants engaged in a general course of business activity in the State of Florida for their own pecuniary benefit.

10. The amount in controversy exceeds a sum of $75,000.00.

11. Venue is proper in this judicial district pursuant to 28 U.S.C. § 1391(b) and 28 U.S.C. § 1400(b) because (1) the acts complained of occurred within this judicial district and division; and (2) Defendants have committed acts of infringement within this judicial district and division and have a regular and established place of business within this judicial district and division.

FACTS COMMON TO AND APPLICABLE TO ALL COUNTS

The ‘654 Patent

12. Prior to June 6, 2006, Mr. Richard Jones invented a new flashing beacon and method for slowing vehicle traffic now called an RRFB.

13. Mr. Jones applied for and obtained United States Patent No. 8,269,654 which was duly and legally issued on September 18, 2012 (“the ‘654 patent”). A true and correct copy of the ‘654 patent is attached hereto as Exhibit A. The ‘654 patent is a continuation of patent application number 12/303,802 that issued as U.S. Patent No. 8,081,087 on December 20, 2011.

14. Plaintiff, RDJ STOP EXPERTS, is the owner of all right, title and interest in and to the ‘654 patent by way of assignment, including but not limited to the right to sue for past infringement.

15. Plaintiff, RRFB GLOBAL, is the exclusive licensee of the ‘654 patent.

16. Plaintiff, RRFB GLOBAL, manufactures and sells RRFB systems using the design of the '654 patent throughout the United States ("Plaintiff's RRFB Systems"). Stop Experts, Inc. ("Stop Experts") is a Florida corporation that previously sold and developed RRFB systems and is a related company to RRFB GLOBAL and RDJ STOP EXPERTS. (The group of RRFB GLOBAL and RDJ STOP EXPERTS are collectively referred to as "the Stop Experts Group").

17. The Stop Experts Group, via Stop Experts, Inc., is approved to sell RRFBs in the State of Florida. A true and correct copy of Florida Department of Transportation Approved Product List for Rectangular Rapid Flashing Beacon Assembly is attached hereto as Exhibit B

18. The '654 patent covers a traffic directing device and a method for slowing vehicle traffic. A wig–wag (alternating) flash pattern of "*two* light flashes from one light unit, and *at least three* light flashes and *no more than five* light flashes from the other light unit for each wig-wag cycle," *which proven through formal Engineering Studies* is significant to the Stop Experts' design for safety and effectiveness to alert drivers to slow down in order to prevent pedestrian-automobile collisions. *See* Exhibit A.

19. RRFB GLOBAL sells its RRFB systems through distributors who typically are licensed in states and sell the systems to municipalities based on approval of such RRFB's pursuant to Interim Approval IA-11 issued July 16, 2008 by the U.S. Department of Transportation, Federal Highway Administration ("FHWA"), Manual of Uniform Traffic Control Devices (MUTCD) ("FHWA Interim Approval"). A true and correct copy of the FHWA Interim Approval is attached hereto as Exhibit C.

The Federal Highway Administration Interim Approval

20. The FHWA has issued an interim approval of the RRFB within the Manual of Uniform Traffic Control Devices (MUTCD), following an extensive study that monitored the effectiveness of the devices over a two-year period.

21. The FHWA Interim Approval for RRFB's states that, "The RRFB use rectangular shaped high-intensity LED-based indications, flashes, rapidly in a wig-wag flickering flash pattern, and is mounted immediately between the crossing sign [for a cross-walk] and the sign's supplemental arrow plaque." *See* Exhibit C, FHWA Interim Approval.

22. In 2010, 4,280 pedestrians were killed and an estimated 70,000 were injured in traffic crashes in the United States. On average, a pedestrian was killed every two hours and injured every eight minutes in traffic crashes."- U.S. Department of Transportation, NHTSA's National Center for Statistics and Analysis August 2012.

23. The Stop Experts Group's RRFB systems have attained the historic and near miraculous test scores proving an 80% + yield rate of drivers approaching a cross-walk where their RRFB system had been installed (*see* FHWA Study). Such "game changing" performance is due in a large part to the high quality components used by the Stop Experts Group in order not to compromise the safety of the children, men and women who rely on the RRFB systems when crossing busy intersections.

24. The success of Plaintiffs' product is no accident - it was earned through Plaintiffs' substantial investment in design innovation, product development, and marketing and advertising.

25. Indeed, CARMANAH endorsed the Stop Expert's Group's RFB, when citing the FHWA Interim Approval in their Press Release stating that according to the FHWA Interim Approval, "The RRFB's very high compliance rates are previously unheard of for any device other than a full traffic signal and a 'HAWK' hybrid signal, both of which stop traffic with steady red signal indications." CARMANAH News Release June 19, 2012: *Carmanah Launches R920 Series Rectangular Rapid Flashing Beacon*, a true and correct copy of which is attached hereto as Exhibit D.

SPOT Devices' RRFB Systems Are Inferior and Falsely Advertised to Be Compliant with FHWA Interim Approval

26. SPOT DEVICES regularly submits bids for RRFB systems that are at least 20% lower in price than a comparable bid that the Stop Experts Group would provide.

27. A manufacturer of an RRFB system can make less costly RRFB systems by using LEDs that are not Class 1 LEDs (Society of Automotive Engineers J-595 Class 1), using a lead acid battery back-up and improperly assembling the RRFB system and signs, among other short cuts. Yet each of these cost saving measures will affect the operation of the RRFB system and will jeopardize the safety of the men, women and children attempting to cross a street where such inferior RRFB system is being installed.

28. CARMANAH regularly submits bids for RRFB systems that are at least 20% lower in price than a comparable bid that the Stop Experts Group would provide.

29. Plaintiff, RRFB GLOBAL, continues to suffer losses of RRFB sales across the U.S. due to Defendants' sale of infringing RRFBs sold at lower pricing per RRFB than Plaintiff, RRFB GLOBAL's pricing for its RRFB systems.

30. The RRFB's manufactured and sold by Defendants, SPOT DEVICES, and/or CARMANAH, were falsely advertised as being compliant with the FHWA Interim Approval.

31. SPOT DEVICES is approved by the Florida Department of Transportation to sell RRFB's in the state. *See* Exhibit B.

32. Defendants, CARMANAH, identify themselves as having sales across the U.S. and reported generating annual sales of approximately $15 million. RRFB GLOBAL's sales of RRFB systems is less than $1 million.

The Federal Highway Administration Study Partially Funded By Stop Experts

33. The Federal Highway Administration conducted a study entitled "Effects of Yellow Rectangular Rapid-Flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks" issued September 2010 (hereinafter "FHWA Study"). A true and correct copy of the FHWA Study is attached hereto as Exhibit E.

34. The FHWA Study was based on the use of RRFB systems provided by Stop Experts. "This specified flashing pattern was based on the flashing pattern used in the successful experiments with RRFB in St. Petersburg, Florida, and elsewhere. The specific product tested in the experiments with RRFB was a device known as the 'Enhancer' as supplied by Stop Experts, Inc." FHWA Letter August 3, 2010. A true and correct copy of the FHWA HOTO-1 Interpretation letter to Mr. R. Van Houten, August 3, 2010 is attached hereto as Exhibit F.

35. Stop Experts partially funded the equipment for the FHWA Study approval and the associated costs in re-educating the signaling industry of the new concept to obtain MUTCD approval and incurred at least $1.3 million in costs over a two year period.

36. The FHWA Study provided background information regarding the problems that RRFBs were meant to solve and stated:

> Drivers often fail to yield to pedestrians who have the right-of-way in marked crosswalks at uncontrolled locations. From the beginning of 2004 to the end of 2006, there were a total of 14,351 pedestrian fatalities and 212,786 pedestrian injuries resulting from pedestrian-automobile collisions nationwide. Decreasing the occurrence of these crashes would increase the safety and overall walking experience for pedestrians. Anything less than a traffic signal has historically failed to produce over 70 percent yielding at crosswalks on multilane roads. *See* Exhibit E, FHWA Study page 11 of 50.

37. The FHWA Study included testing of the Plaintiffs' RRFB system, shown in the Figure 1 below and determined a significant increase in safety by using such RRFBs. The Abstract of the FHWA Study states that:

> A series of five experiments examined the efficacy of RRFBs. These studies found that RRFBs produced an increase in yielding behavior at all 22 sites located in 3 cities in the United States. Data collected over a 2-year follow-up period at 18 of these sites also documented the long-term maintenance of yielding produced by RRFBs. A comparison of RRFBs to a traditional overhead yellow flashing beacon and a side-mounted traditional yellow flashing beacon documented higher driver yielding associated with RRFBs that was not only statistically significant, but also practically important. *See* Exhibit E, FHWA Study page 3 of 50.

Figure 1. Photo. RRFB with two forward-facing LED flashers and a side-mounted LED flasher.

38. The FHWA Study reported that the results of one of the tests of the RRFB system as follows:

> The first site at 22d Avenue N east of 7th Street had an average baseline driver yielding percentage of 28 percent. The first two-beacon system produced an average yielding percentage of **82 percent**, while the first four-beacon system produced an average yielding percentage of **95 percent**. The reversal back to two beacons produced an average yielding percentage of 87 percent, and the second treatment of four beacons had an average yielding percentage of 91 percent. *See* Exhibit E, FHWA Study page 9 emphasis added).

39. The FHWA Study confirmed earlier studies that also demonstrated the significant improvement in traffic safety that had led the federal government to initiate a program for

nationwide use of RRFB systems via the FHWA Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11) published in the Manual on Uniform Traffic Control Devices (MUTCD) on July 16, 2008. *See* Exhibit E.

The MUTCD

40. The MUTCD provides RRFB requirements as follows:

- RRFB shall be located between the bottom of the crossing warning sign and the top of the supplemental downward diagonal arrow plaque;
- Two yellow indications in each RRFB;
- 70 to 80 periods of flashing per minute;
- Flash in rapidly alternating "wig-wag" flashing sequence (left light on, then right light on);
- Light intensity of the yellow indications shall meet minimum specifications of the Society of Automotive Engineers (SAE) standard J595 standard dated January 2005.

41. The MUTCD does not regulate any energy source and manufacturers may use hard wired systems (using standard AC current) where an electric cable connects to the RRFB unit and/or a solar collector mounted on the RRFB unit and/or a battery back-up system and/or generator.

42. In an Interpretation from the Federal Highway Administration, it was determined the "a flash pattern of two yellow indications followed by four pulses of light followed by a long pulse in the other yellow indication meet the intent of the [the MUTCD for RRFB's] item 5.b." *See* Exhibit F.

Plaintiffs Suffer Financial Harm as a Result of Defendants' Unlawful Conduct

43. The Stop Experts Group/ Plaintiffs have suffered severe financial harm due to the ongoing willful infringement of Defendants. In particular, the Stop Experts Group has had their sales of RRFB systems decline by more than 80% in the last 30 month period.

44. As a result of the severe financial harm, Stop Experts Group has had their budget for marketing and advertising of their RRFB systems reduced to zero dollars. In contrast, the Stop Experts Group in previous years had been able to compete with other RRFB system manufacturers and distributors by expending large amounts on marketing and advertising. For example, in September 2009, Stop Experts, Inc. rented a booth at the American Public Works Association (APWA) convention in Columbus, Ohio and expended approximately $90,000 at that single show for marketing and display of their RRFB systems.

45. The activities of Defendants as alleged in this Complaint occurred in interstate commerce within the United States and within the State of Florida.

COUNT I – PATENT INFRINGEMENT

46. Plaintiffs, R.D. JONES, STOP EXPERTS, INC. and RRFB GLOBAL, re-allege and re-incorporate paragraphs 1 – 45 fully and completely as if set forth herein.

47. This is a claim for patent infringement under the laws of the United States, specifically 35 U.S.C. § 271.

48. Commencing on the issue date of the ‘654 patent, September 18, 2012, Defendant, SPOT DEVICES, began infringing the ‘654 Patent by making, using, offering to sell or selling within the United States and/or importing into the United States, RRFB systems having the claimed elements of the ‘654 Patent. The SPOT DEVICES RRFB system including model number SB435HP and SB430 infringe the ‘654 patent. A true and correct copy of the Spot Devices’ Specifications for Rectangular Rapid Flashing Beacon is attached hereto as Exhibit G.

49. CARMANAH continued selling the infringing RRFB systems previously sold by SPOT DEVICES.

50. Additionally, only SPOT DEVICES is currently approved for sale of RRFBs in Florida, and such infringing RRFB systems continue to be sold (by CARMANAH) under the SPOT DEVICES name and model numbers in Florida and other states.

51. SPOT DEVICES has been on the State of Florida Approved Product List since August 15, 2011. *See* Exhibit B.

52. CARMANAH is applying with the State of Florida to have their RRFB included on the Approved Product List (APL). Based on the July 15, 2013 bid approval by the City of Dunedin, Florida to install an RRFB system from CARMANAH (Temple, Inc.), the FDOT APL approval is likely to occur on or before July 26, 2013. True and correct copies of the Dunedin, Florida June 20, 2013 City Commission Agenda, Temple's Website (showing the Carmanah RRFB) and City of Dunedin Award of an RRFB are attached hereto as Composite Exhibit H.

53. The '654 patent is a continuation of the '087 patent, but its independent claims specify a flash pattern of "two flashes from one light unit, and at least three light flashes and no more than five light flashes from the other light unit for each wig-wag cycle." *See* Exhibit A.

54. On March 1, 2012, in an open letter to the RRFB/ traffic signaling industry , Mr. Chris Peddie, President of SPOT DEVICES stated the following:

> While it is true that Stop Experts was granted a patent that covers a version of the RRFB, the Spot Device's RRFB does not infringe on this ['087] patent [because] …the Spot Device's RRFB operates with a two-four flash pattern. (hereinafter "the two-four flash pattern letter").

A true and correct copy of the March 1, 2012 two-four flash pattern letter is attached hereto as Exhibit I.

55. Mr. Peddie's two-four flash pattern letter (*See* Exhibit I) is describing the specific "wig-wag" pattern and describes the SPOT DEVICES RRFB as having a "two-four" flash pattern (e.g. a flash pattern of two pulses in one of the yellow lights followed by four pulses in the other yellow light).

56. Mr. Peddie's two-four flash pattern letter recites claim 1 of Stop Experts '087 patent (of which the '654 patent is a continuation) with respect to a flash pattern of two light flashes from one light unit and three light flashes from the other light unit (e.g. a "two-three" flash pattern). Mr. Peddie distinguishes the SPOT DEVICES RRFB from the claimed invention of Plaintiff's '087 patent solely based on the SPOT DEVICES RRFB having a two-four flash pattern, rather than a two-three flash pattern. *See* Exhibit I.

57. In the two-four flash pattern letter, Mr. Peddie states, "The Spot Devices RRFB differs in that instead of operating with a two-three flash pattern, the Spot Devices RRFB operates with a two-four flash pattern." Mr. Peddie fails to recite any other distinctions between the SPOT DEVICES' RRFB and the claims of the '087 patent. *See* Exhibit I.

58. As a result of claims of the '654 patent having a range of three to five flashes from the second light unit, the two-four flash pattern of the SPOT DEVICES RRFB infringes the '654 patent and Mr. Peddie's two-four flash pattern letter admits as much.

59. Commencing on the issue date of the '654 patent, September 18, 2012, CARMANAH also began infringing the '654 Patent by making, using, offering to sell or selling within the United States and/or importing into the United States, RRFB systems having the claimed elements of the '654 Patent. The CARMANAH RRFB system including model number

R920 infringe the '654 patent. A true and correct copy of the Carmanah R920 Series Specifications is attached hereto as Exhibit J.

60. CARMANAH will greatly threaten Plaintiff's, RRFB GLOBAL, ability to continue to sell RRFB systems in the State of Florida should CARMANAH obtain APL status for their RRFB products and sell such infringing products in Florida.

61. Defendants, SPOT DEVICES and/or CARMANAH, have also made false claims in their commercial advertising that their RRFBs have obtained 80% rate of yielding by automobiles approaching a cross-walk having a SPOT DEVICES' RRFB system when the test data was actually reflecting the testing solely of the Stop Experts Group's RRFB. *See* Exhibit E, FHWA Study and Exhibit F, FHWA Interpretation HOTO-1, August 3, 2010.

62. By undercutting the pricing of Plaintiff's, RRFB GLOBAL, RRFB systems, SPOT DEVICES (as well as CARMANAH) has been gaining market share in Florida and across the US and is greatly damaging Plaintiff's business due to their ongoing infringement and unfair trade practices.

63. The Federal Government by way of its National Safe Routes to School (SR2S) funding program is distributing approximately $750 million to the states to use on projects including installation of RRFBs to make school crossings areas safer for children.

64. As the SR2S funds are distributed, states and municipalities receiving such funds will lock into RRFB vendors who will be asked to maintain the operation of such RRFB systems and likely be in line for further RRFB installations in the future. New contracts have recently been granted and/or due for an award under the SR2S funding program for installation of RRFB systems as soon as August 13, 2013. A true and correct copy of a Report showing bids for RRFB

systems in Wisconsin by the Wisconsin Department of Transportation is attached hereto as Exhibit K.

65. As a result of the ongoing infringing sales by Defendants, Plaintiffs are being irreparably harmed and their business is being put in jeopardy.

66. The activities complained of in this Count I occurred without license from and/or permission of Plaintiffs.

67. Defendants, CARMANAH and SPOT DEVICES, were put on notice of the '654 patent at least as early as October 1, 2012. Despite the notice of the '654 patent and their admission that it is a "remarkably effective invention," Defendants continue to willfully infringe the '654 Patent. Further, Defendants recognized, "the tremendous amount of effort (and cleverness) [Stop Experts] exerted to get to the current point of interim approval." A true and correct copy of the February 17, 2012 e-mail from Chris Peddie to Richard Jones is attached hereto as Exhibit L.

68. The infringement by Defendants is willful to the extent that such infringement has continued after Plaintiff's, RRFB GLOBAL and the Stop Experts Group's notice.

69. Defendants infringe the claims of the '654 patent directly and/ or indirectly by way of contributory infringement, inducement and/ or joint infringement because Defendants had knowledge of the '654 patent yet continued to make, use, sell, offer for sale or import RRFB systems in violation of the '654 patent either on its own or in concert with its customers, municipalities or third parties.

70. The infringement complained of herein has injured and damaged Plaintiff, RRFB GLOBAL.

WHEREFORE, Plaintiffs demand that the Court enter judgment against the Defendants as follows:

a. Entering a Temporary Restraining Order, as well as Preliminary Injunction, in favor of Plaintiff, RRFB GLOBAL, and enjoining Defendants and all other person in active concert or participation with them, either directly or indirectly, from:

   i. making, using, selling, importing, repairing, assembling or offering for sale RRFB devices that infringe the '654 patent or any product no more than colorably different to such devices;

   ii. infringing upon the '654 patent; and/or

   iii. aiding, contributing or cooperating with third parties who make, use, sell, import, assemble or offer for sale parts or components that when finally assembled infringe the '654 patent;

b. Entering a Permanent Injunction in favor of Plaintiff, RRFG GLOBAL, enjoining the infringement by Defendants;

c. Awarding such damages as Plaintiffs may have suffered but in no event less than a reasonable royalty pursuant to 35 U.S.C. § 284;

d. Finding willful infringement and enhancement of damages;

e. Determining that this is an exceptional case;

f. Awarding Plaintiffs their attorney fees under 35 U.S.C. § 285;

g. Awarding Plaintiffs their costs; and

h. Granting such other and further relief as to the Court appears just and proper.

COUNT II – INDUCEMENT OF PATENT INFRINGEMENT

71. Plaintiffs re-allege and re-incorporate paragraphs 1-70 fully and completely as if set forth herein.

72. The actions of Defendants described above constitute inducement of infringement under 35 U.S.C. § 271(b).

73. Defendants knew or should have known that it was inducing infringement by practicing in conjunction with its customers, municipalities or third parties one or more claims of the '654 patent.

74. Defendants with knowledge of the '654 patent have purposely and with intent caused, urged, encouraged, contracted with or aided its customers, municipalities or third parties in completing the method steps or assembly of the apparatus as claimed by the '654 patent.

WHEREFORE, Plaintiffs demand that the Court enter judgment against the Defendants as follows:

a. Entering a Temporary Restraining Order, as well as Preliminary Injunction, in favor of Plaintiff, RRFB GLOBAL, and enjoining Defendants and all other person in active concert or participation with them, either directly or indirectly, from:

   i. making, using, selling, importing, repairing, assembling or offering for sale RRFB devices that infringe the '654 patent or any product no more than colorably different to such devices;

   ii. infringing upon the '654 patent; and/or

iii. aiding, contributing or cooperating with third parties who make, use, sell, import, assemble or offer for sale parts or components that when finally assembled infringe the ‘654 patent;

b. Entering a Permanent Injunction in favor of Plaintiff, RRFG GLOBAL, enjoining the infringement by Defendants;

c. Awarding such damages as Plaintiffs may have suffered but in no event less than a reasonable royalty pursuant to 35 U.S.C. § 284;

d. Finding willful infringement and enhancement of damages;

e. Determining that this is an exceptional case;

f. Awarding Plaintiffs their attorney fees under 35 U.S.C. § 285;

g. Awarding Plaintiffs their costs; and

h. Granting such other and further relief as to the Court appears just and proper.

COUNT III – CONTRIBUTORY INFRINGEMENT

75. Plaintiffs re-allege and re-incorporate paragraphs 1-74 fully and completely as if set forth herein.

76. The actions of Defendants described above constitute contributory infringement under 35 U.S.C. § 271(c).

77. Defendants have offered to sell or sold within the U.S. or imported into the U.S. a component of the ‘654 invention, or a component for use in practicing the steps of the ‘654 invention that constitute a material part of the ‘654 invention, knowing the same to be especially made or especially adapted for use in an infringement of the ‘654 patent.

WHEREFORE, Plaintiffs demand that the Court enter judgment against the Defendants as follows:

a. Entering a Temporary Restraining Order, as well as Preliminary Injunction, in favor of Plaintiff, RRFB GLOBAL, and enjoining Defendants and all other person in active concert or participation with them, either directly or indirectly, from:

   i. making, using, selling, importing, repairing, assembling or offering for sale RRFB devices that infringe the ‘654 patent or any product no more than colorably different to such devices;

   ii. infringing upon the ‘654 patent; and/or

   iii. aiding, contributing or cooperating with third parties who make, use, sell, import, assemble or offer for sale parts or components that when finally assembled infringe the ‘654 patent;

b. Entering a Permanent Injunction in favor of Plaintiff, RRFG GLOBAL, enjoining the infringement by Defendants;

c. Awarding such damages as Plaintiffs may have suffered but in no event less than a reasonable royalty pursuant to 35 U.S.C. § 284;

d. Finding willful infringement and enhancement of damages;

e. Determining that this is an exceptional case;

f. Awarding Plaintiffs their attorney fees under 35 U.S.C. § 285;

g. Awarding Plaintiffs their costs; and

h. Granting such other and further relief as to the Court appears just and proper.

COUNT IV - VIOLATION OF FLORIDA'S DECEPTIVE AND UNFAIR TRADE PRACTICES ACT (FDUTPA)

78. Plaintiff, RRFB GLOBAL, re-alleges and re-incorporates paragraphs 1-45, 61 and 62 fully and completely as if set forth herein.

79. This is a claim for violations of Florida's Deceptive and Unfair Trade Practices Act ("FDUTPA"), Florida Statutes Section 501.201, *et seq.*

80. The activities complained of in this Count occurred within the State of Florida.

81. The misuse of the test results for Plaintiff's RRFB by Defendants, SPOT DEVICES and/or CARMANAH, described below, constitutes unfair methods of competition, unconscionable acts or practices and/or deceptive acts or practices in the conduct of trade or commerce, all which are a violation of Florida's Deceptive and Unfair Trade Practices Act, Florida Statutes 501.201, *et seq*.

82. Defendants', SPOT DEVICES and/or CARMANAH, wrongful conduct alleged below involves trade practices addressed to the market generally or otherwise implicates consumer protection concerns.

83. The RRFBs sold by Defendants, SPOT DEVICES and/or CARMANAH, were commercially advertised using the test results for Plaintiff's product.

84. Defendants', SPOT DEVICES and/or CARMANAH, use of the test data depicting Plaintiff's product, but not the actual product being sold by Defendants, SPOT DEVICES and/or CARMANAH, acts to deceive a substantial segment of Defendants'

audience/consumers and allows Defendants to gain the benefit of Plaintiff's good will and reputation in the RRFB product.

85. In light of the relatively limited amount of information in Defendants', SPOT DEVICES and/or CARMANAH, advertising and the prominence of the test data, the deception is material, in that it is likely to influence the purchasing decision of Defendants' customers. Customers likely would make a different purchasing decision, absent Defendants' deception.

86. Defendants, SPOT DEVICES (and by ownership CARMANAH) commercially advertised/promoted Infringing RRFBs for sale using test results for Plaintiff's RRFBs and falsely state that the SPOT DEVICES RRFB "[p]roven compliance rates exceed 80%, the highest of any amber light warning device." Defendant also falsely stated, "Effectiveness- compliance rates exceed 80%." A true and correct copy of the subject advertisement is attached hereto as Exhibit M.

87. Defendants, SPOT DEVICES and/or CARMANAH, used the test data relating solely to Plaintiff's product to advertise Defendants', SPOT DEVICES and/or CARMANAH, inferior product with the intent of deceiving the public and inducing members of the public to believe that the Defendants, CARMANAH and/or SPOT DEVICES, Infringing RRFBs used the same quality components and could provide the safety compliance only achieved by Plaintiff's RRFBs.

88. Upon information and belief, Infringing RRFBs sold by Defendant, SPOT DEVICES, have used LEDs that were not Class I compliant and did not illuminate sufficiently

and could not have obtained an 80% yielding compliance rate such as obtained by the Stop Experts Group under the FWHA Study.

89. Defendants', SPOT DEVICES and/or CARMANAH, use of Plaintiff's test data in their advertisements was a willful deceptive act by Defendant, CARMANAH. In view of the lengthy period of time Defendants, SPOT DEVICES and/or CARMANAH, continuously and purposefully maintained the test data in their advertisements, Defendants, SPOT DEVICES and/or CARMANAH, had an intent that consumers rely on that deception.

