| Sign | Roadway/Intersection Characteristics | Sign/Detection Placement | Message Set | Results | Other Notes |
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| 1. Minor Road | **Iowa – Dyersville –** US 20 (4-lane; 9,000 AADT) and 7th St (2-lane; 735 AADT)  **Iowa – Anamosa** – US 151 (4-lane; 10,050 AADT) and Old Dubuque Rd (2-lane; 1,385 AADT)  *Problem: Gap acceptance*  **Missouri – Lowry City –** MO 13 (4-lane; 10,000 AADT) and 1st St (2-lane)  **Missouri – Osceola** – MO 13 (4-lane; 10,000 AADT) and Truman Rd (2-lane)  **Missouri –** 8 other locations  *Problem: Gap acceptance* | **Sign (with yellow flashers):** 50-70’ to the left of STOP; on major road  **Detection (loops):** 1000’ before intersection on major road | TRAFFIC APPROACHING WHEN FLASHING | Missouri: Simple before/after study   * 32% reduction in all crashes * 44% reduction in angle crashes * 33% reduction in all severe crashes * 8% reduction in all severe angle crashes   Isolated locations showed no improvement | Grid power with battery backup  Iowa: 2010 installations  $45,000 approximate cost per intersection  Missouri: 2008-09 installations  Determining acceptable gap for detector placement was challenging |
| 1. Minor Road | **Minnesota – Goodhue County** – US 52 (4-lane; 17,500 AADT) and Co Rd 9 (2-lane)  **Minnesota – Mille Lacs County** – US 169 (4-lane; 11,200 AADT) and Co Rd 11 (2-lane)  **Minnesota – Lyon County –** MN 23 (4-lane; 6,200 AADT) and Co Rd 7 near Marshall  **Wisconsin – Minong** – US53 (4-lane; 4,400 AADT) and WI 77 (2-lane; 2,850 AADT)  Posted speed 65 MPH  *Problem: Gap acceptance* | **Sign (DMS):** First on far-side, opposite corner from STOP and second on far-side corner from median STOP/YIELD  **Detection (radar):** First approximately 800’ and second approximately 150’ before intersection | Symbol: Divided highway with color and do not enter indicators | Structured validation field test performed at Goodhue County site; included 48 participants from young, middle and senior age groups; additional 13 truck drivers completed study using a large truck  Data collected: rejected gap size, lead gap size, maneuver type (one-stage vs. two-stage), crossing and wait times, and safety margins  Overall, results indicated that participants used sign to reduce their risk level at intersection and that drivers had a positive opinion of the sign  Use of sign was associated with the rejection of shorter, unsafe gaps as evidenced by the increase in 80th percentile rejected gap  7.5 second critical gap threshold used by sign was shown to be in agreement with the driver’s gap selection performance  No apparent effect on intersection crossing metrics of accepted gap length, lead gap length, or time-to-contact. | Part of the USDOT Cooperative Intersection Collision Avoidance Systems (CICAS) and Rural Safety Improvement programs  Milles Lacs County site: Power cost estimated at $4,000-5,000 per year for full LED sign; could be less with addition of static sign |
| 1. Minor Road | **Minnesota – Hennepin County** – Co Rd 47 (2-lane; 3,150 AADT) and Lawndale Ln (2-lane; 100 AADT)  Posted speed 40 MPH  *Problem: Sight distance* | **Sign (with yellow LED arrow-shaped flashers):** Far-side corner from STOP  **Detection (radar):** 750’ before intersection | LOOK FOR TRAFFIC | Simple before/after study   * 54% reduction in traffic conflicts (sudden braking, sudden acceleration or swerving)   50% of survey respondents indicated they would pay more attention at intersection | Solar power with battery backup |
| 1. Minor Road | **Minnesota – Washington County** – Manning Ave/CSAH 15 (2-lane) and McKusick Rd/CR 64 (2-lane)  Posted speed 55 MPH  *Problem: STOP running* | **Sign (8 LED lights on STOP):** At STOP  **Detection (radar):** | STOP, CROSS TRAFFIC DOES NOT STOP | Not yet available | Commercial off the shelf sign  Railroad crossing immediately south of intersection  Alerts drivers of approaching stop ahead and to be more aware |
| 1. Minor Road | **Georgia – Gwinnett County –** Lester Rd (2-lane; 9,800 AADT) and Cutler Dr (2-lane residential)  **Georgia – Gwinnett County –** 17 other locations with major road and both major/minor road systems  Posted speeds 25-45 MPH  *Problem: Sight distance* | **Sign (with red flashers):** Far-side, left from STOP  **Detection (loops)**: Approximately 500’ before intersection | VEHICLE APPROACHING, IF NO LIGHT SIGNAL NOT WORKING | Lester Rd site showed preventable accidents went from 7 to 1 during three-year periods before/after installation  Minor road system may be more effective in preventing in preventing potential intersection conflicts  Minimum required sight distances established and 3+ potentially preventable accidents within a one year period or one or more such accident a year for three consecutive years would justify traffic actuated warning signs | Installations done in 1999  Conducted by Gwinnett County Department of Transportation  Primary motivation was to establish uniform guidelines to remedy sight distance problems at existing intersections |

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| Sign | Roadway/Intersection Characteristics | Sign/Detection Placement | Message Set | Results | Other Notes |
| 1. Major Road | **North Carolina – Pender County –** US 421 (4-lane; 4,400 AADT) and NC 210 (2-lane; 1,900 AADT) – Category 3  Posted speed 55 MPH  *Problem: Gap acceptance*  North Carolina – 21 other locations; variety of 2-lane and 4-lane roadways | **Sign (with yellow flashers):** May be single or dual placement for multi-lane roads; placed using MUTCD Table 2C-4. Guidelines for Advance Placement of Warning Signs  **Detection (loops):** 250-400’ from intersection based on design speed | VEHICLE ENTERING (WHEN FLASHING) | * 4 Sites - 2-lane @ 2-lane; simple B&A (-46.1%) * 7 Sites - 4-lane @ 2-lane; simple B&A (-19.9%)   Additional crash data analysis anticipated by late 2010 | System actuated from minor road  Installations from 1997 to 2008  Category 4 – 11 other locations used combination signing/detection from Categories 1-3 |
| 1. Major Road | **Minnesota – Milaca –** US 169 (4-lane; 11,200 AADT) and Co Rd 11 (2-lane)  Posted speed 65 MPH  *Problem: Gap acceptance and sight distance* | **Sign (with yellow flasher):** 850-1,000’ before intersection  **Detection (magnetic):** 400-450’ from STOP on minor road; at STOP bar; in median; in major road left turn lane | CAUTION CROSSING TRAFFIC WHEN FLASHING | Unavailable | System installed for nearly 2 years and then replaced with CICAS-SSA sign  EB to NB was biggest problem; especially with median |
| 1. Major Road | **Missouri – Tunas –** Missouri 73 (2-lane; 2,100 AADT) and Routes E/D (2-lane; 400 AADT)  Posted speed 55 MPH  **Missouri - Louisburg** – US 65 (2-lane; 5,100 AADT) and Missouri 64 (2-lane; 1,200 AADT)  Posted speed 45 MPH  *Problem:*  **Missouri - 7 other locations** | **Sign (with yellow flashers):** 600-800’ before intersection  **Detection (loops):** Actuated at minor road STOP | WATCH FOR ENTERING TRAFFIC  VEHICLES ENTERING WHEN FLASHING | Simple before/after study   * 28% reduction in all crashes * 37% reduction in angle crashes * 72% reduction in all severe crashes * 75% reduction in all severe angle crashes   Approximately 1/3 of locations showed little or no improvement | Contacted Missouri DOT for further details on sign, detection, speed and volume details |

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| Sign | Roadway/Intersection Characteristics | Sign/Detection Placement | Message Set | Results | Other Notes |
| 1. A-Major Road B-Minor Road | **North Carolina – Brassfield** – NC 96/Brassfield Rd (2-lane; 1,300 AADT) and NC 96/Horseshoe Rd (2-lane; 4,000 AADT) – Category 1  Posted speed 55 MPH  *Problem: Gap acceptance*  **North Carolina –** 46 other locations; variety of 2-lane and 4-lane roadways | **Sign (with yellow flashers):** May be placed at or before intersection on major or minor road  **Red flashers** in conjunction with STOP  **Detection (loops):** 250-400’ from intersection based on design speed | VEHICLE ENTERING (WHEN FLASHING)  Occasionally, VEHICLE ENTERING FROM RIGHT (LEFT) WHEN FLASHING  Occasionally, WATCH FOR APPROACHING VEHICLE | Category 1   * 5 Sites - 2-lane @ 2-lane; simple B&A (-1.3%) * 4 Sites - 4-lane @ 2-lane; simple B&A (+31.3%)   Category 2   * 9 Sites - 2-lane @ 2-lane; simple B&A (-7.3%) * 2 Sites - 4-lane @ 2-lane; simple B&A (-7.3%)   Additional crash data analysis anticipated by late 2010 | Two categories of deployment   * Signs and flashers on major road; actuated from minor road (Category 1) * Signs and flashers on minor road; actuated from major road (Category 2)   Installations from 1997 to 2008  Category 4 – 11 other locations used combination signing/detection from Categories 1-3 |