90. Defendants', SPOT DEVICES and/or CARMANAH, use of the test data occurred during a course of conduct involving trade or commerce, directed at Defendants', SPOT DEVICES and/or CARMANAH, customers via their website(s) and websites of their agents, acting to deceive consumers and has allowed Defendants, SPOT DEVICES and/or CARMANAH, to gain the benefit of Plaintiff's good will and reputation in the RRFB product.

91. Defendants, SPOT DEVICES and/or CARMANAH, engaged in "bait and switch" advertising by use of the test results for Plaintiff's product in its advertising as an alluring, but insincere offer to sell a their product having "[p]roven compliance rates exceed 80%, the highest of any amber light warning device" which Defendants, SPOT DEVICES and/or CARMANAH, in truth did not intend or want to sell due to the extra expense of using components such as Class I LEDs, lithium iron phosphate batteries and assembly methods that diminish rays of sunlight piercing above and below the RRFB housing due to careful mounting of crosswalk signage. Defendants', SPOT DEVICES and/or CARMANAH, purpose was to switch customers from buying the Plaintiff's superior RRFB (including the ability to obtain such

80% + yield rates), in order to sell the Infringing RRFBs on a basis more advantageous to Defendants, SPOT DEVICES and/or CARMANAH.

92. The Defendants, SPOT DEVICES and/or CARMANAH, caused their false statement(s) to enter interstate commerce with the intent to deceive consumers.

93. Plaintiff has a discernible competitive injury as a result of the activities of Defendants, SPOT DEVICES and/or CARMANAH, because the sale of competing RRFBs by Defendants, SPOT DEVICES and/or CARMANAH, diminishes the demand for such product by consumers who would otherwise purchase RRFBs manufactured by Plaintiff, as sold by its US distributors and retailers.

94. Plaintiff has a discernible competitive injury with respect to loss of goodwill for its superior RRFB product due to Defendants', SPOT DEVICES and/or CARMANAH, deceptive acts, misrepresentation of the character of Defendants' product and false statements in their advertising with respect to the test data.

95. The test data used by Defendants, SPOT DEVICES and/or CARMANAH, is likely to deceive customers and influence such customers to purchase light strings from Defendants, SPOT DEVICES and/or CARMANAH, instead of Plaintiff's distributors, causing competitive injury to Plaintiff.

96. Defendants', SPOT DEVICES and/or CARMANAH, unfair competition with Plaintiff has caused Plaintiff to suffer actual damages. Plaintiff has been or is likely to be injured as a result of the false statement, either by direct diversion of sales from itself to Defendants, SPOT DEVICES and/or CARMANAH, or by a loss of goodwill associated with Plaintiff's products.

97. The activities complained of in this Count were to the injury and damage of Plaintiff and to the extent that such activities complained of are ongoing they will continue to cause injury and damage to Plaintiff.

WHEREFORE, Plaintiff, RRFB GLOBAL, demands that the Court enter judgment against the Defendants:

a. Awarding such damages as Plaintiff may have suffered;

b. Enjoining the Defendants, and any and all other persons in active concert of participation with them, either directly or indirectly, from making further false statements or using Plaintiff's testing results in their advertising or further violating the statute;

c. Awarding its attorney fees and costs under Fla. Stat., 501.2105;

d. Awarding it punitive damages under Fla. Stat., 768.72; and

e. Granting such other and further relief as to the Court appears just and proper.

COUNT V – VIOLATION OF LANHAM ACT

98. Plaintiff, RRFB GLOBAL, re-alleges and re-incorporates paragraphs 1- 45 and 78-97 fully and completely as if set forth herein.

99. This is an action for violation of the Lanham Act, 15 U.S.C. § 1125(a).

100. Defendants' conduct amounts to a false or misleading description of fact or misleading representation of fact which represents the nature, characteristics or qualities of Defendants' RRFB devices.

101. Plaintiff and Defendants' are competitors with respect to the RRFB devices.

102. The test data used by Defendants, SPOT DEVICES and/or CARMANAH, is false and/or misleading and is likely to deceive customers and influence such customers to purchase RRFBs from Defendants, SPOT DEVICES and/or CARMANAH, instead of Plaintiff's distributors, causing competitive injury to Plaintiff.

103. Plaintiff has a discernible competitive injury as a result of the activities of Defendants, SPOT DEVICES and/or CARMANAH, because the sale of competing RRFBs by Defendants, SPOT DEVICES and/or CARMANAH, diminishes the demand for such product by consumers who would otherwise purchase RRFBs manufactured by Plaintiff, as sold by its US distributors and retailers.

104. Plaintiff has a discernible competitive injury with respect to loss of goodwill for its superior RRFB product due to Defendants', SPOT DEVICES and/or CARMANAH, deceptive acts, misrepresentation of the character of Plaintiff's and Defendants' product and false statements in their advertising with respect to the test data.

105. Defendants', SPOT DEVICES and/or CARMANAH, actions Plaintiff has caused Plaintiff to suffer damages, including lost profits through loss of existing and anticipated RRFB projects, loss of goodwill and reduced viability in the market place.

106. Plaintiff has been or is likely to be injured as a result of the false statement(s), either by direct diversion of sales from itself to Defendants, SPOT DEVICES and/or CARMANAH, or by a loss of goodwill associated with Plaintiff's products.

107. The activities complained of in this Count were to the injury and damage of Plaintiff and to the extent that such activities complained of are ongoing they will continue to cause injury and damage to Plaintiff.

WHEREFORE, Plaintiff, RRFB GLOBAL, demands that the Court enter judgment against the Defendants:

a. Awarding such damages as Plaintiff may have suffered and/or Defendants' profits pursuant to 15 U.S.C. § 1117(a);

b. Determining that the actions of the Defendants were intentional and willful and increase the award of damages pursuant to 15 U.S.C. § 1117(b);

c. Awarding Plaintiff its attorneys' fees and costs;

d. Permanently enjoining Defendants from making further false statements or using Plaintiff's testing results in their advertising; and

e. Granting such other and further relief as is just and proper.

DEMAND FOR JURY TRIAL

Plaintiffs demand a jury trial as to all issues so triable.

Dated this 17th day of July, 2013.

Respectfully submitted,

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UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF FLORIDA

CASE NO. _____

R.D. JONES, STOP EXPERTS, INC., and RRFB GLOBAL, INC.,

Plaintiffs,

v.

CARMANAH TECHNOLOGIES CORPORATION; CARMANAH TECHNOLOGIES (US) CORPORATION; and SPOT DEVICES, INC.,

Defendants.
_____/

VERIFICATION PURSUANT TO 28 U.S.C. § 1746

I, Richard D. Jones on behalf of R.D. Jones, Stop Experts, Inc. and RRFB Global, Inc. hereby verify under penalty of perjury pursuant to 28 U.S.C. § 1746 that the facts alleged in the foregoing Complaint are true and correct to the best of my knowledge.

Dated this 17 day of July, 2013.

_____
By: Richard D. Jones, as President of R.D. Jones, Stop Experts, Inc. and RRFB Global, Inc.

EXHIBIT A

US008269654B2

(12) **United States Patent**
Jones

(10) **Patent No.: US 8,269,654 B2**
(45) **Date of Patent: Sep. 18, 2012**

(54) **FLASHING BEACON**

(76) Inventor: **Richard D. Jones**, Venice, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/230,242**

(22) Filed: **Sep. 12, 2011**

(65) **Prior Publication Data**

US 2012/0001772 A1 Jan. 5, 2012

Related U.S. Application Data

(63) Continuation of application No. 12/303,802, filed as application No. PCT/US2007/070494 on Jun. 6, 2007, now Pat. No. 8,081,087.

(60) Provisional application No. 60/811,157, filed on Jun. 6, 2006.

(51) **Int. Cl.**

G08G 1/07	(2006.01)
G08G 1/095	(2006.01)
G08G 1/01	(2006.01)
G08B 5/22	(2006.01)
B61L 1/02	(2006.01)
B61L 29/24	(2006.01)

(52) **U.S. Cl.** **340/907**; 340/906; 340/917; 340/925; 340/933; 340/481; 246/125; 246/473.2

(58) **Field of Classification Search** ..... None
See application file for complete search history.

(56) **References Cited**

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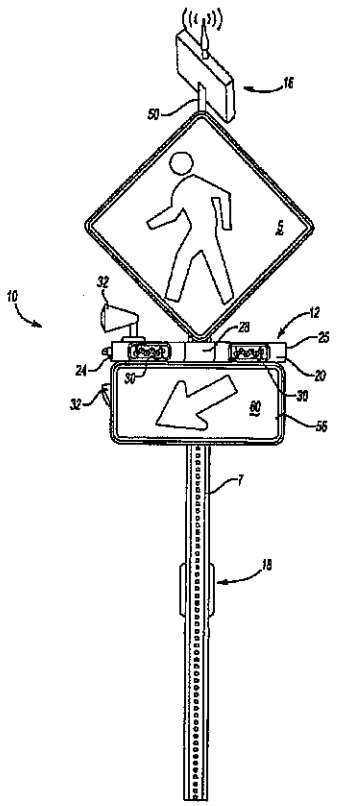
Primary Examiner — George A. Bugg
Assistant Examiner — Renee Dorsey

(57) **ABSTRACT**

A flashing beacon may include a signal unit, a control unit associated with the signal unit, a solar panel or collector, and an activation device that may all be mounted or otherwise positioned on a post of a roadway sign. Light units associated with the signal unit may be programmed to flash on and off in a unique wig-wag pattern. Further, a light bar may also be used with the beacon to generate an intense flash of light soon after activation of the beacon as an additional means of grabbing the attention of the operator of a vehicle.

19 Claims, 8 Drawing Sheets



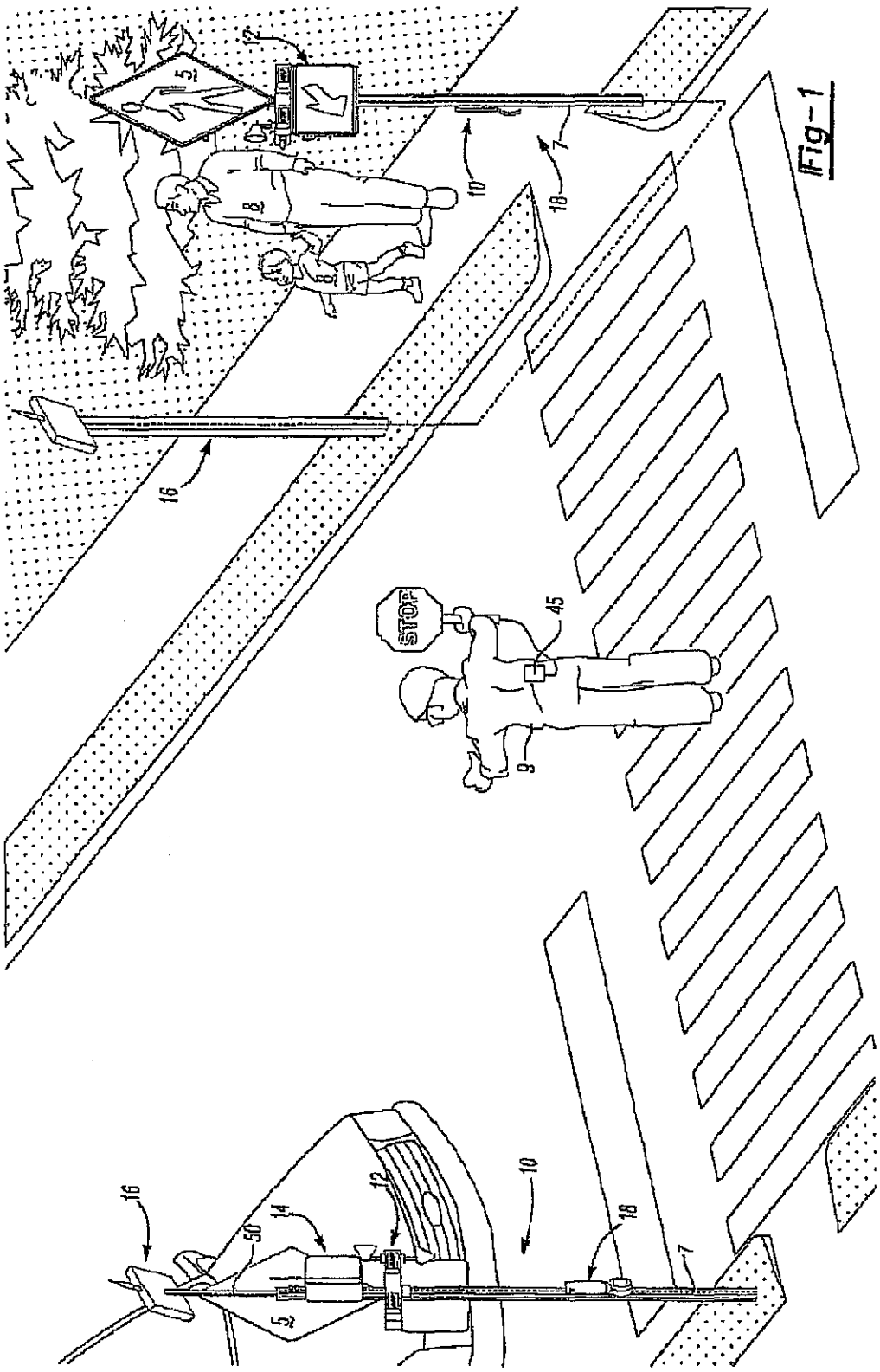


Fig-1

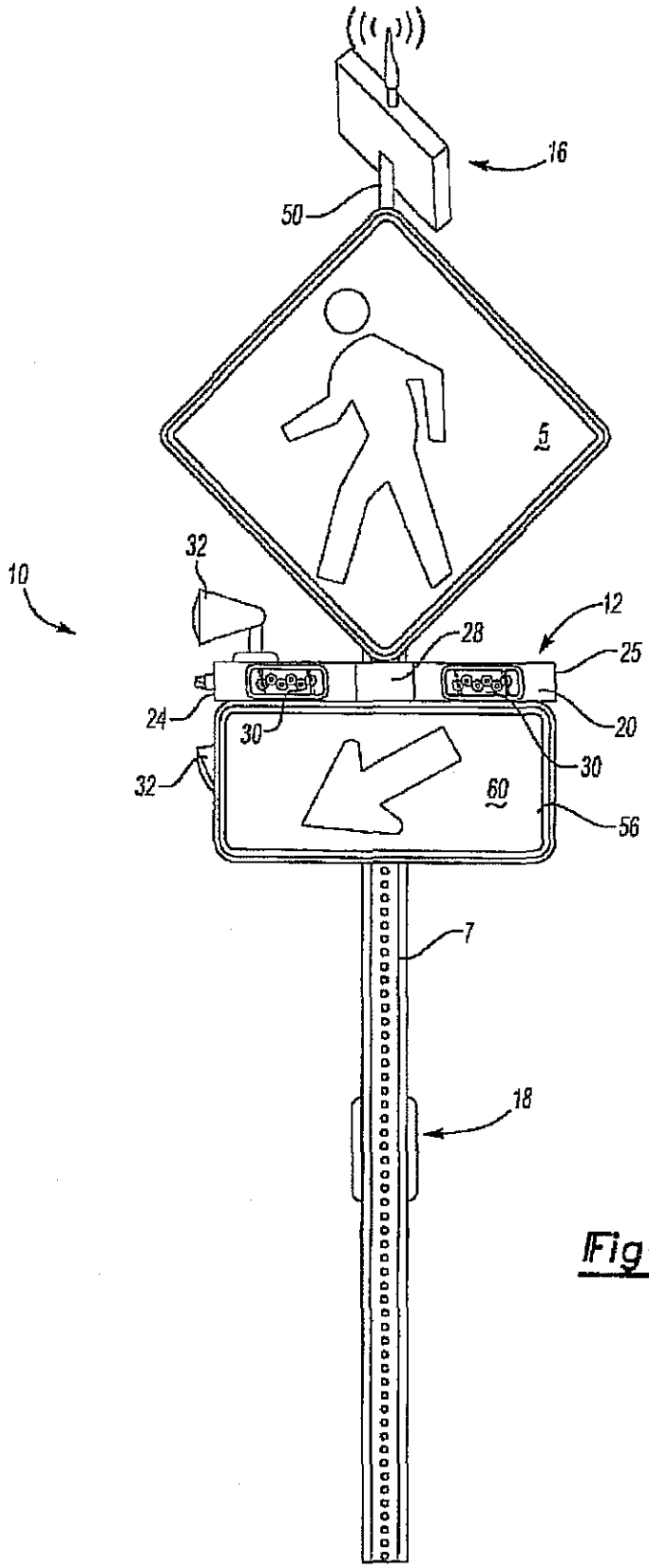


Fig-2

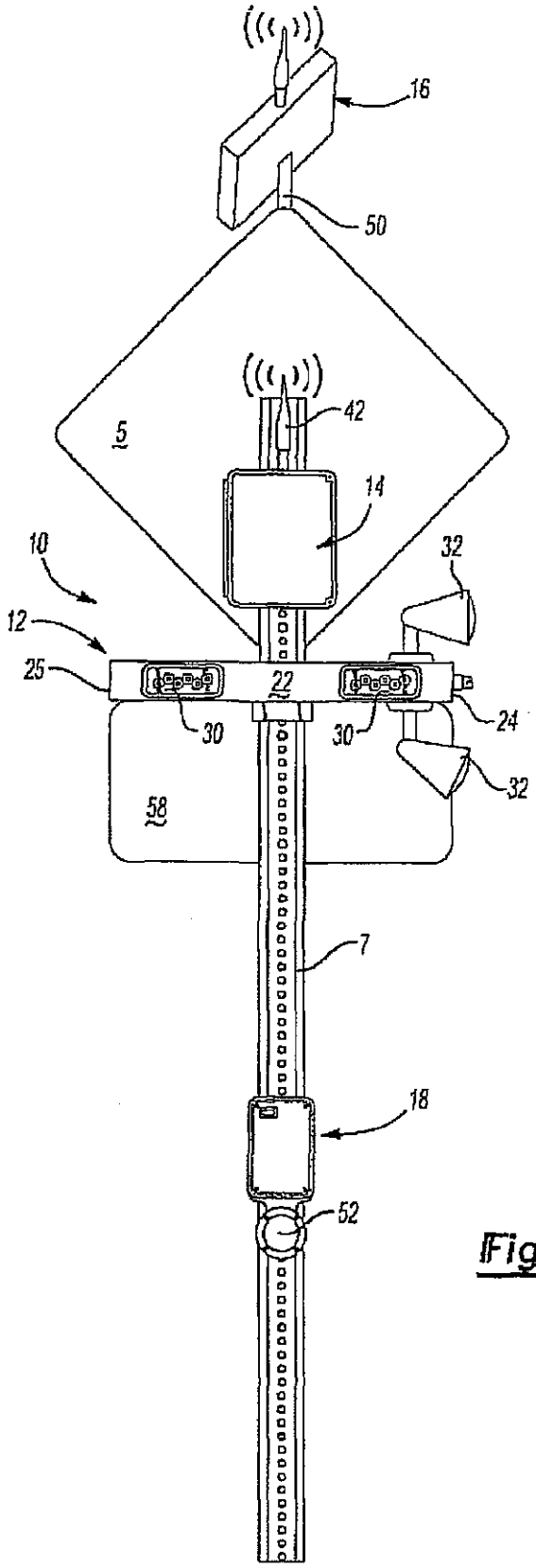


Fig-3

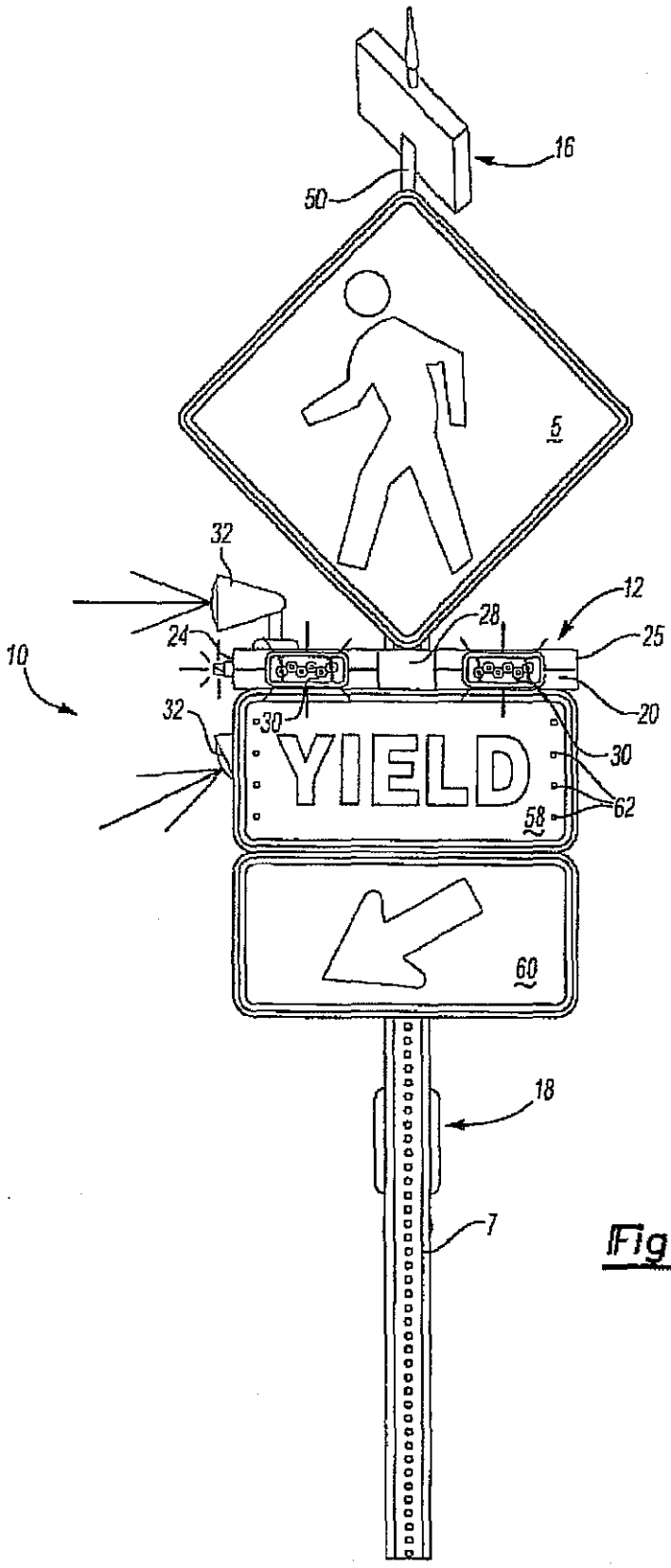


Fig-4

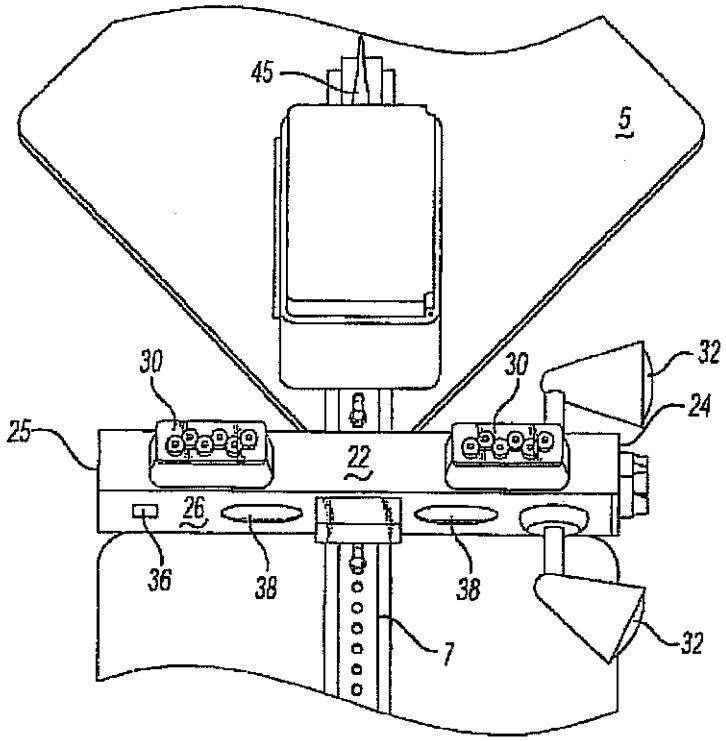


Fig-5

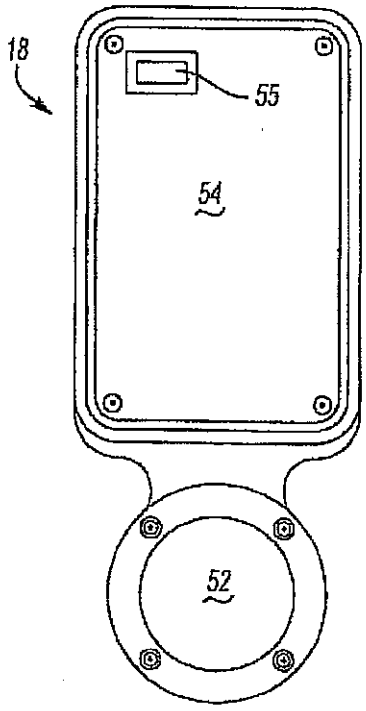


Fig-6

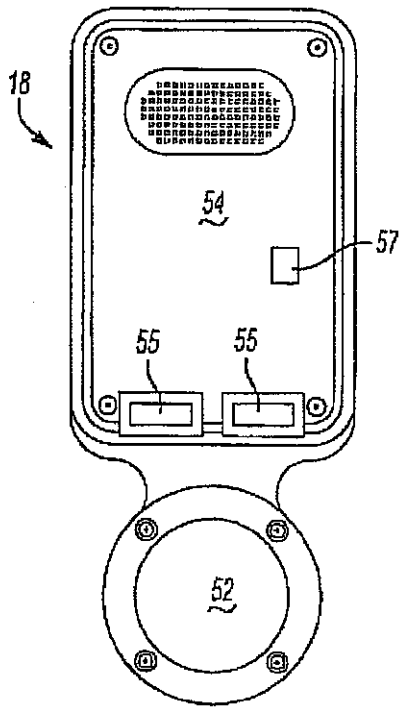


Fig-7

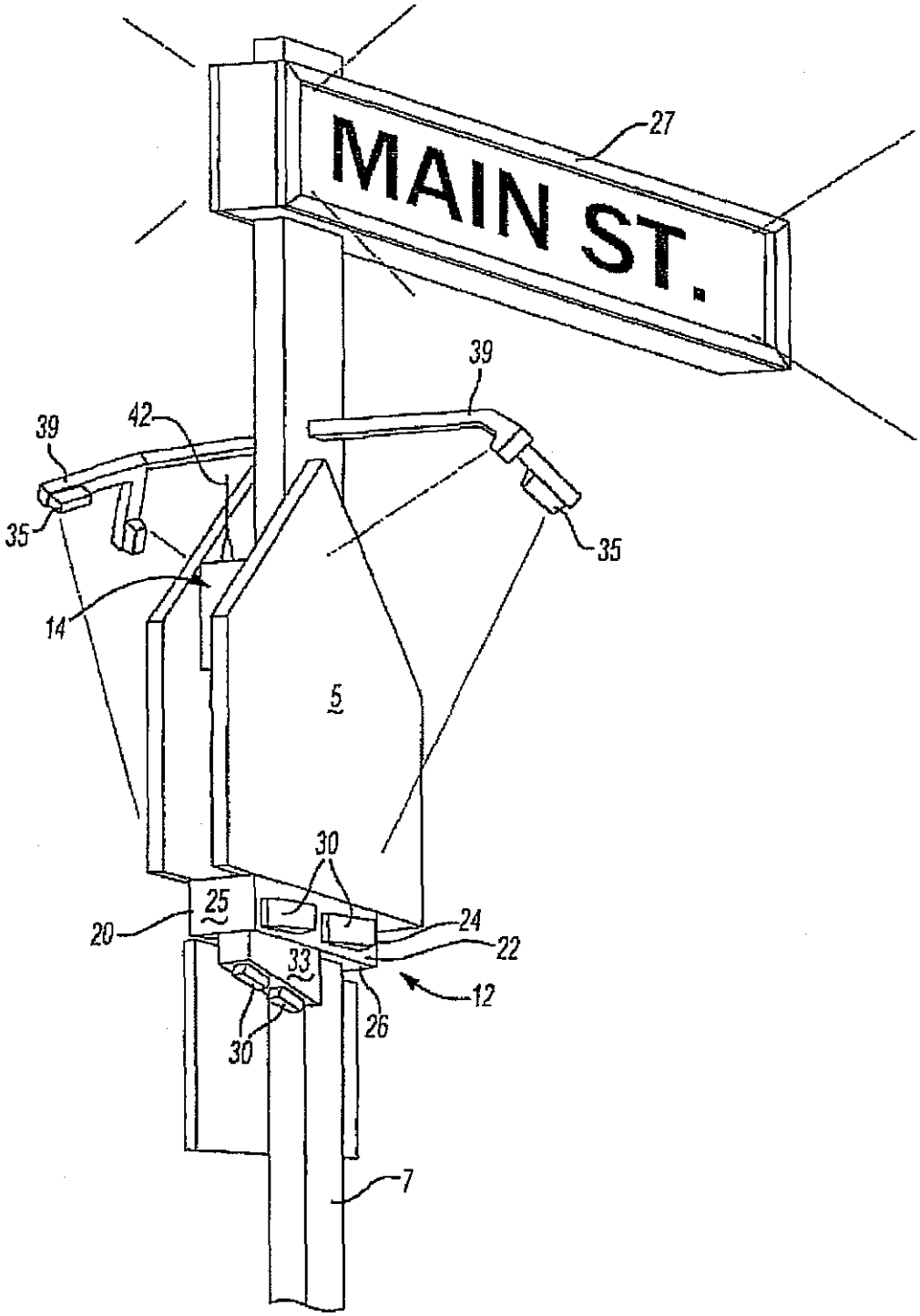


Fig-8

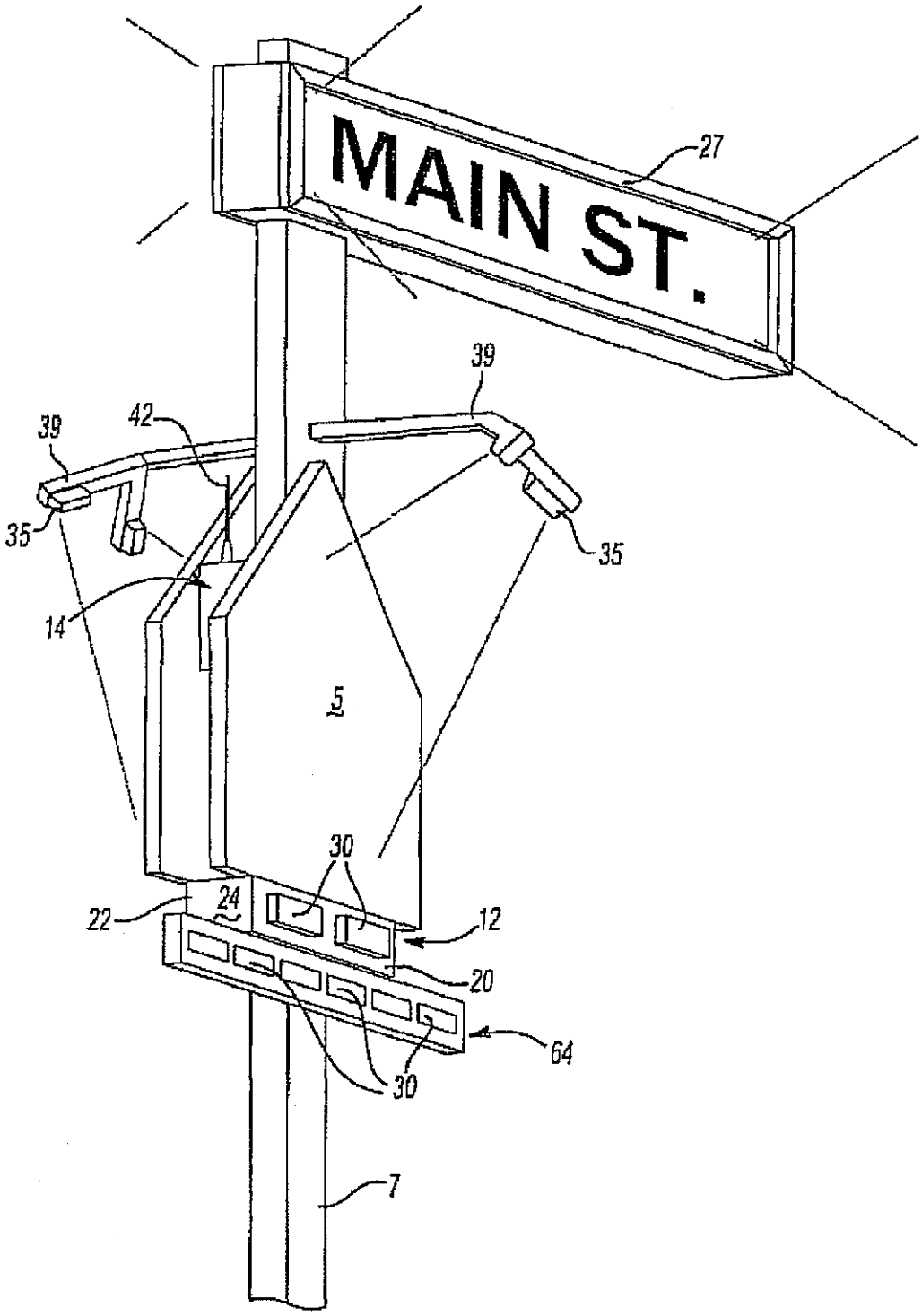


Fig-9

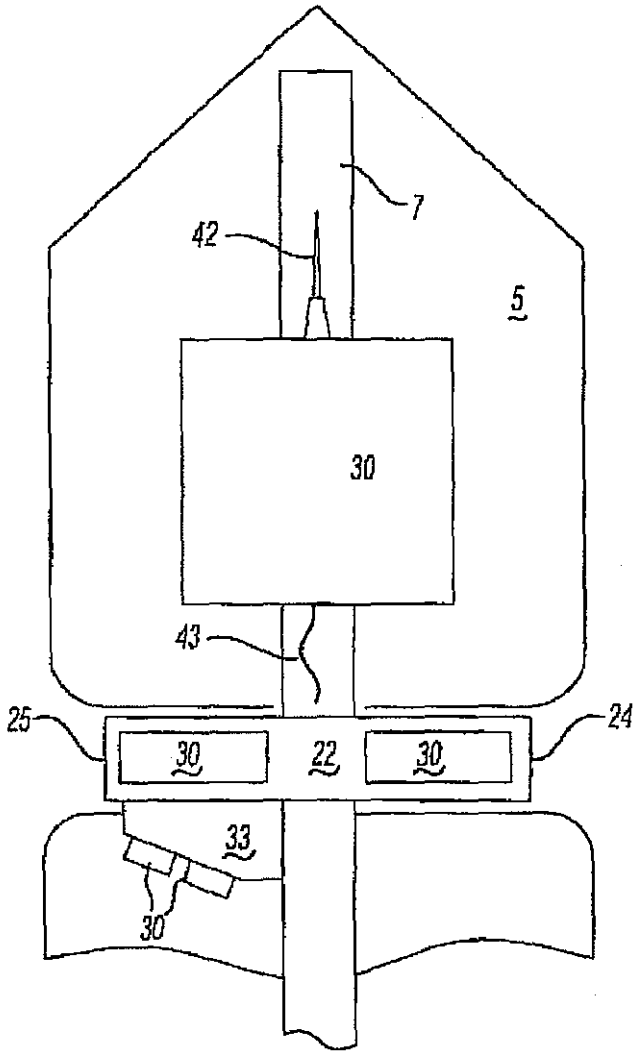


Fig-10

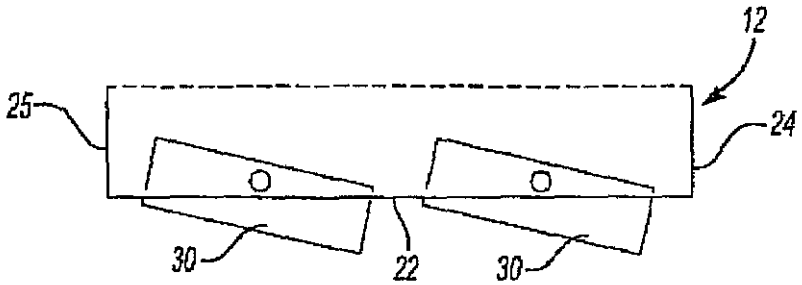


Fig-11

FLASHING BEACON

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation of application Ser. No. 12/303,802 filed on Dec. 8, 2008, which is a National Phase Application of PCT/US2007/070494, which claims the benefit of U.S. Provisional Application 60/811,157 filed on Jun. 6, 2006, the disclosures of which are incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

Disclosed herein is a flashing beacon. More specifically, disclosed herein is a flashing beacon that may be positioned on most any roadway sign or signpost, and that may include a signal unit, a control unit, a solar collector, an activation device (e.g., a timer, microwave emitter, radio transmitter, step-pad, a pushbutton, infrared transmitter, wireless transmitter or like device) and various other accessories.

2. Reference to Related Art

According to the U.S. Manual on Uniform Traffic Control Devices, flasher mechanisms associated with traffic control signs (e.g., a yield or crosswalk sign) must be positioned on the sign (or signpost) so that flashing signal is about 12 feet above the pavement. The flashing signal must also be programmed or otherwise set to flash continuously at a rate of not less than 50 nor more than 60 times per minute. See MUTCD, Section 4D.11. However, while the guidelines set forth in the uniform regulations are intended to provide a visible warning to drivers, recent testing has suggested that only a small percentage of the public responds to flashing signals that operate according to the uniform regulations. Specifically, recent testing has suggest that only 25% of the public complies with or otherwise responds to flashing signals associated with roadway signage. Therefore, it would be advantageous to have an improved flashing beacon system that may be used with existing or future roadway signage to garner a greater response from the vehicle driving public.

SUMMARY OF THE INVENTION

About 20 years ago, the public began to demand that the automotive industry manufacture "quiet" cars and trucks—and the industry responded. Indeed, the industry responded so well that the interior of many vehicles have been effectively transformed into moving soundproof rooms. Unfortunately, the "quiet" has sometime resulted in drivers and passengers alike becoming distracted and forgetting that they are in a moving vehicle. For example, it is not uncommon for present day drivers to be seen talking on a cellular phone, reading a paper, listening to satellite stereo systems, being distract by children in the vehicle, applying makeup, using on-board navigation systems, watching a DVD, or just plain not paying attention to the roadway.

Clearly, one thing that is lost or diminished by all these possible distraction is a proper attention to and respect for roadway signage—signage that exists to increase motorist safety. Existing roadway signage is quite often clear and concise in meaning and message. These signs, however, lose their effectiveness when paired up against a distracted driver.

A 12" flashing beacon has been the tool of choice for the nation's roadways to emphasize a warning on a roadway sign since 1955. Indeed, the flashing pattern and height of these flash beacons might still work on some signs in certain locations. However, given the array of distractions now available to drivers, these traditional flashing beacons are simply too passive. Accordingly, disclosed herein is a beacon having a unique flashing sequence, and installation placement, that upon activation may command a driver's attention. As such, drivers are compelled to again look at a sign, understand its message, and respond.

As disclosed herein, a flashing beacon may include a signal unit, a control unit associated with the signal unit, a solar panel or collector, and an activation device that may all be mounted or otherwise positioned on a post of a roadway signpost. The activation device and solar panel may, however, also be positioned remotely from the post.

The signal unit may be rectangular in shape (although other shapes may be used) in order to decrease its obstructive profile relative to the sign, and it includes one or more flashable lights (e.g., LEDs) on the front, rear, bottom or side faces of the signal unit. One or more spotlights (e.g., LED spotlights) may also be positioned on the signal unit to illuminate an area (e.g., the street) in the vicinity of the signal unit. The signal unit may also include an audio transmission system and one or more displays (e.g., a LCD, plasma, or LEDs) to provide the user with information concerning the operation of the flashing beacon.

The control unit may include an electronic signal receiver (e.g., a radio receiver), a power supply, and control means for use in controlling the initiation and duration of the light assemblies of the flashing beacon.

The solar collector may include one or more solar cells that provide power to the unit during daylight hours and may also operate to recharge the power supply of the control unit so that the flashing beacon has adequate power during evening hours.

Finally, the activation device may include a pushbutton unit, signage, one or more counter displays, an infrared sensor, and a speaker system. Additional accessories for the activation device may also include devices such as a timer, microwave emitter, radio transmitter, step-pad, a pushbutton, infrared transmitter, wireless transmitter or like device. The signage associated with the pushbutton may also include a display (e.g., a LCD, plasma, or LEDs) to convey additional instructions to a pedestrian concerning operation of the flashing beacon and a counter to record the number of times the beacon has been activated. Finally, it will be appreciated that while the flashing beacon disclosed herein is discussed as being used in connection with a pedestrian crosswalk sign, it may also be used with any sign, placard or signal that uses a flashing signal (e.g., fire station sign, yield signs, dangerous curve signs, school speed zone signs, etc.).

BRIEF DESCRIPTION OF THE DRAWINGS

Reference will now be had to the attached drawings wherein like reference numerals refer to like parts throughout and wherein:

FIG. 1 is a environmental perspective view of a pair of flashing beacons constructed positioned on sign posts that are secured on opposite sides of a roadway, with one beacon having a remotely located solar cell and showing a crossing guard holding a stop sign with means to remotely activate the flashing beacons;

FIG. 2 is a front planar view of an embodiment of a flashing beacon wherein the double-sign unit is in a first or retracted position;

FIG. 3 is a rear planar view of an embodiment of a flashing beacon;

FIG. 4 is a front planar view of an embodiment of a flashing beacon wherein the double-sign unit is in a second or extended position;

FIG. 5 is a rear perspective view of an embodiment of a flashing beacon constructed in accordance with the present invention that includes a view of the bottom face or underside of the signal unit of the flashing beacon;

FIG. 6 is a front planar view of an embodiment of a push-button apparatus that may be used in connection with the flashing beacon;

FIG. 7 is a front planar view of another embodiment of a pushbutton apparatus that may be used in connection with the flashing beacon;

FIG. 8 is a side and rear perspective view of an embodiment of the flashing beacon showing, in particular, an illuminating street sign, sign illuminating spotlights, pivotable lights, and lights for illuminating the pavement proximate the flashing beacon;

FIG. 9 is a side and front perspective view of an embodiment of the flashing beacon showing, in particular, an illuminating street sign, sign illuminating spotlights, pivotable lights, lights for illuminating the pavement proximate the flashing beacon and a light bar;

FIG. 10 is a rear view of an embodiment of the flash beacon showing, in particular, the radio signal receiving antennae; and

FIG. 11 is a top planar view of a signal unit of the flashing beacon showing the pivotable lights on the signal unit.

DESCRIPTION OF THE INVENTION

Referring now to FIGS. **1-10**, a flashing beacon **10** for a sign(s) **5** may include a signal unit **12**, a control unit **14**, a solar collector **16**, and an activation device **18** that may all be removably mounted to a post **7** of a sign **5**. In operation, the flashing beacon **10** may provide a safer environment for drivers and pedestrians, particularly pedestrians attempting to traverse a busy street.

Referring now to FIGS. **1-5**, **8** and **9**, the signal unit **12** may have an elongated, rectangular shaped body that may include a front face **20**, a rear face **22**, a pair of side faces **24**, and bottom face **26**. A recess **28** may be defined in the front face **28** of the signal unit **12** such that the signal unit **12** may be positioned along the post **7** of the roadway sign **5**. One or more light units **30** may be positioned on, or alternatively recessed within (see e.g., FIG. **8**), each of the front face **20**, the rear face **22**, the side faces **24**, **25** and the bottom face **26** of the signal unit **12**. As shown in FIGS. **8** and **9**, one or more illuminated street signs **27** may also be associated with each flashing beacon **10** and mounted by mounting each sign on the post of the sign **5**. Further, as shown in FIG. **1**, the signal unit **12** may be positioned on the sign post **7** immediately below the sign **5** so that, in a typically configuration, the light units **30** of the signal unit **12** are approximately the same distance above ground level as a traditional police cruiser. It is appreciated that a lighting array at such a height may receive greater recognition from a vehicle operator who might otherwise be "trained" to slow his or her vehicle when encountering flashing lights at this height.

Referring to FIGS. **1-5**, **8-11**, and as best shown in FIG. **1**, during operation of the flashing beacon **10** the light units **30** of the front face **20** of the signal unit **12** may be illuminated to alert oncoming vehicle traffic that a pedestrian(s) **8** has or is about to enter a crosswalk. Light units **30** on the rear face **22** may also be illuminated concurrently with the light units **30** of the front face **20** to alert vehicle traffic traveling in the opposing direction. Accordingly, it will be appreciated that where at least one flashing beacon **10** is positioned on each side of a roadway (or, e.g., on at least one side and in a center median), a vehicle will be alerted to the presence of a pedestrian(s) in an approaching crosswalk regardless of the vehicle's direction of travel. Further, as shown in FIGS. **8** and **11**, the light units **30** on the rear face **22** of the signal unit **12** may be pivotably mounted to the signal unit **12** so that (during setup) each light unit **30** may be precisely aimed at oncoming traffic.

Still referring to FIGS. **1-5**, **8** and **9**, in addition to the light units **30** associated with the front **20** and rear **22** face of the signal unit **12**, the light units **30** of each side face **24**, **25** of the signal unit **12** may be illuminated to alert the pedestrian(s) **8** and/or crossing guard(s) **9** using the flashing beacon **10** that the light units **30** on the front **20** and rear **22** face of the signal unit **12** been activated. As such, by observing the illumination of a light unit **30** on a side face **24**, **25** of a signal unit **12**, a pedestrian **8** or crossing guard **9** on one side of a roadway may easily confirm that the light units **30** on front **20** and rear **22** faces on a signal unit **12** on the opposite side of the roadway have also been activated.

Still referring to FIGS. **1-5**, **8** and **9**, in addition to the light units **30** on the front **20**, rear **22**, and side **24**, **25** faces of a signal unit **12**, each signal unit **12** may also include lighting for illuminating the area proximate base of the post **7**, including at least a portion of a nearby roadway. For example, one or more light units **30** may be positioned on the bottom face **26** of the signal unit **12**. Further, as shown in FIGS. **1-5**, the signal unit **12** may also one or more spotlights **32** (e.g., LED spotlights) that extend from the signal unit **12**. As shown in FIGS. **8** and **9**, the spotlights **32** may be constructed as lighting pods **33** that are mounted to the bottom face **26** of the signal unit **12**. Each lighting pod **33** may include one or more LED lights. The lighting pods **33** may also be mounted to a signal unit **12** so that any light emitting from the pod **33** is projected directly downward or at a predetermined angle relative to the post **7**. Further, as shown in FIGS. **8** and **9**, one or more spotlights **35** may be used to illuminate the face of a sign **5**. Specifically, the spotlights **35** may be positioned on stanchions **39** that extend from the post **7**.

Referring again to FIGS. **1-5**, **8** and **9**, as mentioned above the light units **30**, spotlights **32** and other light units of the flashing beacon **10** may each include one or more light emitting diodes ("LEDs"). For example, LEDs of the type manufactured by Whelan Engineering Inc. may be used in connection with the light units **30** and spotlights **32** of flashing beacon **10**. However, it will be appreciated that other types of lights may also be used with the flashing beacon **10**.

The one or more of the lights of the light units **30** (i.e., the light units **30** on the bottom face **26**) may function to be continuously illuminated during operation of the flashing beacon **10**. However, as mentioned above, the light units **30** of the flashing beacon **10** may also function to flash according to uniform regulations at a rate of 50-60 cycles per minute, at an increased rate of 60-110 cycles per minute, or at any other rate predetermined by the user. The light units **30** may further be arranged such that they flash in a predetermined pattern such as a wavy line or a so-called wig-wag flashing pattern as will be described below.

Referring now to FIG. **5**, the signal unit **12** may also include a programmable audio unit and a voltage meter display **36**. The voltage meter display **36** (which may also be positioned in the control unit **14**) may include an LCD, plasma screen monitor or an arrangement of LEDs positioned on the bottom face **26** of the signal unit **12** that may be in electrical communication with a power supply (i.e., a battery—not shown) of the control unit **14** (as discussed below) or another battery (not shown) that may be positioned in the

signal unit **12**. An audio unit (which may also be incorporated into the activation device **18**) may include audio transmission apparatus that includes at least one speaker **38** and a memory means (e.g., an erasable/programmable memory). The memory means (not shown) may permit an administrator of the flashing beacon **10** to program and/or change an audio message that is broadcast to a user of the beacon **10**.

Referring again to FIGS. **1-5**, **8** and **9**, the control unit **14** of the flashing beacon **10** may include one or more electronic signal receivers (i.e., a radio or wireless receiver) including an antennae **42**, **43**, a power supply (i.e., a battery), and control means (i.e., an erasable programmable memory (not shown)) for use in controlling activation of the light units **30** and spotlights **32** of the signal unit **12**.

In operation, the control unit **14** may be used to selectively activate and deactivate the various lights of the flashing beacon **10**. For example, a school principal, crossing guard **9** (see FIG. **1**), or public safety official may use a remote transmitter to activate, program or otherwise control the activation of the flashing beacon **10** by transmitting an appropriate signal to the signal receiver of the control unit **14**. More specifically, as shown in FIG. **1**, the crossing guard **9** may carry with him or her a personal flash beacon system **45** such as the Personal Defender™ or Crosswalk Defender™ manufactured by Stop Experts, Inc. of Venice, Fla. These personal flash beacon systems may include a radio transmitter that when activated results in the activation of the lights of the flashing beacon **10** and when deactivated results in the deactivation of the lights of the flashing beacon.

Referring now to FIGS. **1-4**, the solar collector **16** may include a panel of one or more solar cells **48**. The panel **16** may be positioned on arm **50** that extends above the sign from the control unit **16**, or that is otherwise mounted to the post **7** of the sign **5**. Further, as shown in FIG. **1**, in those instances where the overhead tree cover may prevent sufficient exposure of the solar collector to direct sunlight, the solar collector **16** may be positioned a predetermined distance away from the flashing beacon **10** and electrically connected to the beacon **10** by means of underground electrical wire and conduit. It will be appreciated that the solar collector **16** may be used as a clean power source for the signal unit **12** and the control **14** of the flashing beacon **10** during daylight hours. It may also be appreciated that the solar collector **16** may communicate with the power supply of the control unit **14** to thereby provide power to the flashing beacon **14** during evening hours.

Referring now to FIGS. **1-4**, **6** and **7**, the activation device **18** may include a pushbutton **52** in electrical, wireless or radio communication with the control unit and/or the signal unit, and one or more placards **54** that may convey additional information concerning operation of the flashing beacon **10**. Pushing the pushbutton **52** may activate that flashing beacon **10**. However, it should also be appreciated that other devices such as a timer, microwave emitter, radio transmitter, step-pad, internal activation means, a timer, a pushbutton, infrared transmitter, wireless transmitter or like device. For example, the activation device may include an infrared sensor **57** that may detect the presence of an individual within a predetermined range (e.g., 5 feet) from the device **18** and respond by activation of the flashing beacon **10**.

Still referring to FIGS. **1-4**, **6** and **7**, one or more displays **55** (e.g., LCD, plasma screen monitor, or LEDs) may also be positioned on the activation device **18** to provide a user with an additional instructional message. For example, as shown in FIG. **7**, the activation device may include a pair of displays **55** that indicate the number of time the flashing beacon has been activated during daylight hours (right side) and after dark (left side). Likewise, as mentioned above, the activation device **18** may include memory means and an associated speaker system capable for providing a user with an audible instructional message.

Referring now to FIGS. **1-3**, the flashing beacon **10** may also include a double-sign unit **56**. As shown in FIG. **2**, the double-sign unit **56** may include a first sign placard **58** and a second sign placard **60** that is movable relative to the first sign placard **58**. Prior to activation of the flashing beacon **10**, the second sign placard **60** may be positioned in front of the first sign placard **58**. However, upon activation of the flashing beacon **10**, the second sign placard **60** may be translated or otherwise shifted to a second position to thereby reveal the first sign placard **58**. Further, the first sign placard may include one or more LEDs **62** to thereby illuminate the first sign placard.