| 1. A TechFest attendee maneuvers a Scout reconnaissance robot. photo: Matt MirandaA-Major Road B-Minor Road | **Minnesota – St. Louis County –** W Tischer Rd/Co Rd 2 (2-lane; 980 AADT) and Eagle Lake Rd/Co Rd 246 (2-lane; 550 AADT)  Posted speed 45-55 MPH  *Problem: Sight distance* | **Sign-Major (with spot LED flashers):** 525’ before intersection  **Sign-Minor (with spot LED flashers):** Far-side corner from STOP  **Detection (radar and passive infrared):** 2 radar detectors on minor road installed at STOP; 2 passive infrared detectors on major road 460’ and 645’ before intersection | Major: CROSS TRAFFIC, WHEN FLASHING  Minor: VEHICLE APPROACHING, WHEN FLASHING | Before/after video data collected   * Average speed on main approach decreased during nighttime; no changes observed during daytime * Number of intersection roll-throughs *decreased* to zero when minor approach warning signs were flashing * Number of intersection roll-throughs *increased* when minor approach warning signs were *not* flashing | Solar power with battery backup  Project conducted by Minnesota Local Road Research Board |
| 1. Look For Traffic Cropped.jpgMain Line Flasher Cropped.jpgA-Major Road B- Minor Road | **Minnesota – Wright County:**   * CSAH 8 @ CSAH 35 (2-lane; 1,850 AADT) * CSAH 6 @ CSAH 35 (2-lane; 1,125 AADT) * CSAH 9 @ CR 107 (2-lane; 1,113 AADT)   Posted speed 55 MPH  *Problem: Gap acceptance*  **Minnesota – Scott County** – CSAH 42 @ CSAH 17 | **Sign-Major (with yellow flashers):** 600-800’ before intersection  **Sign-Minor (with yellow LED arrow-shaped flashers):** Far-side corner from STOP  **Detection (radar):** 600’ before intersection on major road | Major: Intersection symbol  Minor: LOOK FOR TRAFFIC |  | Project conducted by Wright and Scott counties  Contacted Wright County for further details on sign, detection, speed and volume details |

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| Sign | Roadway/Intersection Characteristics | Sign/Detection Placement | Message Set | Results | Other Notes |
| 1. A-Major Road B-Minor Road | **Pennsylvania – Butler County –** S.R. 38 (2-lane; 3,200 AADT) and S.R. 138/North Washington Rd (2-lane; 825 AADT)  Posted speed 35 MPH  **Pennsylvania – Butler County –** S.R. 38 (2-lane; 3,200 AADT) and S.R. 1010/Hooker Rd (2-lane; 950 AADT)  Posted speed 35 MPH  *Problem: Sight distance*  **Virginia – Prince William County** – Fleetwood Dr and Aden Rd/S.R. 646 | **Sign-Major (with DMS)**: 200-500’ from intersection  **Sign-Minor (DMS)**: Far-side corner from STOP  **Detection (loops):** 300-1,000’ before intersection | Major: Vehicle symbol and TRAFFIC AHEAD  Minor: Vehicle symbol and CROSSING TRAFFIC | MOEs were vehicle speed response, intersection approach speed response, and crash frequency  Conducted before, 2-week and 2-month phase evaluation  Speed reduction in presence of cross-traffic  Lower intersection approach speeds  85th and 90th percentile speed reduction  Apparent lack of change in size of gap acceptance  97% surveyed felt system was beneficial | Initial installation in 2003  $52,300 for design; $370,000 for construction  $24,000 annual maintenance contract |
| 1. A-Major Road B-Minor Road | **Maine – Norridgewock** – Route 201A (2-lane; 5,000 AADT) and Sophie May Ln/River Rd (2-lane; 3,000 AADT)  Posted speed 25 MPH  *Problem: Sight distance* | **Sign-Major (with yellow flashers):** On bridge, north of intersection  **Sign-Minor (with DMS):** Far-side corner from STOP  **Detection (loops):** Based on the time of travel required for a vehicle traveling at the speed limit (using 85th percentile speeds) to reach the intersection | Major: TRAFFIC ENTERING WHEN FLASHING  Minor: Vehicle symbol and VEHICLES ENTERING – FROM LEFT – FROM RIGHT | Crash data, Traffic Conflict Technique, and a vehicle intercept survey were used to evaluate impact  Major road 85th percentile speed remained unchanged at 45 MPH  Critical gap timing increased from 5.7 to 8.5 seconds  TCT data analysis showed improvement in potential collisions demonstrated by reduction in conflict rate of 35%  67% surveyed felt the signs could prevent crashes | Multi-arch concrete bridge with large structural concrete columns and railings limited sight distances at intersection  $31,000 to materials plus installation  $200 average yearly routine maintenance cost  Initial installation in 2001  Additional installations in Lebanon and Sanford in 2006 |

1. Major Road-Unknown Location