Referring now to FIG. **9**, a light bar **64** that may include one or more light units **30** may be positioned on the signpost **7** below the signal unit **12**. Alternatively, the light bar **64** may be positioned above the signal unit **12** or between the light unit **30** on the front face **20** of the signal unit **12**. In operation, the light bar **64** functions to quickly "flash" any oncoming vehicles. Typically, this flash may about 1½ to 2 seconds after any lights on the front **20**, rear **22**, or side **24**, **25** faces of the signal unit **12** had been activated. The advantage of this "flash" (in addition to the normal illumination of the flashing beacon) is that a vehicle that is already within a predetermined distance from the flashing beacon **10** may not see the flash because, in many instances, the vehicle will have already driven past the beacon **10** given the 2 second delay period. However, vehicles that were beyond the predetermined distance when the flashing beacon **12** was activated will encounter not only the normal illumination of the flashing beacon, but also the secondary "flash" of the light bar **64**. As such, the secondary flash functions as a further reminder to the driver to heed the commands of the associated sign **5**.

In preliminary testing of the flashing beacon disclosed herein, Applicant has achieved significant improvement over the traditional flash beacon systems known in the art.

EXAMPLE 1

A study of percent of vehicle responses to 70 pedestrian crossings comparing a traditional (MUTCD Standard) flashing beacon with dual side mounted lights (top row) against Applicant's flashing beacon with dual flashing overhead lights with a "wig-wag" flashing pattern (bottom row) in the City of St. Petersburg, Fla. at 31st Street north of 54th Avenue South. A wig-wag pattern is described as follows: Where the front face **20** of the signal unit **12** of the flashing beacon **10** being tested included two side-by-side LED lights, each wig-wag cycle including two flashes (adjustable) of one light and, simultaneously, three flashes (adjustable) of the other light. The speed of the left and right flashes is adjusted so that the cycle time for the three flashes for the other light is equal to the cycle time for the two flashes. Each flash beacon tested was set up to function at a rate of 76 wig-wag cycles per 30 seconds (for a total of 190 total flashes).

BASE		7—days		30—days	
N/B-W/B	S/B-E/B	N/B-W/B	S/B-E/B	N/B-W/B	S/B-E/B
0.00%	4.03%	3.74%	2.33%	19.51%	7.89%
0.00%	4.03%	58.54%	48.72%	82.76%	69.44%

EXAMPLE 2

A study of percent of vehicle response to 70 pedestrian crossings comparing traditional (MUTCD Standard) flashing beacon with dual side mounted lights (top row) against Applicant's flashing beacon, using a wig-wag pattern, placed in a four-lane divided highway with median (bottom row) in the City of St. Petersburg, Fla. at 4th Street and 18th Avenue South.

BASE		7—days		30—days	
N/B-W/B	S/B-E/B	N/B-W/B	S/B-E/B	N/B-W/B	S/B-E/B
0.00%	0.00%	12.24%	12.09%	14.50%	19.51%
0.00%	4.03%	58.54%	48.72%	82.76%	69.44%

Having thus described my invention, various other embodiments will become known to those of skill in the art that do not depart from the spirit of the present invention.

I claim:

1. A method for slowing vehicle traffic comprising:
providing a flashing beacon including a crosswalk sign, a control unit and a first light and a second light unit in electronic communication with the control unit;
positioning the flashing beacon proximate a roadway so that the first and second light units are visible to oncoming traffic;
switching the light units on and off to generate a wig-wag flash pattern, the pattern including emitting within a predetermined time two light flashes from one light unit, and at least three light flashes and no more than five light flashes from the other light unit for each wig-wag cycle; and
providing power to the flashing beacon using a solar collector operable to supply power to the beacon.

2. The method of claim 1, wherein the cycle time for the first and second lights is equal.

3. The method of claim 1, further comprising positioning the flashing beacon on a signpost proximate a roadway with a sign secured to the signpost.

4. A traffic directing device that provides improved driver compliance, the device comprising:
a sign with a traffic directive fixed in a location proximate to a roadway via at least one post;
a first light unit and a second light unit both in physical proximity to the sign;
a control unit coupled to the first light unit and the second light unit; and
a solar collector that provides power to the control unit, the first light unit and the second light unit;
wherein the control unit is configured to cause the first light unit and the second light unit to generate a wig-wag pattern according to a predetermined time period, the wig-wag pattern including two light flashes from the first light unit and at least three light flashes and no more than five light flashes from the second light unit for each wig-wag cycle.

5. The traffic directing device of claim 4, wherein the wig-wag pattern includes three flashes from the second light unit within the predetermined time period.

6. The traffic directing device of claim 4, wherein the wig-wag pattern including four flashes from the second light unit within the predetermined time period.

7. The traffic directing device of claim 5 further comprising a light bar that includes one or more lights positioned in proximity to the sign; wherein the control unit is further configured to cause the light bar to temporarily switch on after the first light unit and the second light unit generate at least one wig-wag pattern.

8. The traffic directing device of claim 5, wherein the flashes from the first light unit and the flashes from the second light unit occur simultaneously.

9. The traffic directing device of claim 5, wherein each of the first light unit and the second light unit flashes more than sixty times per minute.

10. The traffic directing device of claim 5, wherein the traffic directive of the sign includes a crosswalk icon.

11. A method for controlling a traffic directing device that provides improved driver compliance, the device comprising a sign with a traffic directive, a first light unit and a second light unit both in physical proximity to the sign, a control unit coupled to the first light and the second light, and a solar collector coupled to the control unit, the first light unit and the second light unit, the method comprising:
providing power to control unit, the first light unit and the second light unit using the solar collector; and
using the control unit, causing the first light unit and the second light unit to generate a wig-wag pattern according to a predetermined time period, the wig-wag pattern including two light flashes from the first light unit and at least three light flashes and no more than five light flashes from the second light unit for each wig-wag cycle;
wherein the sign, the first light unit and the second light are fixed in a location proximate to a roadway via at least one post.

12. The method of claim 11, wherein the wig-wag pattern includes three flashes from the second light within the predetermined time period.

13. The method of claim 12, wherein the wig-wag pattern including four flashes from the second light within the predetermined time period.

14. The method of claim 11, wherein the wig-wag pattern including five flashes from the second light within the predetermined time period.

15. The method of claim 11, wherein each of the first light unit and the second light unit flashes more than sixty times per minute.

16. The method of claim 15, wherein at least a flash period of at least one flash of the first light is longer than at least a flash period of at least one flash of the second light.

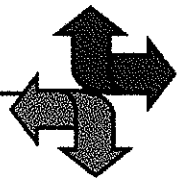
17. The traffic directing device of claim 4, wherein the wig-wag pattern including five flashes from the second light unit within the predetermined time period.

18. The traffic directing device of claim 17, wherein at least a flash period of at least one flash of the first light is longer than at least a flash period of at least one flash of the second light.

19. The device of claim 4, wherein for each wig-wag cycle a number of flashes of the first light unit is different from a number of flashes of the second light unit.

* * * * *

EXHIBIT B



Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)

PDF Version, 84KB
You will need the Adobe Acrobat Reader to view the PDF on this page.

Memorandum

U.S. Department of Transportation
Federal Highway Administration

Sent via Electronic Mail

Subject:	**INFORMATION:** MUTCD - Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)	Date:	July 16, 2008
From:	Anthony T. Furst ***/s/ Anthony T. Furst*** Acting Associate Administrator for Operations	Reply to Attn. of:	HOTO-1
To:	Associate Administrators Chief Counsel Acting Chief Financial Officer Directors of Field Services Federal Lands Highway Division Engineers Resource Center Director Division Administrators		

Purpose: The purpose of this memorandum is to issue an Interim Approval for the optional use of Rectangular Rapid Flashing Beacons (RRFB) as warning beacons under certain limited conditions. Interim Approval allows interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in the Manual on Uniform Traffic Control Devices (MUTCD).

Background: The Florida Department of Transportation, in conjunction with the city of St. Petersburg, has requested that the Federal Highway Administration (FHWA) issue an Interim Approval to allow the use of RRFBs as warning beacons to supplement standard pedestrian crossing and school crossing warning signs at crossings across uncontrolled approaches. The RRFB does not meet the current standards for flashing warning beacons as contained in the 2003 edition of the MUTCD, Chapter 4K which requires a warning beacon to be round in shape and either 8 or 12 inches in diameter, to flash at a rate of approximately once per second, and to be located no less than 12 inches outside the nearest edge of the warning sign it supplements. The RRFB uses rectangular-

shaped high-intensity LED-based indications, flashes rapidly in a wig-wag "flickering" flash pattern, and is mounted immediately between the crossing sign and the sign's supplemental arrow plaque.

Research on the RRFB: The city of St. Petersburg has completed experimentation with the RRFB at 18 pedestrian crosswalks across uncontrolled approaches and has submitted their final report. In addition to "before" data, the city collected "after" data at intervals for 1 year at all sites and for 2 years at the first 2 implemented sites. For the first 2 sites, the city collected data for overhead and ground-mounted pedestrian crossing signs supplemented with standard round yellow flashing beacons, for comparison purposes, before the RRFBs were installed. The data show very high rates of motorist "yield to pedestrians" compliance, mostly in the high 80s to close to 100 percent, in comparison to far lower rates (in the 15 to 20 percent range) for standard beacons. The very high yielding rates are sustained even after 2 years in operation, and no identifiable negative effects have been found. The RRFB's very high compliance rates are previously unheard of for any device other than a full traffic signal and a "HAWK" hybrid signal, both of which stop traffic with steady red signal indications. The St. Petersburg data also shows that drivers exhibit yielding behavior much further in advance of the crosswalk with RRFB than with standard round yellow flashing beacons. These data clearly document very successful and impressive positive experience with the RRFBs at crosswalks in that city.

In addition to the St. Petersburg locations, experimentation is underway at 3 sites in Miami-Dade County, FL, 4 sites in Largo, FL, and 2 sites in Las Cruces, NM, and RRFBs are being installed at 3 sites in northern Illinois. Additionally, the District of Columbia has installed RRFBs at one crosswalk and plans to request experimentation with RRFB at several sites. Data from locations other than St. Petersburg is limited but does show results very similar to those found in St. Petersburg. A study of 2 RRFB locations in Miami-Dade County, FL, reported in a TRB paper, found that evasive conflicts between drivers and pedestrians and the percentage of pedestrians trapped in the center of an undivided road because of a non-yielding driver in the second half of the roadway were both significantly reduced to negligible levels. Data so far from the one RRFB site in DC shows driver yielding compliance rates increased from 26 percent to 74 percent after 30 days in operation and advance yielding distances also increased comparable to the St. Petersburg results.

FHWA Evaluation of Results: The Office of Transportation Operations has reviewed the available data and considers the RRFB to be highly successful for the applications tested (uncontrolled crosswalks). The RRFB offers significant potential safety and cost benefits, because it achieves very high rates of compliance at a very low relative cost in comparison to other more restrictive devices that provide comparable results, such as full midblock signalization. The components of RRFB are not proprietary and can be assembled by any jurisdiction with off-the-shelf hardware. The FHWA believes that the RRFB has a low risk of safety or operational concerns. However, because proliferation of RRFBs in the roadway environment to the point that they become ubiquitous could decrease their effectiveness, use of RRFBs should be limited to locations with the most critical safety concerns, such as pedestrian and school crosswalks across uncontrolled approaches, as tested in the experimentation.

At a recent meeting of the National Committee on Uniform Traffic Control Devices, the Signals Technical Committee voted to endorse the future inclusion of the RRFB for uncontrolled crosswalks into the MUTCD and recommended that FHWA issue an Interim Approval for RRFB. The FHWA believes this indicates a consensus in the practitioner community in support of optional use of RRFB. This Interim Approval does not create a new mandate compelling installation of RRFB but will allow agencies to install this type of flashing beacon, pending official MUTCD rulemaking, to provide a degree of enhanced pedestrian safety at uncontrolled crosswalks that has been previously unattainable without costly and delay-producing full traffic signalization.

Conditions of Interim Approval: The FHWA will grant Interim Approval for the optional use of the RRFB as a warning beacon to supplement standard pedestrian crossing or school crossing signs at crosswalks across uncontrolled approaches to any jurisdiction that submits a written request to the Office of Transportation Operations. A State may request Interim Approval for all jurisdictions in that State. Jurisdictions using RRFB under this Interim Approval must agree to comply with the technical conditions detailed below, to maintain an inventory list of all locations where the devices are placed, and to comply with Item F at the bottom of Page 1A-6 of the 2003 MUTCD, Section 1A.10 which requires:

"An agreement to restore the site(s) of the Interim Approval to a condition that complies with the provisions in this Manual within 3 months following the issuance of a Final Rule on this traffic control device. This agreement must also provide that the agency sponsoring the Interim Approval will terminate use of the device or application installed under the Interim Approval at any time that it determines significant safety concerns are directly or indirectly attributable to the device or application. The FHWA's Office of Transportation Operations has the right to terminate

the interim approval at any time if there is an indication of safety concerns."

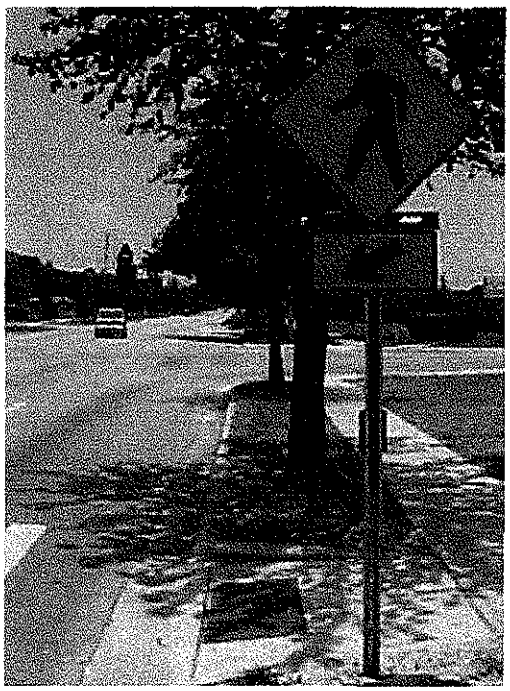
1. General Conditions:
    a. An RRFB shall consist of two rapidly and alternately flashed rectangular yellow indications having LED-array based pulsing light sources, and shall be designed, located, and operated in accordance with the detailed requirements specified below.
    b. The use of RRFBs is optional. However, if an agency opts to use an RRFB under this Interim Approval, the following design and operational requirements shall apply, and shall take precedence over any conflicting provisions of the MUTCD for the approach on which RRFBs are used:
2. Allowable Uses:
    a. An RRFB shall only be installed to function as a Warning Beacon (see 2003 MUTCD Section 4K.03).
    b. An RRFB shall only be used to supplement a W11-2 (Pedestrian) or S1-1 (School) crossing warning sign with a diagonal downward arrow (W16-7p) plaque, located at or immediately adjacent to a marked crosswalk.
    c. An RRFB shall not be used for crosswalks across approaches controlled by YIELD signs, STOP signs, or traffic control signals. This prohibition is not applicable to a crosswalk across the approach to and/or egress from a roundabout.
    d. In the event sight distance approaching the crosswalk at which RRFBs are used is less than deemed necessary by the engineer, an additional RRFB may be installed on that approach in advance of the crosswalk, as a Warning Beacon to supplement a W11-2 (Pedestrian) or S1-1 (School) crossing warning sign with an AHEAD: (W16-9p) plaque. This additional RRFB shall be supplemental to and not a replacement for RRFBs at the crosswalk itself.
3. Sign/Beacon Assembly Locations:
    a. For any approach on which RRFBs are used, two W11-2 or S1-1 crossing warning signs (each with RRFB and 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. On a divided highway, the left-hand side assembly should be installed on the median, if practical, rather than on the far left side of the highway.
    b. An RRFB shall not be installed independent of the crossing signs for the approach the RRFB faces. The RRFB shall be installed on the same support as the associated W11-2 (Pedestrian) or S1-1 (School) crossing warning sign and plaque.
4. Beacon Dimensions and Placement in Sign Assembly:
    a. Each RRFB shall consist of two rectangular-shaped yellow indications, each with an LED-array based light source. Each RRFB indication shall be a minimum of approximately 5 inches wide by approximately 2 inches high.
    b. The two RRFB indications shall be aligned horizontally, with the longer dimension horizontal and with a minimum space between the two indications of approximately seven inches (7 in), measured from inside edge of one indication to inside edge of the other indication.
    c. The outside edges of the RRFB indications, including any housings, shall not project beyond the outside edges of the W11-2 or S1-1 sign.
    d. As a specific exception to 2003 MUTCD Section 4K.01 guidance, the RRFB shall be located between the bottom of the crossing warning sign and the top of the supplemental downward diagonal arrow plaque (or, in the case of a supplemental advance sign, the AHEAD plaque), rather than 12 inches above or below the sign assembly. (See attached example photo.)
5. Beacon Flashing Requirements:
    a. When activated, the two yellow indications in each RRFB shall flash in a rapidly alternating "wig-wag" flashing sequence (left light on, then right light on).
    b. As a specific exception to 2003 MUTCD Section 4K.01 requirements for the flash rate of beacons, RRFBs shall use a much faster flash rate. Each of the two yellow indications of an RRFB shall have 70 to 80 periods of flashing per minute and shall have alternating but approximately equal periods of rapid pulsing light emissions and dark operation. During each of its 70 to 80 flashing periods per minute, one of the yellow indications shall emit two rapid pulses of light and the other yellow indication shall emit three rapid pulses of light.
    c. The flash rate of each individual yellow indication, as applied over the full on-off sequence of a flashing period of the indication, shall not be between 5 and 30 flashes per second, to avoid

frequencies that might cause seizures.

d. The light intensity of the yellow indications shall meet the minimum specifications of Society of Automotive Engineers (SAE) standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005.

6. Beacon Operation:
   a. The RRFB shall be normally dark, shall initiate operation only upon pedestrian actuation, and shall cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk.
   b. All RRFBs associated with a given crosswalk (including those with an advance crossing sign, if used) shall, when activated, simultaneously commence operation of their alternating rapid flashing indications and shall cease operation simultaneously.
   c. If pedestrian pushbuttons (rather than passive detection) are used to actuate the RRFBs, a pedestrian instruction sign with the legend PUSH BUTTON TO TURN ON WARNING LIGHTS should be mounted adjacent to or integral with each pedestrian pushbutton.
   d. The duration of a predetermined period of operation of the RRFBs following each actuation should be based on the MUTCD procedures for timing of pedestrian clearance times for pedestrian signals.
   e. A small light directed at and visible to pedestrians in the crosswalk may be installed integral to the RRFB or push button to give confirmation that the RRFB is in operation.
7. Other:
   a. Except as otherwise provided above, all other provisions of the MUTCD applicable to Warning Beacons shall apply to RRFBs.

Any questions concerning this Interim Approval should be directed to Mr. Scott Wainwright at scott.wainwright@dot.gov or by telephone at 202-366-0857.



Example of RRFB with W11-2 sign and W16-7p plaque at crosswalk across uncontrolled approach. [Photo courtesy of City of St. Petersburg, Florida]

FHWA

EXHIBIT C

MyFlorida.com **Approved Product List of Traffic Control Signals and Devices**

Home Help Search Results

APL Search Results

New Search

Type of Device: Rectangular Rapid Flashing Beacon Assembly

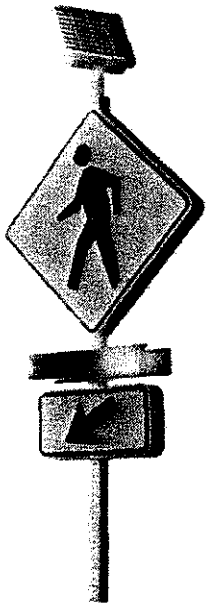
	Certification #	Manufacturer	Device Description	Initial Approval	Last Approval
	65414352453011	Stop Experts Inc. www.stopexperts.com	MODEL Enhancer Series (includes old certification #: 67014352453011)	7/28/2010	7/28/2010
	65414352455011	Spot Devices (sold to Carmanah Technologies Corp.) www.carmanah.com	MODEL SB435 RRFB System, Solar or AC Powered (Note: also known as SB435HP) (includes old certification #: 67014352455011)	8/15/2011	8/15/2011

EXHIBIT D

Carmanah Launches R920 Series Rectangular Rapid Flashing Beacon

PDF File Download: PR-201206-973-Rectangular_Rapid_Flash_Beacon_Launch_FINAL.pdf

VICTORIA, BRITISH COLUMBIA, CANADA (June 19, 2012) Carmanah Technologies Corporation (TSX: CMH) is pleased to announce the launch of the R920 Rectangular Rapid Flashing Beacon (RRFB): the latest technology in crosswalk warning systems. This new device includes features proven to significantly improve crosswalk safety and has experienced rapid acceptance and adoption in the industry. The pedestrian-actuated system provides a high-intensity rapid flash pattern to alert vehicles approaching a crosswalk that pedestrians are present. The R920 RRFB Series will add to Carmanah's industry proven line of solar flashing beacons which have been successfully used by City, County, and DOT (Department of Transportation) Agencies in the US, Canada, and internationally for over a decade.



Traffic Engineers and Planners have struggled with a dilemma of crosswalk safety since a landmark study published by FHWA in 2005 found that once vehicle volumes and speeds exceeded a certain threshold, a crosswalk with basic pavement markings and signage was associated with a higher pedestrian crash rate compared to having no crossing at all. For many of these situations, the dilemma is that a traffic signal is too costly and often is not warranted; standard crosswalk signs and markings alone are not effective; and until the RRFB, the various active warning systems available have been either cost-prohibitive, marginal in effectiveness, or both.

The Federal Highway Administration (FHWA) has issued an interim approval of the RRFB within the Manual of Uniform Traffic Control Devices (MUTCD), following an extensive study that monitored the effectiveness of the devices over a two-year period. According to the FHWA Interim Approval, "The RRFB's very high compliance rates are previously unheard of for any device other than a full traffic signal and a "HAWK" hybrid signal, both of which stop traffic with steady red signal indications."

"The design and performance of this new product presents low power demands, which provides the opportunity to deliver a very compact, cost-effective solar solution that meets or exceeds standards," notes Carmanah's CEO, Bruce Cousins. "The system is being designed with Carmanah's latest solar, LED, and wireless technology. "Our goal is to deliver a product that can be installed for a fraction of the cost of a traditional AC powered system, which will enable cities and other traffic agencies to improve safety at significantly more crosswalks than previously possible."

The R920 will be showcased at the IMSA (International Municipal Signal Association) Annual Conference, July 28-31st in Orlando, Florida. For more information about the RRFB by Carmanah, visit www.carmanah.com/traffic or contact us today at info@carmanah.com.

###

About Carmanah Technologies Corporation

As one of the most trusted names in solar technology, Carmanah has earned a reputation for delivering strong and effective products for industrial applications worldwide. Industry proven to perform reliably in some of the world's harshest environments, Carmanah solar LED lights and solar power systems provide a durable, dependable and cost effective energy alternative. Carmanah is a publicly traded company, with common shares listed on the Toronto Stock Exchange under the symbol "CMH". For more information, visit www.carmanah.com.

References:

FHWA Policy Memorandum: Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons
http://mutcd.fhwa.dot.gov/resources/interim_approval/ia11/fhwamemo.htm

"Effects of Yellow Rectangular Rapid-Flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks"
http://www.fhwa.dot.gov/publications/research/safety/pedbike/10043/10043.pdf

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations Final Report and Recommended Guidelines
http://www.fhwa.dot.gov/publications/research/safety/04100/

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This release may contain forward-looking statements. Often, but not always, forward-looking statements can be identified by the use of words such as "expects," "plans," "estimates," "intends," "believes," "could," "might," "will" or variations of such words and phrases. Forward-looking statements involve known and unknown risks, uncertainties, and other factors which may cause the actual results, performance, or achievements of Carmanah to be materially different from any future results, performance, or achievements expressed or implied by the forward-looking statements. These statements are based on management's current expectations and beliefs and are subject to a number of risks and uncertainties. For additional information on these risks and uncertainties, see Carmanah's most recently filed Annual Information Form (AIF) and Annual MD&A, which are available on SEDAR at www.sedar.com and on the Company's website at www.carmanah.com. The risk factors identified in Carmanah's AIF and MD&A are not intended to represent a complete list of factors that could affect Carmanah. Accordingly, readers should not place undue reliance on forward-looking statements. Carmanah does not assume any obligation to update the forward-looking information contained in this press release.

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RV and Fleet

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EXHIBIT E

Effects of Yellow Rectangular Rapid-Flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks

PUBLICATION NO. FHWA-HRT-10-043

SEPTEMBER 2010

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101-2296

FOREWORD

The overall goal of the Federal Highway Administration's (FHWA) Pedestrian and Bicycle Safety Research Program is to increase pedestrian and bicycle safety and mobility. From better crosswalks, sidewalks, and pedestrian technologies to growing educational and safety programs, the program strives to make it safer and easier for pedestrians, bicyclists, and drivers to share roadways.

This study was part of a larger FHWA research study to quantify the effectiveness of existing and new engineering countermeasures in improving safety and operations for pedestrians and bicyclists. This effort involved data collection and analysis to determine whether these countermeasures increased driver yielding to pedestrians. In this study, the safety effectiveness of the rectangular rapid-flashing beacon (RRFB) for pedestrians was evaluated using a before-after time-series analysis.

This report will interest engineers, planners, and other practitioners who are concerned about implementing pedestrian and bicycle treatments as well as city, State, and local authorities who have a shared responsibility for public safety.

Monique R. Evans
Director, Office of Safety
Research and Development

TECHNICAL REPORT DOCUMENTATION PAGE

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4. Title and Subtitle Effects of Yellow Rectangular Rapid-Flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks		5. Report Date September 2010 6. Performing Organization Code	
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16. Abstract The rectangular rapid-flashing beacon (RRFB) device is a pedestrian-activated beacon system located at the roadside below side-mounted pedestrian crosswalk signs. This study examined the effects of the RRFB at uncontrolled marked crosswalks. Several methods have been examined to increase driver yielding to pedestrians at multilane crosswalks at uncontrolled locations with relatively high average daily traffic (ADT). Previously, only treatments that employed a red phase have consistently produced sustained high levels of yielding at high-volume multilane crosswalks. A series of five experiments examined the efficacy of RRFBs. These studies found that RRFBs produced an increase in yielding behavior at all 22 sites located in 3 cities in the United States. Data collected over a 2-year follow-up period at 18 of these sites also documented the long-term maintenance of yielding produced by RRFBs. A comparison of RRFBs to a traditional overhead yellow flashing beacon and a side-mounted traditional yellow flashing beacon documented higher driver yielding associated with RRFBs that was not only statistically significant, but also practically important. Data from other experiments demonstrated that mounting additional beacons on pedestrian refuge islands, or medians, and aiming the beacons to maximize its salience at the dilemma zone increased the efficacy of the system, while two other variants were not found to influence the effectiveness of the system.			
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	$candela/m^2$	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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CHAPTER 1. INTRODUCTION

BACKGROUND

St. Petersburg, FL, has approximately 100 uncontrolled crosswalks located in close proximity to pedestrian generators and attractors that do not meet current pedestrian signal warrants. It is difficult for pedestrians to safely cross at these locations because these crosswalks are located along wide high-speed multilane roads, are not in close proximity to traffic signals, and have low percentages of drivers yielding to pedestrians.

With the Federal Highway Administration's (FHWA) permission to experiment, the city has taken steps to address this problem by installing solar-powered, radio-controlled, pedestrian-activated amber light-emitting diode (LED) rectangular rapid-flashing beacons (RRFBs) mounted under pedestrian crosswalk signs at 19 existing uncontrolled crosswalks. The purpose of this research was to evaluate the behavioral effects of this treatment on driver yielding at these crosswalks and to determine variables that influence the efficacy of this treatment.

STUDY APPROACH

The objective of the research effort was to evaluate whether RRFBs could increase driver yielding to pedestrians on high-volume, multilane crosswalks. Researchers selected three cities in the United States, with typically low percentages of drivers who yield to pedestrians: St. Petersburg, FL; Washington, DC; and Mundelein, IL. The research team also wanted to determine the optimum way to install the device. Because the RRFB is side mounted, researchers compared mounting the beacons on only the side of the road as well as mounting them on the side of the road plus in the median or refuge island to increase visibility in all traffic lanes.

CHAPTER 2. LITERATURE REVIEW

Drivers often fail to yield to pedestrians who have the right-of-way in marked crosswalks at uncontrolled locations. From the beginning of 2004 to the end of 2006, there were a total of 14,351 pedestrian fatalities and 212,786 pedestrian injuries resulting from pedestrian-automobile collisions nationwide.[1] Decreasing the occurrence of these crashes would increase the safety and overall walking experience for pedestrians. Anything less than a traffic signal has historically failed to produce over 70 percent yielding at crosswalks on multilane roads.

Several techniques and technologies have been used to increase driver yielding to pedestrians at marked crosswalks. One older technology included the use of flashing overhead standard yellow beacons.[2] More recent approaches include the use of in-street signs labeled "YIELD TO PEDESTRIAN" and in-roadway lights.[2] Ellis et al. experimented with in-street signs placed vertically in center lanes.[3] The signs were placed at the crossing, 20 ft in advance of the crosswalk, and 40 ft in advance of the crosswalk. The installation of these signs produced an increase of two to three times the yielding percentage over the baseline, with maximum yielding of about 61 percent. However, a study by Turner et al. shows that in-street signs do not work well on multilane roads.[4] Several studies have shown only modest increases in yielding with in-pavement lighting.[4,5]

An inexpensive and effective alternative solution is the pedestrian crossing device that employs yellow LED RRFBs that are similar in operation to emergency flashers on police vehicles. Van Houten et al. reported the results of a preliminary evaluation of this device at two multilane sites in Miami-Dade County, FL.[6] They found that the RRFB produced a large increase in driver yielding to staged pedestrian crossings (crossings made by research assistants who crossed in a consistent manner) and that the data obtained with staged crossings accurately reflected the data obtained with nonstaged crossings at these sites. The purpose of this study was to identify variables related to the efficacy of the RRFB, determine the long-term effectiveness of the RRFB, compare the RRFB to standard incandescent yellow flashing beacons, and determine if similar results can be obtained in different regions of the United States. The first experiment compared the effects of installing RRFBs on pedestrian signs on both sides of the crosswalk (two sets of beacons) to installing them on both sides of the crosswalk plus on the median island (four sets of beacons). The second experiment compared RRFBs with a traditional overhead flashing beacon and traditional beacons mounted beside the pedestrian signs. The third experiment examined the long-term effects of RRFBs at 18 sites in St. Petersburg, FL, and the short-term effects of RRFBs at three sites in two other parts of the country. The fourth experiment examined the efficacy of direct-aim technology that allowed RRFBs to have maximum brightness at a particular point in the roadway. Finally, the fifth experiment examined the effect of placing additional RRFBs on the crosswalk advance warning signs.

CHAPTER 3. EXPERIMENT 1

METHOD

Participants and Setting

The first experiment took place in St. Petersburg, FL. Participants drove on several routes including: 1st Street N south of 37th Avenue, 58th Street N south of 3d Avenue, 22d Avenue N east of 7th Street, and 31st Street S north of 54th Avenue. The crossing at 1st Street N traverses four lanes and has a posted speed limit of 35 mi/h and an average daily traffic (ADT) of 8,596. This location provides a crossing between two bus stops and includes a median island. The 58th Street N crossing traverses four lanes of traffic and has a posted speed limit of 35 mi/h and an ADT of 19,192. It also has a median island and provides a crossing for residents from a nearby retirement center. The 22d Avenue N crossing traverses four lanes and has a posted speed limit of 35 mi/h and an ADT of 13,524. It is equipped with a center island and provides a crossing for neighbor residents and a dog park. The 31st Street S crossing traverses three lanes at the crossing itself and has a posted speed limit of 35 mi/h and an ADT of 9,600. It has a median island and provides a crossing between an overflow parking lot and a community sports complex. Each of these sites is on a road carrying two-way traffic. All sites have advance yield markings installed and no-pass solid lane lines in advance of the crosswalks to reduce the risk of multiple threat crashes. These features were present during the before-and-after conditions at each site.

Apparatus

The treatment in this experiment was a standard pedestrian warning sign with two rectangular yellow LED flashers attached (see figure 1). The warning sign was either yellow or yellow-green depending on whether it was a regular sign or a school crossing sign. Each LED flasher is 6 inches wide and 2.5 inches high and placed 9 inches apart. In addition, each unit is dual indicated, with LEDs on the front and back. Each side of the LED flasher illuminates in a wig-wag sequence (left and then right). The left LED flashes two times in a slow volley each time it is energized (124 ms on and 76 ms off per flash). This is followed by the right LED, which flashes four times in a rapid volley when energized (25 ms on and 25 ms off per flash) and then has a longer flash for 200 ms. This flash pattern violates a person's expectation and results in a pattern that can be described as a "stutter flash effect."[6] In addition to the LED beacons, four signs were installed at each crosswalk. Radio frequency transmitters linked the devices so that depressing any of the pedestrian call buttons activated the flashers on all four signs. A flashing LED display facing the pedestrians flashed to indicate to them that the system was operating. The system also presented an audible message informing pedestrians that the light flashing across the street indicated that the device was operating and instructing them to wait for cars to stop before crossing. This message was also visible on a plaque posted by the call button.

Figure 1. Photo. RRFB with two forward-facing LED flashers and a side-mounted LED flasher.

Experimental Design

For this experiment, a reversal design was used. The design allowed for control of several possible confounding variables. Following baseline conditions, the signs were installed and activated in an alternating series of LED beacons flashing on two side signs and LED beacons flashing on all four signs upon button activation. Each datasheet consisted of 20 pedestrian crossings when vehicles were present. Baseline sessions consisted of four sites, and researchers recorded the first site for 5 datasheets, the second site for 7 datasheets, the third site for 9 datasheets, and the fourth site for 11 datasheets. This allowed for a staged introduction of the treatment across sites. Once the treatment was introduced, two datasheets were collected at each site, with one datasheet used to record only two of the flashers switched on and the second datasheet used to record the other half of the crossing with all four systems switched on. After five sessions of data collection using this procedure, the treatment was switched off, and data were collected for five sessions without device activation (a return to the baseline condition). Next, the treatment was switched on again, and two sets of data were collected for each of the next five sessions, half with only the two curbside devices activated and half with both curbside devices plus the two median devices activated. This produced a total of 82 datasheets comprised of 1,640 crossings. Long-term data were collected approximately 14 months following the initial experimental sessions. Each of the four sites received at least 40 additional crossings during follow-up data collection.

Measures

During each session, data were collected for 20 pedestrians who crossed the street when vehicles were present, which could have influenced crossing behavior. Most data were collected on weekdays during daylight hours when it was not raining. Probe data were collected at night on a number of sessions. Observers measured the following behaviors:

- The number of drivers who did and did not yield to pedestrians in crosswalks.
- The number of vehicle/pedestrian conflicts that involved evasive action taken by a driver or pedestrian.
- The number of pedestrians trapped at the centerline by drivers who failed to yield.
- The percentage of drivers who yielded at less than 10 ft, more than 10 ft but less than 20 ft, more than 20 ft but less than 30 ft, more than 30 ft but less than 50 ft, more than 50 ft but less than 70 ft, more than 70 ft but less than 100 ft, and more than 100 ft.
- The number of drivers who passed or attempted to pass a stopped vehicle.
- The number of drivers in following vehicles who engaged in hard braking behind a stopped car.

Whether Drivers Yielded to Pedestrians

Observers recorded the percentage of drivers who did and did not yield to pedestrians. Drivers were recorded as yielding if they stopped or slowed and allowed pedestrians to cross. Conversely, drivers were recorded as not yielding if they passed in front of pedestrians but would have been able to stop when the pedestrians arrived at the crosswalk. The Institute of Transportation Engineers (ITE) signal formula for determining the duration of the yellow signal phase was used to decide whether a driver could safely stop.[(7)] Calculating the distance before which a driver can safely stop for a pedestrian is essentially the same problem as calculating the distance that a driver can stop for a traffic signal that changes to red. Traffic engineers use the signal-timing formula, which takes into account driver reaction time, safe deceleration rate, posted speed, and grade of the road.[(7)] This formula was used to measure the distance beyond which a driver could safely stop for a pedestrian by calculating the yellow time and then multiplying this time by the speed limit to determine a distance. A landmark associated with this distance was identified for each approach to the crosswalk. Drivers who passed this landmark before the pedestrian started to cross could be scored as yielding to pedestrians and not for failing to yield because they might not have sufficient distance to safely stop. Drivers who were located beyond the landmark when the pedestrian entered the crosswalk could be scored as yielding or not yielding because they had sufficient distance to safely stop. When pedestrians first started to cross, only drivers in the first half of the roadway were scored for yielding. Once pedestrians approached the painted median, the yielding behaviors of drivers in the remaining two lanes were scored. This procedure was followed because it conformed to the obligation of drivers specified in the Florida statutes.

Staged crossings always followed a specific crossing protocol. First, the staged pedestrian placed one foot in the crosswalk when an approaching vehicle was just beyond the landmark distance (this is the measured distance for the vehicle speed, which ensured a safe stopping distance for drivers traveling at the posted speed). If the driver made no attempt to stop, the pedestrian did not proceed to cross and scored the driver and any subsequent drivers as not yielding. If the driver clearly began to yield and the next lane was free, the pedestrian would begin crossing. The pedestrian always stopped at the lane line and made sure the next lane was clear. If a large gap appeared, the pedestrian finished the crossing. This is essentially the protocol followed by police officers when they conduct pedestrian-crossing-enforcement sting operations. This protocol ensured the safety of the staged pedestrians. Unstaged pedestrian crossings were only scored if the pedestrian initiated a crossing in the same manner as the staged pedestrian by placing at least one foot in the crosswalk. Pedestrians who did not place a foot into the crosswalk were not scored because according to the Florida statutes, drivers are not required to yield unless the pedestrian is in the crosswalk.

Conflicts Between Drivers and Pedestrians

A conflict between a driver and a pedestrian was recorded whenever a driver suddenly stopped or swerved to avoid striking a pedestrian or whenever a pedestrian jumped, ran, or suddenly stepped or lunged backward to avoid being struck by a vehicle. Conflicts were rare because of the use of the safe crossing protocol.

Pedestrian Trapped at the Centerline

Pedestrians were recorded as trapped at the center whenever they had to wait at the centerline for 5 s or more because at least one car in the second half of the roadway did not yield.

Yielding Distance

The distances of yielding drivers were also recorded. Each yielding driver represented a yielding distance. The distance at which a driver yielded was recorded by observing the colored flag the driver yielded behind. A series of small colored utility-like flags were placed alongside the curb in each direction of traffic at 10, 20, 30, 50, 70, and 100 ft. The colors of the flags were red, orange, yellow, green, blue, and red, respectively. This provided a simplified system for recording the distance of yielding drivers in the following divisions: less than 10 ft, more than 10 ft but less than 20 ft, more than 20 ft but less than 30 ft, more than 30 ft but less than 50 ft, more than 50 ft but less than 70 ft, more than 70 ft but less than 100 ft, and more than 100 ft. The distance of a yielding driver was recorded only after the pedestrian had completely cleared the lane and was no longer in the path of the vehicle so that the vehicle posed no threat.

Driver Passed or Attempted to Pass Stopped Vehicle

Drivers were recorded as passing a stopped vehicle if they passed another driver that was yielding to a pedestrian. Drivers were recorded as attempting to pass a stopped vehicle if they did not yield until after they were alongside or past a yielding vehicle and engaged in hard braking after seeing the pedestrian or if they were behind a yielding vehicle and changed lanes to go around but then yielded.

Driver Behind Yielding Vehicle Engaged in Hard Braking

A driver was recorded as hard braking if his or her vehicle was behind a yielding vehicle, and the front end of his or her vehicle was observed taking a sudden movement toward the ground.

RESULTS

Driver Yielding Behavior

The first site at 22d Avenue N east of 7th Street had an average baseline driver yielding percentage of 28 percent. The first two-beacon system produced an average yielding percentage of 82 percent, while the first four-beacon system produced an average yielding percentage of 95 percent. The reversal back to two beacons produced an average yielding percentage of 87 percent, and the second treatment of four beacons had an average yielding percentage of 91 percent.

The second site at 58th Street N south of 3d Avenue had an average baseline driver yielding percentage of 11 percent. The first two-beacon system produced an average yielding percentage of 78 percent, while the first four-beacon system produced an average yielding percentage of 88 percent. The reversal back to two beacons produced an average yielding percentage of 85 percent, and the second treatment of four beacons had an average yielding percentage of 89 percent.

The third site at 1st Street N south of 37th Avenue had an average baseline driver yielding percentage of 18 percent. The first two-beacon system produced an average yielding percentage of 87 percent, while the first four-beacon system produced an average yielding percentage of 90 percent. The reversal back to two beacons produced an average yielding percentage of 84 percent, and the second treatment of four beacons had an average yielding percentage of 90 percent. Night data were also collected at this location. During night collection, there was a baseline driver yielding percentage of 5 percent. The introduction of the two-beacon system increased yielding to 85 percent, while the activation of the four-beacon system further increased yielding to 100 percent. The yielding percentage decreased to 89 percent with the reversal back to the two-beacon system and increased to 99 percent during the last phase of the four-beacon system.

The fourth site at 31st Street S north of 54th Avenue had an average baseline driver yielding percentage of 15 percent. The first two-beacon system produced an average yielding percentage of 67 percent, while the first four-beacon treatment produced an average yielding percentage of 79 percent. Yielding averaged 79 and 81 percent during the final two-beacon and four-beacon conditions, respectively. The results showed an average yielding percentage of 15 percent for the baseline, 73 percent for two systems, and 80 percent for four systems.

A two-sample *t*-test for matched pairs was performed to test the significance of the reported yielding percentages between the two- and four-beacon systems. The test showed significance at the 0.05 level. Figure 2 illustrates the average yielding percentage per condition at night at one site where night data were collected.

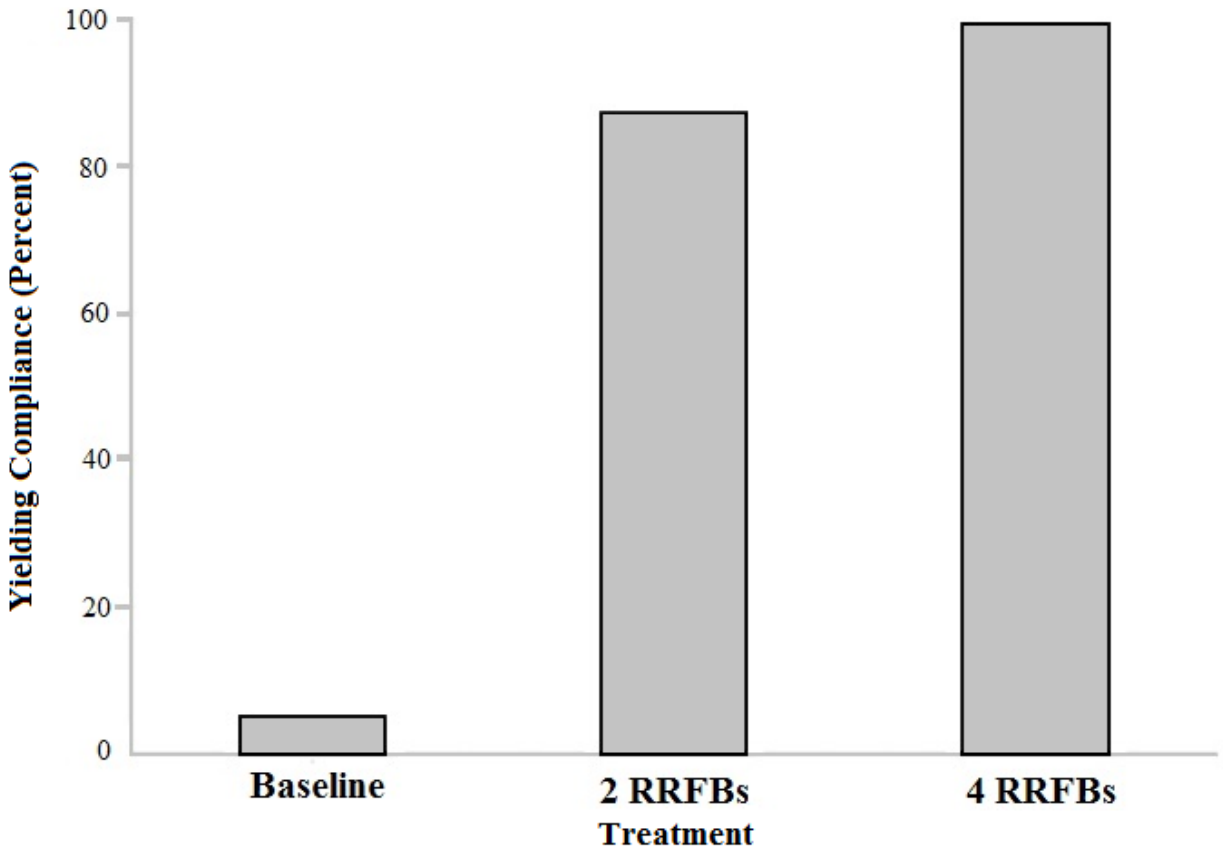

Figure 2. Graph. Yielding compliance for three conditions during nighttime observations at the third site at 1st Street and 37th Avenue S.

The data collected during each of the follow-up sessions show that the RRFB devices were able to maintain a high level of driver yielding behavior during the follow-up condition. The first original site at 22d Avenue produced an average yielding compliance of 99 percent for the four-beacon treatment. The second site at 58th Street N had an average yielding compliance of 90 percent. The third site at 1st Street N produced an average four-beacon yielding compliance of 100 percent. The final site at 31st Street S had an average yielding compliance of 93 percent during the four-beacon system follow-up evaluation. The third site was evaluated during nighttime conditions as a follow-up to previous night evaluations. This location was evaluated for 60 consecutive crossings with an average yielding compliance of 97 percent. Brief reversals back to the baseline for the above follow-up locations produced low yielding compliances similar to pre-installation. These data are shown in table 1 and figure 3.

Table 1. Average yielding compliance per condition including follow-up for each site.

Location	Percent Yielding Compliance					
	Baseline	2 RRFBs	4 RRFBs	4 RRFBs	Baseline	4 RRFB
Site 1: 22nd Avenue N	28	85	93	99	23	98
Site 2: 58th Street N	11	82	89	90	5	92
Site 3: 1st Street N	18	86	93	100	28	100
Site 4: 31st Street S	15	73	80	93	15	N/A
Average	18	82	89	96	18	95

N/A = data not available.

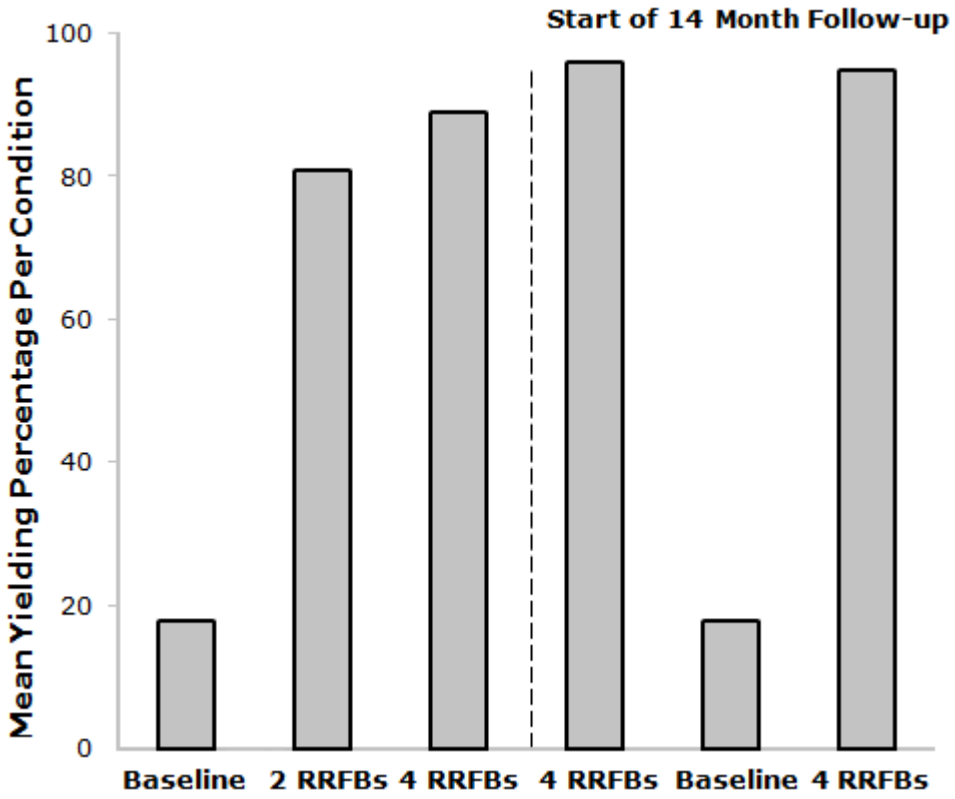

Figure 3. Graph. Mean yielding percentage for each condition.

Figure 3 represents all of the data from the four experimental sites averaged together per treatment condition. The data to the right of the dashed line show yielding during the follow-up data collected 14 months after installation.

Distance of Driver Yielding Behavior

The majority of yielding across all four sites during each condition occurred at the 30- to 50-ft interval. Yielding increases of 3.1 and 8 percent occurred at more than 30 ft over the baseline for the two-beacon and four-beacon system treatments, respectively. Yielding doubled at more than 100 ft. The total average yielding distances for all four sites (more than 30 ft) is shown in table 2. The presence of advance yielding markings at all sites throughout the study likely influenced yielding distance.

Table 2. Average percentage of drivers yielding in each distance category for each experimental condition.

Condition	Less than 10 ft	Between 10 and 20 ft	Between 20 and 30 ft	Between 30 and 50 ft	Between 50 and 70 ft	Between 70 and 100 ft	Greater than 100 ft
Baseline	3	10	17	37	16	11	7
2 RRFBs	3	7	12	31	18	14	15
4 RRFBs	2	6	13	32	18	12	17

Driver Passed or Attempted to Pass Stopped Vehicle

During the baseline across all four sites, there was a total of 48 passes or attempted passes. There were only eight of these occurrences for both two- and four-beacon systems combined during all of the treatment phases.

There were no significant results reported for evasive pedestrian-vehicle actions such as pedestrians trapped in a median or drivers behind a yielding vehicle slamming on their brakes.

Interobserver Agreement

Both observers stood in such a way that they had the same vantage point, but they were not able to see what the other observer recorded. A measure of interobserver agreement was computed by dividing the number of times both observers agreed on the occurrence of each pedestrian behavior by the number of times they agreed plus the number of times they disagreed on its occurrence. The interobserver agreement on the occurrence of a yielding behavior averaged 92 percent with a range of 78 to 100 percent. The interobserver agreement on evasive conflicts was 100 percent. In addition, the interobserver agreement averaged 100 percent on whether the pedestrian was trapped in the center of the road, averaged 100 percent on vehicle passes or pass attempts, averaged 100 percent on vehicles that slammed on brakes, and averaged 95 percent on stopping distance.

CHAPTER 4. EXPERIMENT 2

METHOD

Participants and Setting

The second experiment took place in St. Petersburg, FL. Participants consisted of drivers traveling past two sites. The first site is on 58th Street N south of 3d Avenue. The site traverses four lanes and has a posted speed limit of 35 mi/h and an ADT of 19,192. It also has a median island and provides a crossing for residents of a nearby retirement center. There is also a pedestrian-activated standard overhead incandescent yellow flashing beacon at this site. The second site is at 4th Street S and 18th Avenue. It is equipped with a side-mounted, pedestrian-activated, standard overhead incandescent yellow flashing beacon system. This roadway traverses four lanes and has a posted speed of 35 mi/h and an ADT of 9,600.

Apparatus

The treatment in this experiment was the standard overhead yellow flashing beacon (see figure 4) and a standard side-mounted yellow beacon. These systems are activated when the pedestrian call button is pressed. The system has two 12-inch-diameter yellow beacons facing both directions of traffic. The beacons flash 55 times per minute, and the illumination period of the beacon is 50 percent of the time.

Experimental Design

The comparison of the first site with a standard overhead beacon with the RRFB system was carried out at the 58th Street N south of 3d Avenue site. Following the baseline, the standard overhead beacon was introduced, followed by the RRFB system. First, only the two curbside beacons were activated, and then all four beacons were activated (curbside plus median beacons). Five baseline datasheets were collected in the absence of activation of the standard system. The system was activated during treatment, and 7 datasheets, each comprised of 20 crossings, were collected. Following the standard beacon treatment, two RRFBs were implemented, followed by the four-beacon system. Each rapid-flash treatment was observed for 5 datasheets each, creating a total of 680 crossings.

Figure 4. Photo. Northbound view of standard overhead beacon system and crosswalk at 58th Street N with advance yield markings.

At the second site (4th Street S and 18th Avenue), the standard side-mounted incandescent beacon system was compared to the RRFB system. The baseline consisted of 46 crossings. After the baseline, a side-mounted standard beacon system was evaluated for 70 crossings at 7- and 30-day intervals. Next, a two-beacon RRFB system was installed and evaluated for 70 crossings at 7- and 30-day intervals. All crossings at this site were staged.

RESULTS

Statistical Analysis

For the first site at 58th Street N, a *z*-test for proportions was performed. The difference in driver yielding behavior between the baseline and the standard overhead beacon was not significant at the 0.01 level ($z = 1.06$ with 85.5 percent confidence level). The difference in driver yielding behavior between the baseline and the two-beacon system was significant at the 0.01 level ($z = 12.75$ with 100 percent confidence level). The difference in yielding behavior between the baseline and the four-beacon system was also significant at the 0.01 level (100 percent confidence interval), and the difference between the two- and four-beacon system was significant at the 0.01 level ($z = 1.85$ with 96.8 percent confidence level).

The difference in the proportion of drivers yielding less than 30 ft before the crosswalk was significantly greater at the 0.01 level for the standard beacon condition than the baseline condition ($z = -2.70$ with 99.7 percent confidence level).

There were no significant results reported for evasive actions such as pedestrian/vehicle, pedestrian trapped in median, or car behind a yielding car or drivers slamming on brakes (inadequate number of occurrences of these events to perform the tests).

For the second site at 4th Street S, a *z*-test for proportions was performed. The difference in driver yielding behavior between the baseline and the standard side-mounted beacon was significant at the 0.01 level ($z = 6.03$ with 100 percent confidence level). The difference in driver yielding behavior between the standard side-mounted beacon and the two-beacon RRFB was significant at the 0.01 level ($z = 11.58$ with 100 percent confidence level). The difference in proportions of drivers yielding more than 30 ft between the standard side-mounted beacon and the RRFB was significant at the 0.01 level ($z = 4.65$ with 100 percent confidence level). No test was performed between the baseline and either condition because no vehicle yielded during the baseline condition. The level of conflicts observed at this site was not sufficient to perform a statistical analysis at this site. It should be noted that the low level of conflicts was likely a result of the research assistant consistently using the safe crossing procedure during crossing. This effect was most marked during the baseline condition when driver yielding was low.

Driver Yielding Behavior

The average yielding compliance at the first site at 58th Street N Avenue during the baseline recording was 11 percent. The activation of the overhead standard beacon produced an average yielding percentage of 16 percent—an increase of 5 percentage points above the baseline. The introduction of a two-beacon RRFB system produced an increase in yielding compliance to 78 percent. A four-beacon RRFB system was associated with 88 percent yielding compliance. Reversal back to the two-beacon system produced a yielding compliance of 85 percent followed by 89 percent yielding compliance for the second four-beacon system treatment. The average yielding compliance for a two-beacon system was 82 percent. The average yielding compliance for the four-beacon system was 89 percent. The introduction of a two- and four-beacon system produced 71 and 78 percentage point increases over the baseline and increases of 66 and 73 percentage points over the standard-beacon system, respectively (see figure 5).

Baseline data from the second site at 4th Street and 18th Avenue showed zero percent yielding compliance. Activating the side-mounted standard beacon produced a yielding compliance of 15 percent after 30 days. The RRFB system produced a yielding compliance of 87 percent after 30 days. The RRFB percentages are representative of a two-beacon system only (see figure 6).

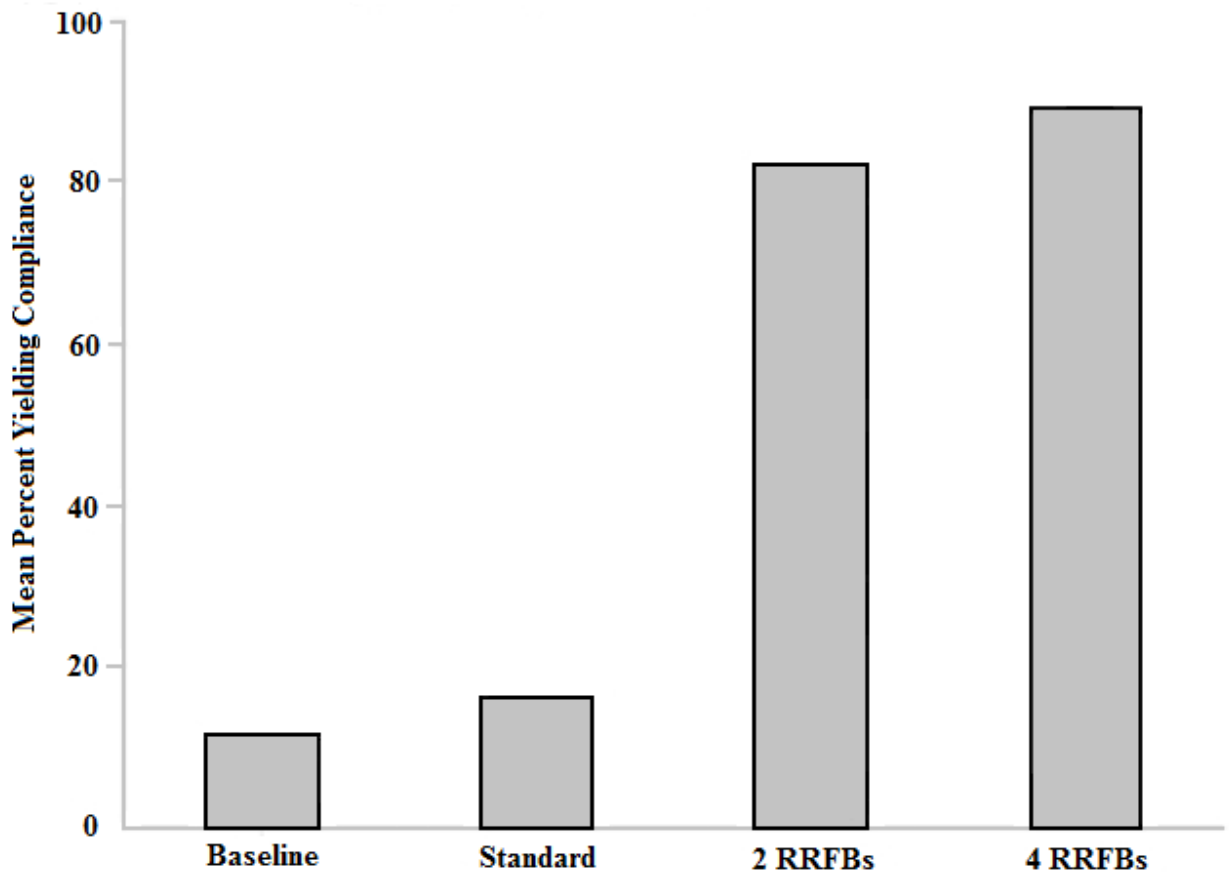

Figure 5. Graph. Driver yielding behavior at the 58th Street N site.

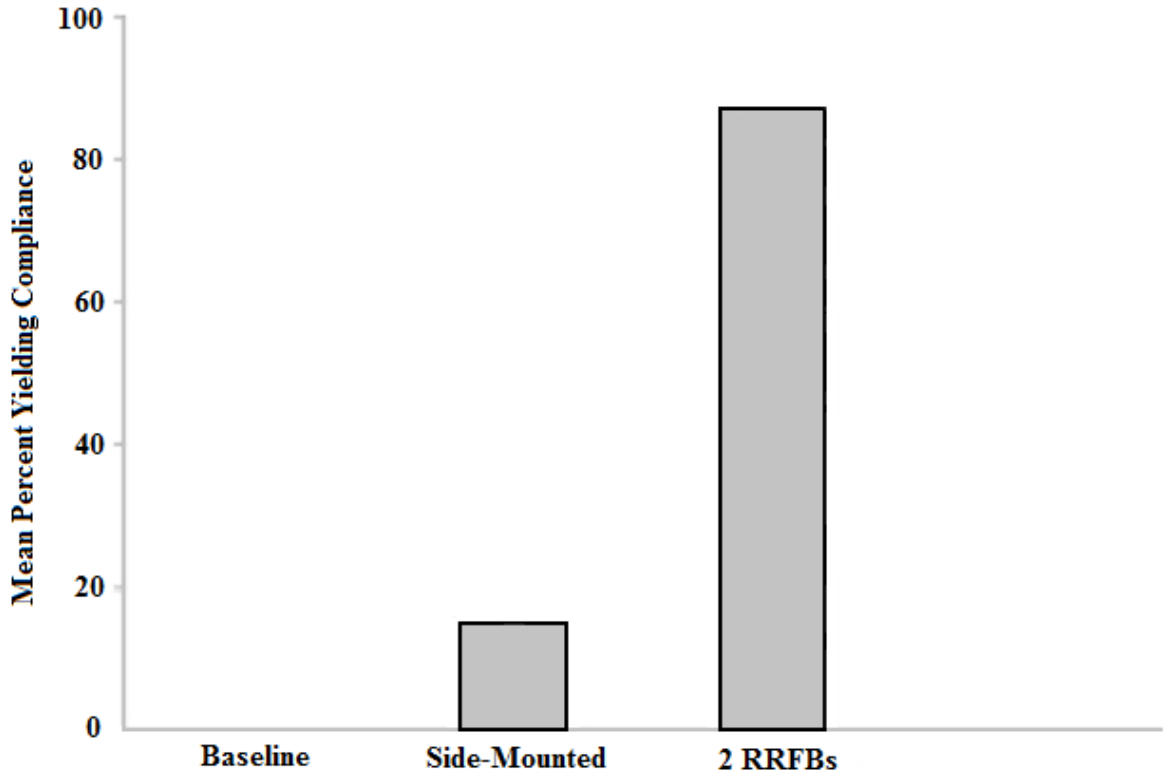

Figure 6. Graph. Relative efficacy of the side-mounted yellow beacon at the 4th Street S site.

The yielding distance improved in the absence of the standard flashing beacon than in its presence. When the standard flashing beacons were activated, a higher percentage (1 percent) of drivers yielded at less than 30 ft. However, there were more drivers yielding during treatment, and this produced a larger number of drivers who yielded at a closer distance than in the absence of the light. There were 48 drivers who yielded at less than 30 ft during the treatment compared with only 27 drivers who yielded during the baseline condition. In addition, 5.6 percent of drivers yielded at more than 100 ft during treatment as opposed to 8.4 percent who yielded at more than 100 ft during the baseline. The majority of yielding during both conditions occurred between 30 and 50 ft. During the baseline, 41 percent of drivers yielded at this distance, and 43 percent yielded during the standard beacon treatment. The majority of driver yielding when the RRFB was activated occurred between 30 and 50 ft (44 percent). During the four-beacon system, the majority of driver yielding was also between 30 and 50 ft (42 percent). The percentage of drivers who yielded at more than 100 ft more than doubled from the two-beacon system to the four-beacon system, with an increase from 6 to 12 percent.

Interobserver Agreement

Interobserver agreement on the occurrence of a yielding behavior averaged 92 percent with a range of 80 to 98 percent, averaged 100 percent on drivers who slammed on the brakes, and averaged 99 percent on stopping distance.

CHAPTER 5. EXPERIMENT 3

METHOD

Participants and Setting

Participants in experiment 3 consisted of drivers and pedestrians across 22 sites, with 19 sites in Florida, 2 sites in Illinois, and 1 site in Washington, DC. These sites, along with the ADT and posted speed limit at the crosswalk location, are presented in table 3.

Table 3. Characteristics at each of the treatment sites.

Location of Crosswalk	Number of Lanes	Median Present	Traffic Flow	ADT	Posted Speed Limit (mi/h)
Florida					
31st Street and 54th Avenue S	4	Yes	Two-way	9,600	35
4th Street and 18th Avenue S	4	Yes	Two-way	17,657	35
22d Avenue N and 7th Street	4	Yes	Two-way	13,524	35
9th Avenue N and 26th Street	4	No	Two-way	12,723	35
22d Avenue N and 5th Street	4	Yes	Two-way	18,367	35
Martin Luther King Street and 15th Avenue S	5	Yes	Two-way	12,025	35
Martin Luther King Street and 17th Avenue N	5	No	Two-way	14,336	35
1st Avenue N and 13th Street	3	No	One-way	9,715	30
9th Avenue N and 25th Street	4	No	Two-way	12,723	35
1st Street and 37th Avenue N	4	Yes	Two-way	6,216	35
58th Street and 3d Avenue N	4	Yes	Two-way	13,826	35
Central Avenue and 61st Street	4	No	Two-way	12,742	40
1st Avenue S and 61st Street	3	No	One-way	12,742	35
1st Avenue N and 61st Street	4	No	One-way	9,128	35
83d Avenue N and Macoma Drive	2	No	Two-way	4,774	35
9th Avenue N and 45th Street	4	No	Two-way	9,343	35
22d Avenue S and 23d Street	4	No	Two-way	9,343	35
62d Avenue S and 21st Street	3	No	Two-way	5,008	35
9th Avenue N and 31st Street	4	No	Two-way	11,982	35
Illinois					
Hawley Street and Atwater Drive	2	No	Two-way	N/A	35
Midlothian Road and Kilarny Pass Road	4	No	Two-way	N/A	35
Washington, DC					
Brentwood Road and 13th Street	4	No	Two-way	30,000	30

N/A = data not available.

Additional participants consisted of drivers and pedestrians located at two school crosswalks in Illinois, one crosswalk in Washington, DC, and one of the sites in St. Petersburg, FL, equipped with an advance warning rapid-flash device similar to the one in Washington, DC. The first site is located at Hawley Street east of Atwater Drive in Illinois, the second site is located at Midlothian Road south of Kilarny Pass Road in Illinois, the third site is located at Brentwood Road and 13th Street NE in Washington, DC, and the fourth site is located at 1st Avenue N and 61st Street in St. Petersburg, FL (see table 3).

Apparatus

The treatment in this experiment is identical to that of experiment 1. The RRFB system as described previously was employed in this study. Exceptions are found at the third and fourth sites. These locations had a device similar to the previous locations with the exception of being equipped with an advance warning rapid-flash sign. The additional sign was a standard STOP FOR PEDESTRIANS AHEAD sign in Washington, DC, and a standard pedestrian silhouette sign at 1st Avenue in St. Petersburg, FL, equipped with an RRFB system similar to those used in the previous experiments. The advance warning sign in Washington, DC, was placed in the approximate area of the ITE threshold previously discussed. This location was designed so that upon activation of the pedestrian call button, the advance sign would activate immediately. After approximately 1.5 s, the devices located at the crosswalk would then become activated. However, the advance sign in St. Petersburg, FL, was located further away at 368 ft.

Experimental Design

This experiment used a before-after design. The baseline was collected for a series of 22 sites. Because these beacons were introduced at different times at each site, it is not likely that the resulting changes were due to any uncontrolled confounding variables such as the level of police enforcement or the occurrence of increased publicity that sometimes follows major pedestrian crashes. After the baseline data were collected, a treatment consisting of either two- or four-beacon RRFB systems was implemented. This treatment was extended in intervals of 7, 30, 60, 90, 180, 270, and 360 days, respectively. Not all sites were yet reporting data to 360 days. The site in Florida equipped with the advance warning sign was evaluated in an alternating treatment design. After a baseline period, the two treatment conditions, the rapid-flash device at the crosswalk sign and the rapid-flash device at the crosswalk sign plus the rapid flash device at the advance warning sign, were alternated in rapid succession (every other crossing).

Statistical Analysis

The general statistical methodology used in this study was based on the general time-series intervention regression modeling approach described in Huitema and McKean and McKnight et al. (See references 8–11.) However, the specific parameters included in the present model differ from those used in the earlier work.

The statistical model used here was developed to conform to the nature of traffic data collected in this study. Because it is well known that compliance with traffic-signal stimulus changes usually occurs rapidly but does not reach an asymptote immediately, the analysis was designed to model this expected change pattern.

Specifically, the change model contained five parameters. The first parameter measured the baseline level, the second measured the change from the baseline to day 7, the third measured the change from day 7 to day 30, the fourth measured the change from day 30 to day 60, and the fifth measured the slope during the remaining time points (days). This fifth parameter measured the general trend after the first month of observations through the final observation month (day 720). An additional parameter was also included to accommodate possible autoregressive patterns in the errors of the model. Because this parameter was of limited interest in this study, it is not described in detail here. The approach used to estimate the parameters of the model is based on a double bootstrap methodology that accommodates both independent and autocorrelated error structures encountered in time-series intervention designs of the type used in behavioral research.[11] Certain variants of this approach have been developed for the analysis of both simple and complex versions of single-case designs.[12]

RESULTS

The five main parameter estimates obtained in the study are shown in table 4. Alpha was set at 0.05 before the data were collected, and any *p*-value that is less than equal to or 0.05 is statistically significant. *P*-values are presented to allow the reader to decide whether the evidence is convincing. There is an immediate and large statistically significant level change from the baseline to day 7, a small but statistically significant additional increase from day 7 to day 30, a minor and not statistically significant level decrease at day 60, and a general trend after day 60 that has little slope across the remaining observation days. Hence, the evidence for change is overwhelming, and it is maintained for the duration of the study. There are 144 degrees of freedom for all tests shown in table 4.

Table 4. Florida data estimates of treatment effect parameters and associated *t*-ratios and *p*-values.

Treatment Effect Parameter	Parameter Estimate	*t*-Ratio	*p*-Value
Baseline level	1.79		
Level change day 7	77.25	29.22	0.001
Level change day 30	6.03	2.38	0.02
Level change day 60	–4.26	–1.75	0.08
Follow-up slope	0.0059	1.62	0.11

Note: Certain cells were left blank because only *t*-ratios and *p*-values that show a change from the baseline were included.

Driver Yielding Behavior

The average combined yielding percentage during the baseline of all 19 Florida sites was less than 1.7 percent. Follow-up data were available for all 19 sites at the 7-, 30-, and 60-day periods. The average yielding percentage of all combined sites was 79 percent after 7 days, 86 percent after 30 days, and 82 percent after 60 days. Yielding percentages for the 19 sites at 90, 180, 270, and 365 days were 80, 76, 86, and 83 percent, respectively. The 17 sites that were installed for 2 years showed a yielding compliance of 85 percent 730 days after installation.

Each of the two locations in Illinois has reported data during the baseline and again 7 and 30 days after installation. The first location, Hawley Street east of Atwater Drive, produced 19 percent yielding during the baseline, 71 percent 7 days after installation, and 68 percent 30 days after installation. The second location, Midlothian Road south of Kilarny Pass Road, produced a yielding percentage of 6.6 percent during the baseline. The device was activated 7 days after installation, and yielding compliance increased to 62 percent 30 days after installation. Both of the sites used only two of the rapid-flash devices.

The Washington, DC, location, which was equipped with an advance warning rapid-flash device, was evaluated during baseline conditions and again 7, 30, and 180 days after installation. Baseline yielding compliance at this location was 26 percent. Average yielding compliance increased for 7-, 30-, and 180-day evaluations to 62, 74, and 80 percent, respectively.

The St. Petersburg, FL, site that was equipped with the advance warning device at 1st Avenue North and 61st Street had an average yielding compliance of 8.6 percent during the baseline condition. During activation of the rapid-flash device, average yielding increased to 92 percent only at the crosswalk. The addition of the advance warning device had no effect on yielding, which remained at 92 percent (see table 5).

Distance of Driver Yielding Behavior

Data on the distance of yielding drivers were recorded for both of the Illinois sites, the Washington, DC, site, and the St. Petersburg, FL, site at 1st Avenue North and 61st Street that was equipped with the rapid-flash advance warning device. The total combined percentage of drivers yielding at 30 ft or more during the baseline for the two sites in Illinois was 83 percent. The introduction of the treatment device produced increases in the percentage of drivers yielding at 30 ft or more to 94 percent at the Atwater Drive site and 92 percent at the Kilarny Pass Road site. The Washington, DC, site had a baseline percentage of 41 percent for drivers yielding at 30 ft or more. Once the rapid-flash device, including the advance warning sign, was activated 7 days after installation, the percentage increased to 62 percent. Follow-up data collected at days 30 and 180 showed an additional yielding increase at 30 ft or more to 72 and 87 percent, respectively.

The St. Petersburg, FL, site had an average baseline yielding percentage of 50 percent for drivers who yielded at 30 ft or more. No drivers yielded at more than 100 ft during the baseline for this location. During the crosswalk alone condition, the average percentage of those yielding at 30 ft or more was 83 percent. The crosswalk plus advance warning condition saw a slight increase in yielding to 84 percent.

Table 5. Baseline and follow-up yielding data at sites in Florida, Illinois, and Washington, DC.

Site	Day (Percent)								
	Baseline (Percent)	7	30	60	90	180	270	365	730
Florida									
31st Street and 54th Avenue S	0	54	76	N/A	59	N/A	91	75	83
4th Street and 18th Avenue S	0	63	72	N/A	69	N/A	69	80	80
22d Avenue N and 7th Street	0	97	96	91	93	92	91	98	96
9th Avenue N and 26th Street	0	80	82	85	95	81	88	77	78
22d Avenue N and 5th Street	8	87	89	92	92	87	96	92	95
Martin Luther King Street and 15th Avenue S	1	86	84	85	82	N/A	89	88	88
Martin Luther King Street and 17th Avenue N	0	96	94	80	82	83	88	82	83
1st Avenue N and 13th Street	2	85	87	75	78	N/A	91	88	N/A
9th Avenue N and 25th Street	0	86	90	83	90	N/A	88	81	79
1st Street and 37th Avenue N	0	79	87	85	87	N/A	90	97	95
58th Street and 3d Avenue N	0	85	84	85	85	79	92	82	88
Central Avenue and 61st Street	0	94	95	77	73	72	79	67	72
1st Avenue S and 61st Street	5	68	72	73	75	72	90	72	78
1st Avenue N and 61st Street	0	75	75	68	82	42	76	79	83
83d Avenue N and Macoma Drive	0	86	93	91	73	88	84	80	90
9th Avenue N and 45th Street	0	54	91	89	90	80	83	77	78
22d Avenue S and 23d Street	0	89	86	78	77	60	75	81	82
62d Avenue S and 21st Street	0	77	76	77	53	78	81	84	80
9th Avenue N and 31st Street	16	93	95	89	88	82	82	89	N/A
Average	2	81	86	82	80	76	86	83	84
Illinois									
Hawley Street and Atwater Drive	19	71	68	N/A	N/A	N/A	N/A	N/A	N/A
Midlothian Road and Kilarny Pass Road	7	62	62	N/A	N/A	N/A	N/A	N/A	N/A
Average	13	67	65	N/A	N/A	N/A	N/A	N/A	N/A
Washington, DC									
Brentwood Road and 13th Street	26	62	74	80	N/A	80	N/A	N/A	N/A

N/A = data not available.

CHAPTER 6. EXPERIMENT 4

METHOD

Participants and Setting

Participants in experiment 4 drove through the crosswalk at 4th Street and 18th Avenue S in St. Petersburg, FL. This location has four through lanes at the crosswalk with a refuge island in the center median. The location has a posted speed limit of 35 mi/h and an ADT of 17,657.

Apparatus

The treatment in this experiment is identical to that of experiment 1. A standard pedestrian warning sign with two RRFBs with the same light positioning, timing, and sequence was used. Each unit was dual indicated, with LEDs on the front and back. Each side of the beacon flashed in a wig-wag sequence (left light on followed by the right light on). Combined, the two LEDs flashed 190 times in the wig-wag sequence during a 30-s cycle. The devices were updated with Direct Aim® lighting and the momentary light bar (MLB).

Direct Aim® lighting angles the LED lights of preexisting units so that the lights, when activated, do not flash parallel to the roadway but rather flash at an angle that places oncoming traffic lanes in the direct path of the light (see figure 7). In the figure, the arrows on the left panel show perpendicular lighting, while the arrows on the right panel highlight Direct Aim®. This device was developed to accommodate the sensitive directivity of LED lights. That is, LED lights have a small angle of maximum visibility and effect. While new LED lighting systems mounted on emergency vehicles are parallel to the roadway and the vehicle, they remain effective in their purpose. The reason for this may be that their purpose is to alert all of those directly in front of them to pull off to the side of the roadway. However, it would seem impossible to place the RRFB lights directly in the path of oncoming traffic. The MLB device is an addition to Direct Aim® lighting. The MLB attaches below the Direct Aim® and is activated on a delay circuit. The delay allows any vehicles in close proximity to the activated crosswalk to clear the crosswalk. Once this has occurred, the MLB activates with a horizontal arrangement of intensely bright LEDs. After a moment, the MLB lights fade out.

Experimental Design

In this study, an alternating treatment design was employed to record driver yielding percentages in an evaluation of two devices in an effort to further increase driver yielding to pedestrians at a single midblock crossing. The alternating treatment design was chosen due to its ability to evaluate multiple treatments while offering experimental control. This is accomplished by rapidly alternating between two or more different treatments in succession after an initial stable baseline has been achieved. The design allows for the alleviation of any possible confounding or nuisance variables.[13] First, baseline data were collected by having staged pedestrians (researchers) cross as the drivers' yielding behavior was recorded for three datasheets, each consisting of 20 crossings. After this, data were collected on the preexisting RRFB device for a total of 70 crossings following the baseline at 7, 30, 270, and 365 days. The third stage involved the installation of Direct Aim® LED lights along with an MLB to the RRFB.

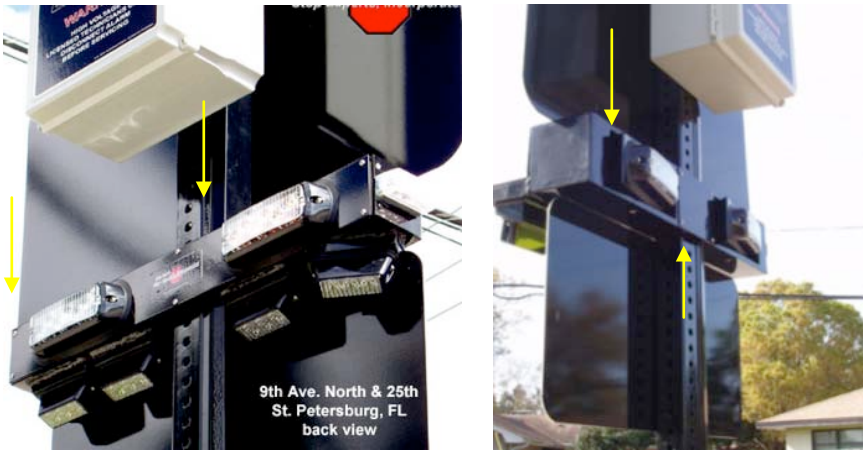

Figure 7. Photo. Perpendicular lighting (left panel) and Direct Aim® lighting (right panel).

The MLB device was installed with a cutoff switch to allow for a quick transition between Direct Aim® and Direct Aim® plus MLB. A coin flip was used to decide which device was to be evaluated first. After Direct Aim® was evaluated for 20 crossings, the switch was flipped, and the MLB was evaluated for 20 more crossings. This collection procedure was reproduced 5 times per condition, producing 100 crossings per condition.

RESULTS

Statistical Analysis

A *z*-test for proportions was used to test for differences. The percentage of drivers yielding in the RRFB with the Direct Aim® condition did not differ from the percentage yielding in the Direct Aim® plus MLB condition at the 0.05 level ($z = 0.43$ with 66.6 percent confidence level one tail test). However, the RRFB with Direct Aim® was associated with higher yielding than the parallel aim RRFB at the 0.05 level ($z = 1.74$ with 95.9 percent confidence level one tail test).

The percentage of drivers who yielded to pedestrians during the baseline condition was zero percent. The average yielding compliance 7 days after RRFB installation increased to 33 percent. Yielding compliance continued to increase to 72 percent 30 days after installation. Average yielding compliance was 69 percent after 180 days and remained unchanged 270 days after installation. Yielding compliance 365 days after installation averaged 80 percent (see figure 8). The average yielding compliance during the duration of the RRFB with perpendicular lighting was about 80 percent.

The change from perpendicular LEDs to Direct Aim® lighting produced an average increase of 89 percent. Sessions including the MLB produced an average of 86 percent. These averages included 100 crossings per condition.

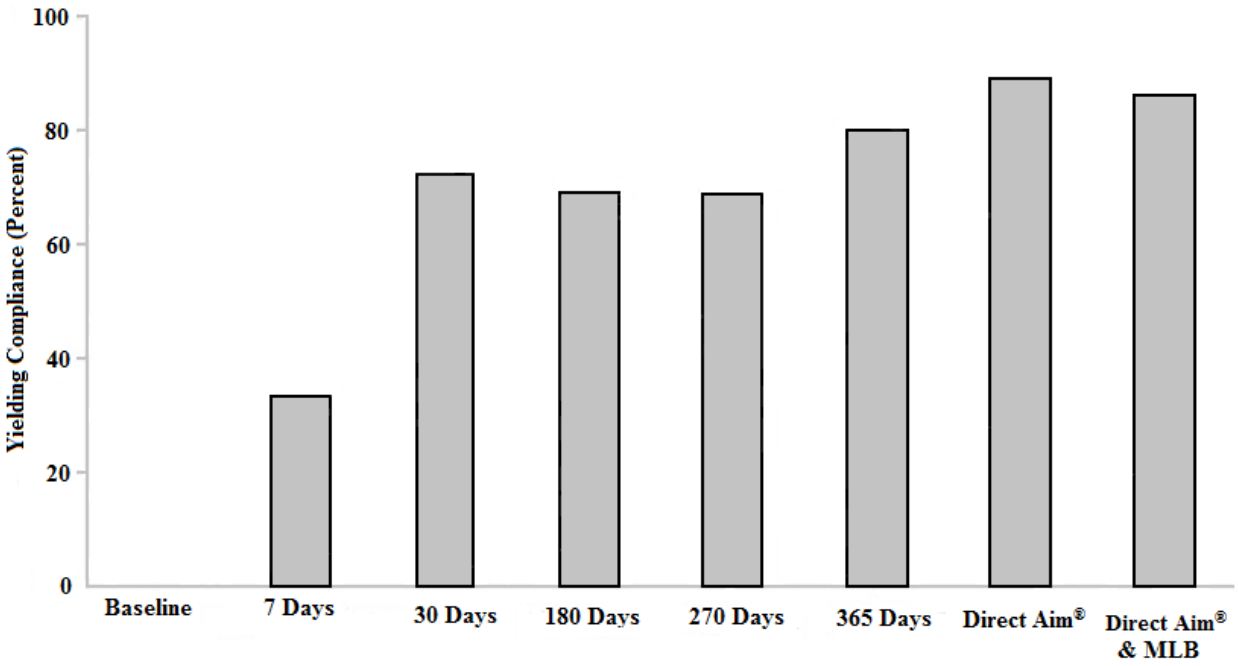

Figure 8. Graph. Yielding compliance for experiment 4 located at 4th Street and 18th Avenue S in St. Petersburg, FL.

CHAPTER 7. EXPERIMENT 5

METHOD

Participants and Setting

In experiment 5, participants consisted of drivers who traveled on 1st Avenue N and 61st Street and pedestrians who crossed the street. This site is a one-way avenue where the crosswalk traverses three lanes and has a posted speed limit of 35 mi/h and an ADT of 12,245. This site does not provide a median for crossing pedestrians.

Apparatus

The treatment in this experiment was the standard RRFB described in experiment 4. A standard pedestrian warning sign with two LED flashers with the same light positioning, timing, and sequence was used. Additional RRFB advance warning units were also placed on each side of the roadway 2 $^{1}/_{2}$ times the distance of the dilemma zone for this location. These advance warning devices did not have any call buttons and were attached to a PEDESTRIAN CROSSWALK AHEAD sign. The advance warning devices were activated when the call button at the crosswalk was depressed. The RRFB unit at the crosswalk would not activate when the advance warning devices were turned on until 2.5 s had elapsed.

Experimental Design

This experiment was conducted at 1st Avenue N and 61st Street to compare the efficacy of RRFB units with the addition of an advance warning LED unit. It used an alternating treatment design similar to the one used in experiment 4. During the baseline condition, driver yielding compliance and the distance of yielding were collected for 6 sessions, each consisting of 20 crossings. Following the baseline condition, each treatment condition was then evaluated for 20 crossings per session. Each session was alternated with the other in rapid succession. The RRFB units alone were evaluated first for 20 crossings. Following this phase, the advance warning devices were turned on and evaluated in addition to the RRFB units at the crosswalk for 20 crossings. This method was repeated until each of the treatment conditions had been evaluated five times. Following data collection of the treatment conditions, a return to the baseline was observed for 20 crossings.

RESULTS

Statistical Analysis

A *z*-test for proportions was used to test whether the RRFB alone or the RRFB plus advance warning sign produced more yielding. The results were not significant at the 0.01 level ($z = 0.26$ with 39.7 percent confidence level).

Driver Yielding Behavior

The average yielding compliance at the site during the initial baseline recording was 8.6 percent. The yielding compliance during the initial baseline ranged from 0.8 to 17 percent. The RRFB unit alone produced yielding averages of 95, 85, 83, 100, and 95 percent per session. The average yielding compliance during the RRFB at the crosswalk alone was 92 percent. The RRFB plus advance warning device had yielding averages of 93, 92, 98, 79, and 96 percent, respectively. The average yielding compliance during the RRFB plus advance warning condition was 92 percent (see figure 9). A return to baseline conditions for 20 consecutive crossings produced a yielding compliance of zero percent. The number of vehicles observed as not yielding during the return to baseline conditions was 344.

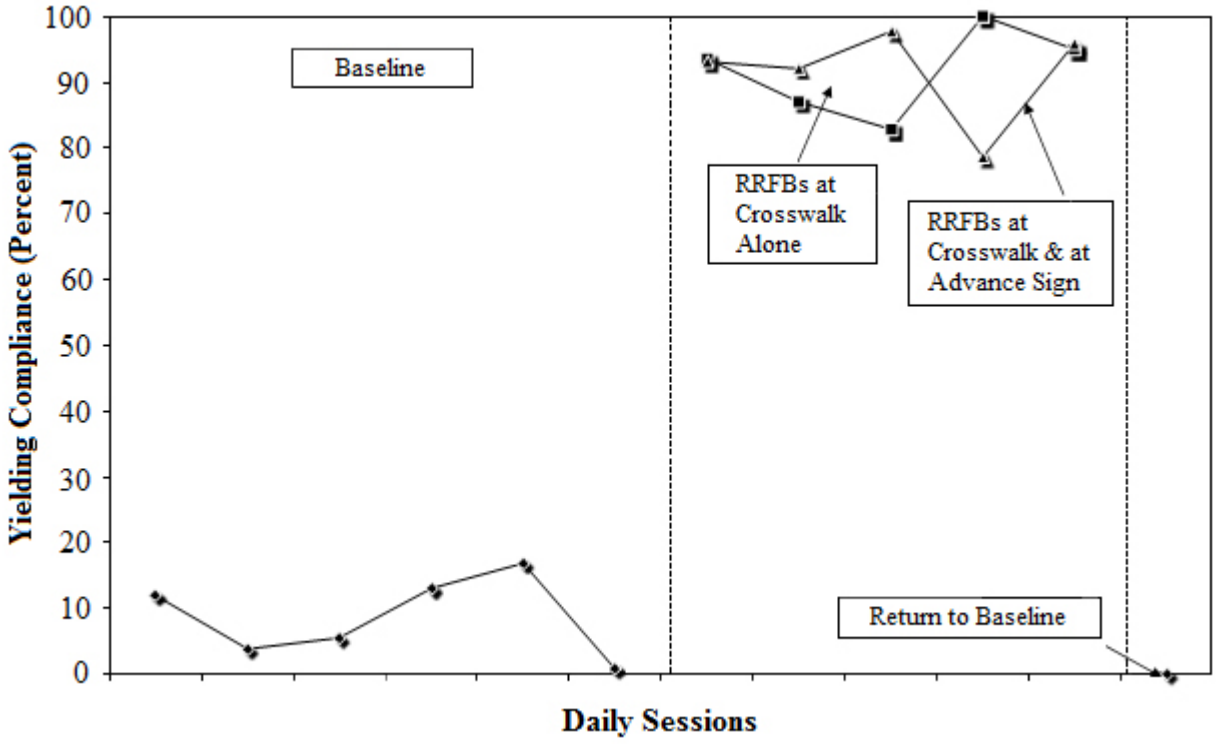

Figure 9. Graph. Yielding compliance during the baseline and the RRFBs at the crosswalk alone versus the RRFB at the crosswalk plus the RRFB at the advance sign.

Driver Yielding Distance Behavior

The absence of LED devices at this site was associated with a large proportion of driver yielding at 30–50-ft, with a yielding compliance of 37 percent. The second and third highest yielding distances during the baseline were the 20–30-ft and 10–20-ft intervals, with yielding compliances of 30 and 13 percent. During the RRFB at crosswalk alone condition, the largest proportion of drivers (39 percent) yielding more than 100 ft in advance of the crosswalk. The second and third highest percentages of yielding occurred at the 30–50-ft and 50–70-ft intervals, with 18 and 16 percent yielding compliance. The RRFB on the crosswalk and advance warning sign condition produced the highest proportion of drivers (49 percent) yielding over 100 ft from

the crosswalk. Drivers yielding farther in advance of the crosswalk can be expected to improve the safety of pedestrians (see figure 10).

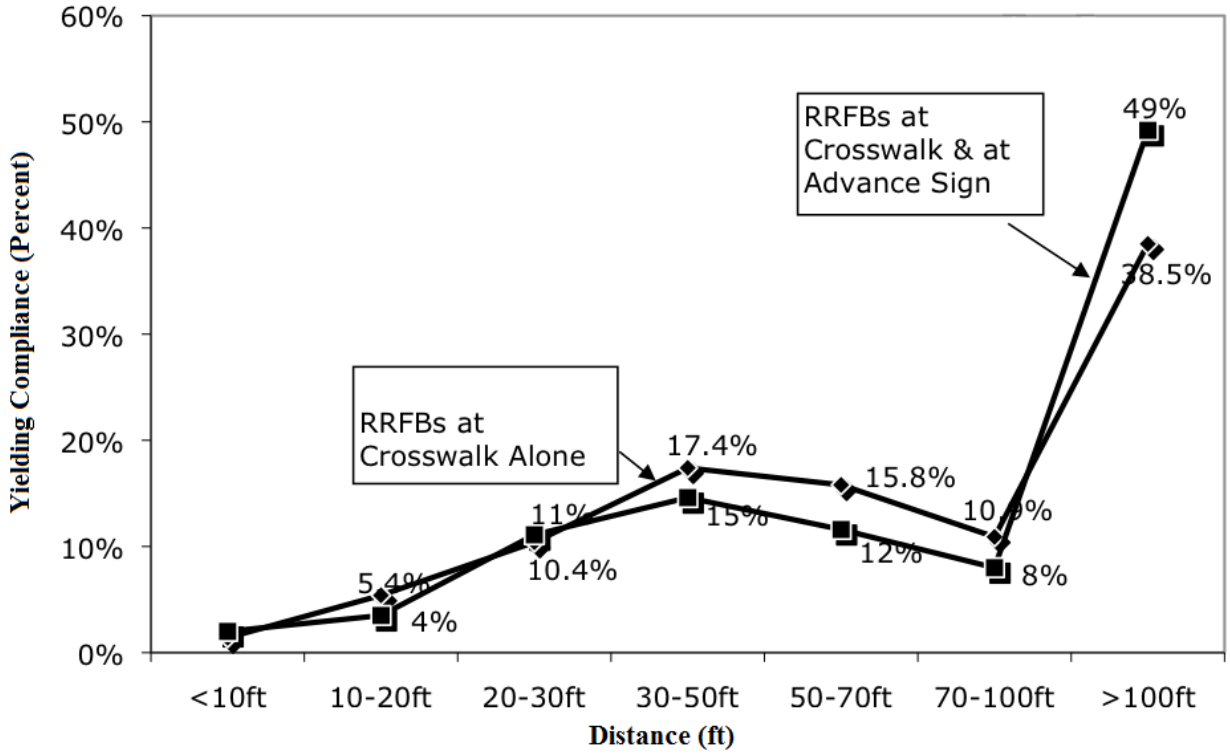

Figure 10. Graph. Average yielding percentage during the RRFBs at the crosswalk alone and the RRFBs at the crosswalk and on the advance sign.

CHAPTER 8. SUMMARY, CONCLUSION, AND DISCUSSION

SUMMARY

The results of the first experiment showed that the RRFB produced an increase in yielding behavior at multilane uncontrolled crosswalk locations. In addition, installing additional beacons on the median island further improved the efficacy of the system.

The second experiment compared the RRFB with a traditional overhead yellow flashing beacon and a side-mounted traditional yellow flashing beacon. The results showed that the RRFB system was more effective at increasing driver yielding behavior than the traditional beacon system.

The third experiment showed that the RRFB was highly effective in increasing yielding behavior at a large number of sites located in three cities in the United States and that these effects were maintained over time at each location.

The fourth experiment showed that while the use of Direct Aim® lighting increased yielding compliance, further increases in yielding were not achieved by implementing MLB.

The fifth experiment showed that the use of RRFB devices, with the addition of advance warning devices placed before the crosswalk, did not increase yielding compliance but may have increased the distance that drivers yielded in advance of the crosswalk.

CONCLUSION

In conclusion, the study found the following:

- The installation of the two-beacon system in experiment 1 increased yielding compliance from 18 to 81 percent, which was statistically significant.

- Yielding compliance increased from 81 to 88 percent following the installation of the four-beacon system at these sites, which was statistically significant.

- The percentage of drivers yielding at more than 100 ft doubled over the baseline condition during the four-system treatment. Many of the drivers yielded at distances much greater than 100 ft after the RRFB system was installed. This outcome reduced the chance that a pedestrian may have been struck by drivers due to the inability to see the pedestrian when a yielding vehicle blocked the view of the driver in the passing vehicle.

- The installation of a standard yellow overhead beacon increased yielding compliance from 11 to 16 percent. When side-mounted RRFBs replaced the overhead beacon, yielding compliance increased to 78 percent. Adding the RRFB to the median island increased yielding compliance to 88 percent. The installation of standard yellow side-mounted beacons increased yielding compliance from zero to 16 percent. The installation of side-mounted RRFBs increased yielding compliance to 72 percent. The increases produced by the RRFB system were statistically significant.

- The effects of the RRFB on driver yielding persisted for 2 years, and there was no tendency for them to decrease in effectiveness. These effects were statistically significant.

DISCUSSION

All comparisons of different systems or variations of the same system were conducted at the same sites, eliminating site characteristics as a confounding variable. Another strong point of this study was the large number of systems installed and evaluated.

The increased effectiveness of the four-beacon system over the two-beacon system may have been due to better visibility of the median island rapid-flash beacons for drivers occupying the inside lanes. This effect would be expected to be most pronounced when there were large vehicles in the outside lane that could block drivers' views.

Another important finding from this study was the increased percentage of drivers yielding well in advance of the crosswalk. The increases in yielding percentages and the yielding distances should be associated with a marked decrease in the number of vehicle passes or attempts to pass. This effect should be expected because of the signs' visibility to all drivers and not only those in the direct field of vision of the pedestrian.

One possible explanation of why the RRFB system produced a larger increase in driver yielding over the baseline is that it produced a novelty effect where an unfamiliar stimulus that had not been encountered by the drivers in the past was more likely to get their attention (similar to a unusual sound getting someone's attention). If this was the case, there should be a large decrease in yielding behavior over time; however, this was not found. The follow-up data (experiments 1 and 3) showed that the systems were still associated with high yielding behavior 1 and 2 years after installation. It appears that the lights on the system were such a salient stimulus that they obtained drivers' attention over the other competing stimuli and distractions they were exposed to when driving.

One problem that may arise is promoting the activation of the devices (i.e., pushing the devices' activation buttons). If a device is not activated, it is not effective. Some RRFBs contain sensors that detect pedestrians in the immediate area of the crosswalk and deliver an audible voice prompt that encourages pedestrians to activate the before crossing the street. No systematic data were collected to evaluate the efficacy of this feature.

The current device was not designed specifically for visually impaired pedestrians. It does not have a locator tone, but it does have a proximity sensor that provides an audible message when a pedestrian is in proximity to the device. When the button is pressed, another audible message confirms the button press and asks the pedestrian to wait for cars to stop before crossing. No other accessibility feature is included. Research should determine whether marked crosswalks at uncontrolled locations fitted with an RRFB are suitable or can be made suitable for use by visually impaired pedestrians.

These results show that the rectangular LED yellow rapid-flashing beacon appeared to be an effective tool for producing a large increase in the percentage of drivers yielding right-of-way to

pedestrians in crosswalks at sites where drivers rarely yielded to pedestrians. Therefore, it should be a valuable tool for improving the pedestrian level of service at marked uncontrolled crosswalks. When used in conjunction with advance yield marking, it may also greatly increase the safety at uncontrolled crosswalks at high ADT multilane sites. As more sites are installed, a crash study should be conducted to determine if RRFBs increase the safety of crossings at high ADT multilane sites.

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HRDS-07/09-10(WEB)E

EXHIBIT F

U.S. Department
of Transportation
Federal Highway Administration

1200 New Jersey Ave., SE
Washington, D.C. 20590

AUG 3 2010

In Reply Refer To:
HOTO-1

Mr. Ron Van Houten
Professor
Western Michigan University
3700 Wood Hall
Kalamazoo, MI 49008

Dear Mr. Van Houten:

Thank you for your email of July 15 to Mr. Scott Wainwright of our Manual on Uniform Traffic Control Devices (MUTCD) Team requesting an interpretation of item 5.b. of the technical conditions of Interim Approval IA-11 for Rectangular Rapid Flashing Beacons (RRFB) dated July 16, 2008.

Item 5.b. pertains to the flashing pattern of the two yellow indications of the RRFB and requires that "During each of its 70 to 80 flashing periods per minute, one of the yellow indications shall emit two rapid pulses of light and the other yellow indication shall emit three rapid pulses of light." This specified flashing pattern was based on the flashing pattern used in the successful experiments with RRFB in St. Petersburg, Florida, and elsewhere. The specific product tested in the experiments with RRFB was a device known as the "Enhancer" as supplied by Stop Experts, Inc.

In your message you indicate that, while conducting product acceptance testing of an RRFB submitted by Stop Experts, Inc., the Florida Department of Transportation used an oscilloscope to check the flash pattern. The human eye saw a flash pattern as specified in item 5.b. (two flashes by the left-hand yellow indication, followed by three flashes by the right-hand yellow indication. However, as shown in the photograph you provided, the oscilloscope revealed that the right-hand yellow indication actually emitted four pulses of light rather than three.

You also provided a video of an RRFB installed in St. Petersburg in which the speed of the video has been slowed down to one-fourth the actual speed. That video appears to show two flashes followed by three flashes and thus the eye is being deceived, as the oscilloscope can detect pulses of light that the human eye cannot detect.

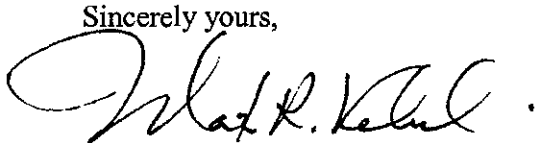
Stop Experts, Inc. has certified that the RRFB units tested with an oscilloscope by the Florida Department of Transportation are identical to those installed and evaluated in the RRFB

experiments that led to the issuance of IA-11 in July 2008. Therefore, you asked that a flash pattern of two flashes followed by four flashes be considered acceptable for use of RRFB under the conditions of IA-11.

We believe that what the human eye sees is the proper basis for determining whether the flash pattern of an RRFB meets the specified details of item 5.b. in the IA-11 technical conditions. However, based on the information submitted, we concur that units for which an oscilloscope detects a flash pattern of two pulses in one of the yellow indications followed by four pulses in the other yellow indication meet the intent of item 5.b., as long as the units appear to human observers with 20:40 visual acuity or better to flash in the specified two-three pattern.

Thank you for writing on this subject. We hope that our interpretations answer your questions. If you have any questions, please contact Mr. Wainwright by e-mail at **scott.wainwright@dot.gov** or by telephone at 202-366-0857. Please note that we have assigned your request the following official interpretation number and title: "4(09)-4(I)—RRFB Flash Pattern." Please refer to this number in any future correspondence regarding this issue.

Sincerely yours,



Mark R. Kehrli
Director, Office of Transportation
Operations

EXHIBIT G

Rectangular Rapid Flashing Beacon

Models SB435HP & SB430

News update: FHWA revises Rectangular Rapid Flashing Beacon (RRFB) flash pattern...

The FHWA announced a change to the approved flash pattern for the RRFB on June 13, 2012. The revised pattern is different from the one described in the original Interim Approval Memorandum, dated July 16, 2008. The revised pattern matches the "2/4-1" pattern that was originally tested in St. Petersburg, FL where high motorist compliance with the RRFB was initially documented.

Effective immediately, Spot Devices will be shipping RRFB systems with the FHWA's revised "2/4-1" flash pattern. Spot Devices will be working with existing RRFB customers to upgrade them to the new flash pattern. The Spot Devices System Infrastructure Management Application (SIMA), a remote application standard with all network-enabled systems, makes this change easy and free to our customers. Should future revisions occur, the power of SIMA will help our customers remain compliant. Furthermore, the Spot Devices RRFB, using the 2/4-1 flashing pattern, does not infringe upon Stop Experts' 087 patent.

The FHWA letter that outlines these revisions can be viewed here.

Description

The pedestrian-activated ***SB435 High Performance (HP) Rectangular Rapid Flashing Beacon (RRFB)*** and ***SB430 RRFB*** provide a bright, unmistakable alert to motorists that pedestrians are present. LED lights are long-lasting, durable and bright. The ***SB435HP*** and ***SB430 RRFB's*** are controlled by the Spot Devices ***300 Series Network Controllers***.

The ***SB435HP RRFB*** is fully compliant with FHWA standards but provides increased light emitting area and LED module size.

Highlights

- Directional flash bar
- Autodim™ adjusts light to ambient conditions
- FHWA compliant
- Manufactured in the USA in an ISO 9001 facility
- 2 year warranty

Specifications

MODEL	SB435HP RRFB	SB430 RRFB
POWER		
AC or solar	120 VAC, 12VDC	120 VAC, 12VDC
LIGHT CHARACTERISTICS		
Daylight distance visibility	>1000 feet	>500 feet
Night distance visibility	>1 mile	>1000 feet
Flash patterns	RRFB pattern	RRFB pattern
Optics	Polycarbonate lens	Polycarbonate lens
Light emitting area	Exceeds FHWA standards	Meets FHWA standards
LED modules	2-4	2-4

EXHIBIT H

DUNEDIN, FLORIDA

CITY COMMISSION REGULAR

MEETING OF JUNE 20, 2013

6:30 PM

AGENDA

* * * * *

CALL TO ORDER

* * * * *

INVOCATION AND PLEDGE OF ALLEGIANCE

* * * * *

PRESENTATIONS

1. **22ND ANNUAL MARDI GRAS PARADE WINNERS** Appearance: Wendy Barmore, President of the Downtown Dunedin's Merchants Association

2. **2013 TAMPA BAY REGIONAL PLANNING COUNCIL "FUTURE OF THE REGION AWARDS"** Recognition: Public Works Municipal Vehicle Equipment & Exchange Initiative Oak Tree Plaza "Pocket Park" Community Gardens Program

   EXHIBIT: PRES-2 TBRPC Future of the Region Awards

3. **BOARD & COMMITTEE MEMBERS RECOGNITION** Appearance: Duane Wright Five years on the Board of Adjustment and Appeal James Lalumiere Twenty years currently on the Building Board of Adjustment and Appeal Gregory Brady, as Chairman of Community Redevelopment Agency Advisory Committee, will speak to the contributions of Sylvia and John Sylvia Szekas Five years on the Community Redevelopment Agency Advisory Committee John Freeborn Ten years currently on the Community Redevelopment Agency Advisory Committee Not available: Teresa Miller Ten years on the Board of Adjustment

and Appeal Christopher Miller Ten years on the Building Board of Adjustment and Appeal

EXHIBIT: PRES-3 Board and Committee Members Recognition

4. **INDEPENDENCE DAY PROCLAMATION** - July 4, 2013 Appearance:

EXHIBIT: PRES-4 Independence Day Proclamation

5. **SOME VIEWS OF OUR HISTORY AS COLLECTED AND PRESERVED BY OUR DUNEDIN HISTORICAL SOCIETY** Appearance: Susan Littlejohn, member of the Dunedin Historical Society and Museum

* * * * *

ANNOUNCEMENTS

FOR MEETING OF JULY 11, 2013: There will be a public hearing for the First Reading of: Ordinances 13-16/Annexation, 13-17/Land Use and 13-18/Zoning for Application AN-LUP-Zo 13-55.00 Z/C - Request for Annexation, Land Use Plan designation to T/U (Transportation/Utility) and Zoning designation to AR (Agricultural Residential). Property located at 1774 Union Street (Parcel 35-28-15-00000-430-0200). Owner/Applicant/Representative: Florida Power Corporation, d/b/a Progress Energy Florida, Inc. (Duke Energy Florida, Inc.) / Michael J. Gaylor - Gaylor Engineering Ordinances 13-19/Annexation, 13-20/Land Use and 13-21/Zoning for Application AN-LUP-Zo 13-56.00 Z/C - Request for Annexation, Land Use Plan designation to RU (Residential Urban) and Zoning designation to MF-7.5 (Multifamily). Property located at 1680 Union Street (Parcel 35-28-15-00000-430-0100). Owner/Applicant /Representative: Republic Bank / Michael J. Gaylor - Gaylor Engineering Ordinance 13-22 for Application DEV-S/D-LDO 13-57.00 Z/C - Request for amendment to a previously approved Development Agreement (Application DEV-S/D-LDO 07-59.03 Z/C), Preliminary Conceptual Review followed by Final Design Review per Section 104-24.4 of the LDC, and Parkland Dedication per Section 104-26 of the LDC for a mixed-use development. Property located at Milwaukee Avenue, Main Street and Skinner Boulevard (Dunedin Gateway). Owner/Applicant/Representative: Pizzuti Dunedin, LLC / Christopher Wrenn - The Pizzuti Companies

* * * * *

CITIZEN INPUT

* * * * *

PUBLIC HEARINGS

* * * * *

CONSENT AGENDA

1. **APPROVE THE MINUTES** for the regular Commission meeting of June 6, 2013.

   EXHIBIT: CA-1 Approve the June 6, 2013 Commission Meeting Minutes

2. **APPROVE MID-BLOCK CROSSWALK FLASHING BEACON UPGRADE/CAUSEWAY BOULEVARD AND PATRICIA AVENUE, to purchase equipment** (Rectangular Rapid Flashing Beacons "RRFB") from Temple, Inc. in Decatur, AL, in the amount of $34,755, to convert/upgrade the remaining beacons.

   EXHIBIT: CA-2 Approve Mid-Block Crosswalk Flashing Beacon Upgrade re Causeway Blvd and Patricia Ave

3. **APPROVE BID #12-964, CONTROL OF EXOTIC NUISANCE PLANTS** to renew a contract with Delta Seven, Inc. of St. Petersburg, FL, in the amount of $25,619.40, to provide services related to the control of exotic nuisance plants.

   EXHIBIT: CA-3 Approve Bid 12-964, Control of Exotic Nuisance Plants

* * * * *

OLD BUSINESS

* * * * *

NEW BUSINESS

1. **BUDGET AMENDMENT**

   RECOMM: Adopt Resolution 13-27

   EXHIBIT: NB-1 Budget Amendment, Resolution 13-27

2. **BIDS/CONTRACTS/AGREEMENTS**

   a. APPROVAL OF A CHANGE ORDER TO THE CONTRACT FOR STREETS RESURFACING AWARDED TO ASPHALT PAVING SYSTEMS, INC.

      RECOMM: Approve award for additional work to Asphalt Paving Systems, Inc. of Zephyrhills, FL, in the amount of $190,457.50, to resurface San Christopher Drive between County Road 1 and Pinehurst Road.

EXHIBIT: NB-2a Approve a Change Order to the Contract for Streets Resurfacing Awarded to Asphalt Payings Systems, Inc

b. CONTRACT FOR UTILITY BILLING AUDIT

RECOMM: Approve an Agreement with Water Company of America (WCA) to provide a comprehensive audit of the City's water, wastewater, stormwater, reclaimed water and solid waste systems.

EXHIBIT: NB-2b Contract for Utility Billing Contract

c. REPLACEMENT OF DRIVE UNITS ON TWO WASTEWATER CLARIFIERS

RECOMM: Approve the replacement of two drive units for the Wastewater clarifiers as a Sole Source purchase from Ovivo USA, LLC of Salt Lake City, UT at a cost of $177,100.

EXHIBIT: NB-2c Replacement of Drive Units on Two Wastewater Clarifiers

3. **RESOLUTION 13-26, THE DON STORY PUBLIC SAFETY SEMINAR SERIES**

RECOMM: Adopt Resolution 13-26

EXHIBIT: NB-3 Resolution 13-26 the Don Story Public Safety Seminar Series

4. **** STARRED ITEM ** EXTENSION OF THE MEDICAL CENTER PARTNERSHIP AGREEMENT WITH THE CITY OF CLEARWATER**

RECOMM: Approve the Extension of the Medical Center Partnership Agreement with the City of Clearwater

EXHIBIT: NB-4 STARRED ITEM Extension of the Medical Center Partnership Agreement with the City of Clearwater

5. **BOARDS AND COMMITTEES**

a. LIBRARY ADVISORY COMMITTEE

RECOMM: Appoint alternate member Bunny Dutton to regular membership to finish a three year term that expires March 2016 and appoint applicant Margaret DeLargy as an alternate member to finish a three year term that expires March 2014.

EXHIBIT: NB-5a Library Advisory Board Appointment

b. STORMWATER ADVISORY COMMITTEE

RECOMM: Reappoint Committee on Environmental Quality representative Ed Heitov for another three year term expiring June 2016.

EXHIBIT: NB-5b Stormwater Advisory Committee Reappointment

6. **CITY CLERK'S UPDATE** Verbal status report relative to significant matters affecting the City.

7. **CITY MANAGER'S UPDATE** Written status report relative to significant matters affecting the City.

EXHIBIT: NB-7 City Manager's Update

8. **LEGAL UPDATE** Verbal status report by the City Attorney relative to significant legal matters affecting the City.

9. **COMMISSION DISCUSSION** Exchange of ideas and open discussion to any concerns of the Mayor and/or individual Commissioners.

10. **COMMISSION COMMENTS** Comments from the Mayor and Commissioners relative to pertinent issues and the various committees on which they serve.

11. **AGENDA APPROVAL** Commission approval of the proposed agenda for the regular meeting of July 11, 2013.

EXHIBIT: NB-11 Approve the July 11, 2013 Proposed Agenda

COPIES OF THIS AND ALL COMMISSION AGENDAS ARE AVAILABLE TO THE PUBLIC AT THE OFFICE OF THE CITY CLERK, 750 MILWAUKEE AVENUE, ON THE MONDAY PRIOR TO THE MEETING DATE. COPIES ARE ALSO AVAILABLE AT CITY HALL, 542 MAIN STREET AND THE CITY'S WEBSITE AT WWW.DUNEDINGOV.COM .

EXHIBIT I

Spot
DEVICES

March 1, 2012

Re: Stop Experts, Inc. does not have a patent covering Spot Devices' RRFB pedestrian warning device under item 5.b. in the IA-11 technical conditions

To whom it may concern,

While it's true that Stop Experts was granted a patent that covers a version of the RRFB, the Spot Devices RRFB does not infringe on this patent.

The first claim of the Stop Experts patent states that the device operates in a

> "wig-wag flash pattern, the pattern including emitting within a predetermined time two light flashes from one light unit and three light flashes from the other light unit..."

The Spot Devices RRFB differs in that instead of operating with a two-three flash pattern, the Spot Devices RRFB operates with a two-four flash pattern.

The Spot Devices' RRFB two-four flash pattern is fully compliant with the FHWA's guidelines for the RRFB as stated in Mark R. Kehrli's (US Department of Transportation's Director, Office of Transportation Operations) August 3 2010 letter per the following excerpt,

> "...units for which an oscilloscope detects a flash pattern of two pulses in one of the yellow indications followed by four pulses in the other yellow indication meet the intent of 5.b., as long as the units appear to human observers with 20:40 visual acuity or better to flash in the specified two-three pattern."

Please don't hesitate to contact me directly with any questions.

Respectfully,

Chris Peddie
President, Spot Devices

1455 Kleppe Lane • Sparks, NV 89431 • 888.520.0008 P • 775.351.1681 P • www.spotdevices.com

EXHIBIT J

carmanah®
we put solar to work

LEGION

R920 SERIES

RECTANGULAR RAPID FLASHING BEACON

Pedestrian-actuated warning system for uncontrolled marked crosswalks

RRFBs have been found to provide vehicle yielding rates between 72 and 96 percent for crosswalk applications, including 4 lane roadways with average daily traffic (ADT) exceeding 12,000*.

Superior Design and Technology
The R920 utilizes a self-contained solar engine integrating the energy management system with an on-board user interface, housed in a compact enclosure together with the batteries and solar panel. In low light conditions, the ambient auto-adjust option provides over-lighting protection and system efficiency.

Easy Installation
With its highly efficient and compact design, installation is quick and uncomplicated, dramatically reducing installation costs. Retro-fitting can be done where existing sign bases are used to enhance existing marked crosswalks in minutes, and new installations can be completed without the cost of larger poles and bases.

Advanced User-Interface
The R920 is the first RRFB with an on-board user interface and display for quick configuration and status monitoring. It allows for simple in-the-field set-up adjustment to flash duration, ambient settings, and night intensity. Settings are broadcasted automatically to all units in the system.

Reliable
Designed with Carmanah's industry leading solar modeling tools to provide dependable year-after-year operation.

Trusted
With thousands of installations in the field, Carmanah solar beacons and solar LED lights have become the benchmark in traffic applications and other transportation applications worldwide.

Smart Growth America
Making Neighborhoods Great Together

National Complete Streets Coalition

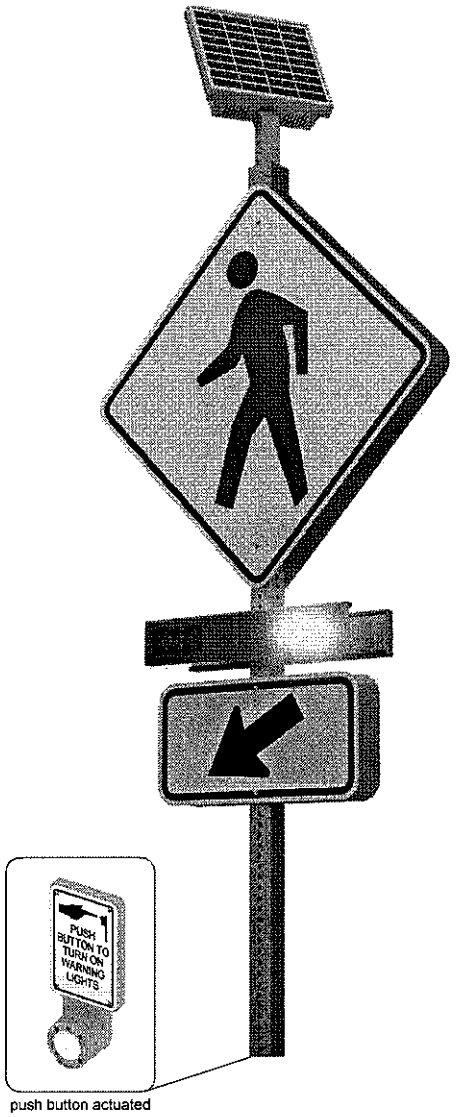
Alliance for Biking & Walking

America Walks
ENGAGE. EDUCATE. CONNECT.

* U.S. Department of Transportation Federal Highways Administration, Publication No. FHWA-HRT-10-043 - "Effects of Yellow Rectangular Rapid-Flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks"

The R920 is the new benchmark for Rectangular Rapid Flashing Beacons (RRFBs):

- Ultra-efficient optical and Energy Management Systems (EMS)
- Compact design to simplify installation
- Proven technology platform
- Exceeds FHWA standards



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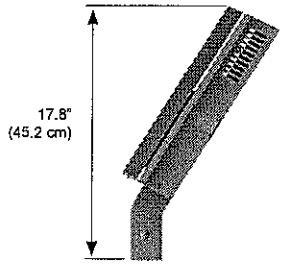
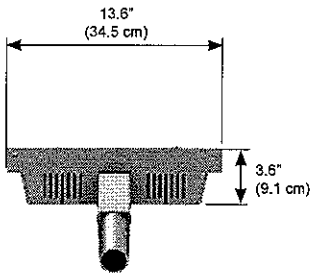
DIMENSIONS

Side View

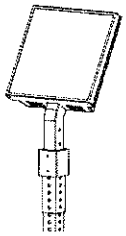


Bottom View

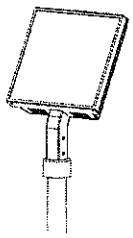


MOUNTING OPTIONS

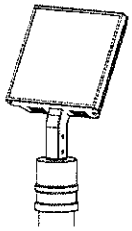
2", 2.5" Perforated Square Post Mount



2 3/8" - 2 7/8" Diameter Round Post Mount

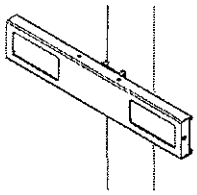


4" - 4 1/2" Diameter Round Post Mount

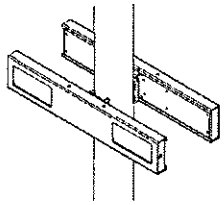


SYSTEM CONFIGURATION

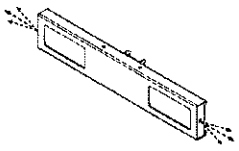
Uni-directional Configuration



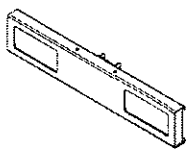
Bi-directional Configuration



LIGHTBAR OPTIONS

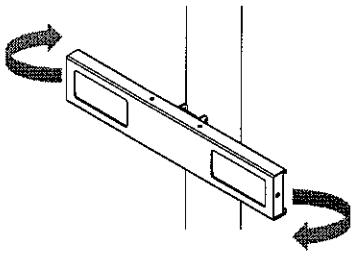


Side-emitting Pedestrian Confirmation Light (Both Ends)



No Side-emitting Pedestrian Confirmation Light

IN THE FIELD AIMING



Rotate the lightbar towards the incoming vehicle lane, independent of the wire hole location.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

MODEL R920 SERIES

RECTANGULAR RAPID FLASHING BEACON

On-Board User Interface (OBUI)	Adjustable, auto-scrolling LED display
	Field-configurable flash duration to one second increment
	Ambient auto-adjust configuration
	Night dimming configuration
	Wireless update of configurable settings from any unit to all systems
	Channel selection
	System test, status and fault detection
	Activation data reporting
Optical	MUTCD IA-11 compliant flash pattern
	3" x 7" amber LED Indications
	Exceeds SAE J595 class 1 intensity
	Meets SAE J578 chromaticity
	High-power LEDs meets 90% lumen maintenance (L90) based on IES LM-80
Energy Collection	10 watt high-efficiency photovoltaic cell with blocking diodes
	Maximum power point tracking with temperature compensation (MPPT-TC) for optimal energy collection in all solar conditions
Energy Storage	Replaceable, recyclable best in-class 12V dual battery system (sealed, maintenance-free)
	Designed for minimum 5 year battery life
	Lightweight for ease of handling
	Quick connect terminals and strapping for efficient installation
Solar Engine Construction	Weatherproof, vented solar engine enclosure for ambient air transfer
	Hinged access lid for access to on-board user interface and batteries
	Compact, lightweight aluminum housing
	Top of pole mounting to standard 2" sign posts and 4" poles; side of pole mounting to standard 4" poles
	Pre-wired assembly designed to minimize installation time
	Weight: 19.8 lb (9 kg) including batteries, excluding light bars and pushbutton
Lightbar Construction	Premium, UV-resistant polycarbonate lens
	Waterproof LED Indications (NEMA 3R)
	Two-piece mounting bracket to facilitate mounting back-to-back lightbars
	Horizontal rotation adjustment for in-the-field aiming of lightbar
	Dimensions: 24" L x 1.5" W x 4" H (61.0 cm L x 3.8 c m W x 11.4 cm H)
Operating Performance	Rated for 300, 20 second activations per day, year-round operation with a minimum of 0.94 sun hours
	Patented automatic light control (ALC) technology provides over 30 days of rated operation without charging
	Wireless activation within 120 mS
	Wireless range of 500 ft (152 m)
Quality Certification	ISO 9001:2008 Certified Manufacturer
Warranty	3-year limited warranty

EXHIBIT K

ONVIA

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Account Manager: Dustin O'Connor(206) 373-9349

My Guide | My Account

Home > Project Center > All Projects > Search Results

Saved Searches

Project Search Results: 1 - 20 only of 60 for RRFB

See also:All Awards,All Term Contracts

Search within Project Results

SEARCH CRITERIA Refine

Keywords (All)
RRFB

Procurement Type
Bid
RFP/RFI/RFQ

Location
National
All States

Special Filters
U.S. General Services Admin. (GSA)
Not Included

Open Opportunities
Only

Collapse

NARROW RESULTS BY

Industry Verticals

Construction Services...	58
Operations and Maint...	29
Architectural and Engi...	9
IT/Telecommunications	2

Location

Level of Government

Agency Function

Special Filters

Dates

TRACKED ITEMS *(New)*

Projects 24

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Actions: Select an item | Sort By: Publication Date: Descending

Title	Location	Agency	Publication Date	Submittal Date	Available Info
Bid 7th Street NE Bike Path Improvements	MN	City of Dilworth	07/09/2013	07/30/2013 **Due in 20 days.**	
Bid Fernside Boulevard Intersection Improvement Project (Electrical)	CA	City of Alameda	07/09/2013	07/22/2013 **Due in 12 days.**	Documents
Bid Necedah - Coloma, Sth 13 - Third Lane	WI	Wisconsin Department of Transportation	07/09/2013	08/13/2013 **Due in 34 days.**	Documents
Bid Manitowoc - Green Bay, Sth 147 Interchange Ramp	WI	Wisconsin Department of Transportation	07/09/2013	08/13/2013 **Due in 34 days.**	Documents
Bid Park Falls - Springstead, Hay Creek Culvert, C-50-18	WI	Wisconsin Department of Transportation	07/09/2013	08/13/2013 **Due in 34 days.**	Documents
Bid Merrill - Rhinelander, Cth G - Norwegian Road	WI	Wisconsin Department of Transportation	07/09/2013	08/13/2013 **Due in 34 days.**	Documents
Bid City Of River Falls, Cascade Avenue, Spruce Street To Sixth Street	WI	Wisconsin Department of Transportation	07/09/2013	08/13/2013 **Due in 34 days.**	Documents
Bid Prescott - Ellsworth, Cth Qq Intersection	WI	Wisconsin Department of Transportation	07/09/2013	08/13/2013 **Due in 34 days.**	Documents
Bid Appleton - Manitowoc, Ush 10 And Sth 32/57 Intersection	WI	Wisconsin Department of Transportation	07/09/2013	08/13/2013 **Due in 34 days.**	Documents

EXHIBIT L

From: Chris Peddie [mailto:chrisp@spotdevices.com]
Sent: Friday, February 17, 2012 5:04 PM
To: Rick Jones
Cc: Kristine@stopexperts.com; Dr. Dean McKay; johnp@spotdevices.com
Subject: RE: Thank you.

Hi Rick,

We enjoyed meeting you and Rosalie too, and appreciated the chance to speak with you personally about your remarkably effective invention and the tremendous amount of effort (and cleverness) you exerted to get to the current point of interim approval.

We will be back in touch with you sometime next week – likely with more questions, as we continue our due-diligence.

Have a good weekend.

Kindest regards, Chris

Chris Peddie 888.520.0008 x8396 chrisp@spotdevices.com
President 775.846.0311 www.SpotDevices.com

From: Rick Jones [mailto:RDJones@StopExperts.com]
Sent: Friday, February 17, 2012 10:54 AM
To: Chris Peddie
Cc: Kristine@stopexperts.com
Subject: Thank you.

Hello Chris. 13 and I (Rosalie), would like pass along our thanks' to you, Dean and John for spending some time with us Wednesday afternoon at your plant. Both 13 and I left the meeting with a feeling that all of us involved understand the future that is before us, it's market and a comfortable feeling that that our two companies share very similar interest.

As I mentioned in our meeting, I am looking to secure 3, maybe four Manufacturing Licensing Agreements (MLA) with different firms, among these firms a distribution network in which would encompass ample market representation and distribution, and a clear understanding among the MLA's that the market and the end user is served best if the MLA's "think" as a unit. Spring is approaching as I mentioned and I am looking to proceed in a timely matter for all of the interests.

As you walked us to the door, we were discussing a timeline for me to understand your interests, assorted definitions and intentions as you may know them, by the latter part of next week on up to this coming Friday, the 24th of February.

Again thanks, and if you folks have any additional questions, please don't hesitate to just drop me a line and I'll get right to them. I will be traveling almost all of next week visiting with other folks and potential Dealers – so if you try me on my cell and I can't get to the call, please leave me a message and I will get right back to you in a timely manner.

Have a great afternoon. -rj

EXHIBIT M

Rectangular Rapid Flashing Beacon

Crosswalk System

Description

Installed at mid-block crosswalks, the ***Rectangular Rapid Flashing Beacon (RRFB)*** remains dark until a pedestrian presses a pushbutton to activate the system. When activated, the ***RRFB*** emits rapid, alternating bursts of light to warn motorists that pedestrians are crossing the roadway. Proven compliance rates exceed 80%, the highest of any amber light warning device. Unlike competing devices which use off-the-shelf emergency flashers that were designed for other purposes, Spot Devices ***RRFB*** lights are designed and built in-house to maximize effectiveness. The result is a ***RRFB*** with a light emitting surface area and brightness that far surpasses FHWA minimum standards. The ***RRFB*** also saves time and money by employing solar and spread spectrum wireless technologies, eliminating costly trenching and the need to pull power from an AC source.

Operation

Spot Devices ***System Infrastructure Management Application (SIMA)*** is a browser-based tool for remote, enterprise-wide supervision of all Spot Devices systems. ***SIMA*** allows users to perform system configuration, download reports or receive automatic diagnostic alerts from a browser-enabled desktop, notebook, tablet or smartphone.*

Highlights

- Compliance - meets or exceeds FHWA minimum requirements
- Effectiveness - compliance rates exceed 80%
- Brightness - surpasses FHWA minimum standards for size and brightness
- Reliability - systems are manufactured, configured and tested as a single system in the factory
- Easy Installation - spread spectrum radio and optional solar power eliminate the need for trenching and bringing AC power to the site
- System Alerts – proactive e-mails, diagnostics and reporting simplify maintenance
- Power Options - AC or solar
- Warranty - 2 years

System Components

- SC320, SC315 or SC310 Network Controller
- SB435 High Performance or SB430 Rectangular Rapid Flashing Beacon
- Pushbutton or passive activation device
- Crosswalk signage

* Local programming option available

Spot DEVICES
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Sparks, NV 89431
888.520.0008 Toll Free
888.520.0007 Fax
www.spotdevices.com

Arrive Safely

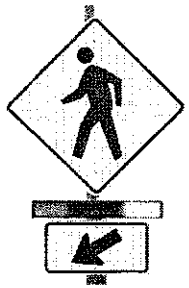
Rectangular Rapid Flashing Beacon

Crosswalk System

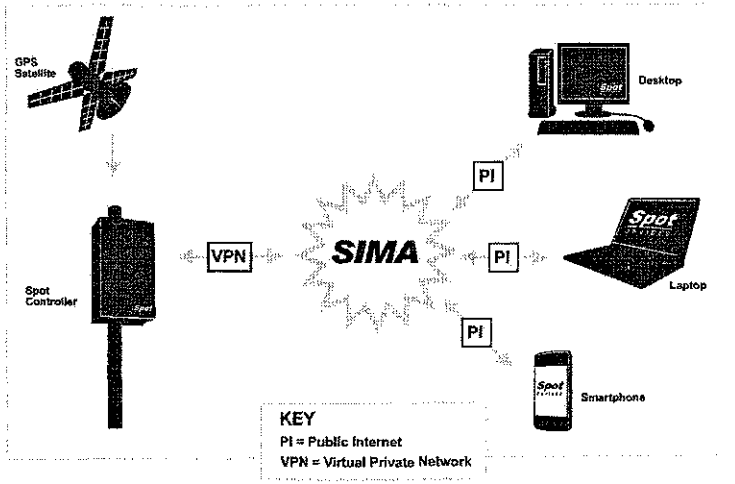
The Spot Devices Difference

Spot Devices is a US manufacturer with industry-leading technology, a full line of pedestrian and school zone safety systems and a reputation for exceptional customer service. Unique remote monitoring and programming tools reduce the total cost of ownership by decreasing the need for technician field visits, saving customers time and money.

Spot Devices System Infrastructure Management Application (SIMA) allows users to perform system configuration, download maintenance reports and receive automatic diagnostic alerts from any browser-enabled desktop, notebook, tablet or smartphone.



SIMA - Diagram



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Arrive Safely