RWSTC Agenda Item IV.3 June 2014

TECHNICAL COMMITTEE: NCUTCD Regulatory/Warning Signs Technical Committee

DATE OF ACTION: (TASK FORCE): May 30, 2014
TASK FORCE: Dan Paddock (chair), Tom Heydel, Mark Bott, Scott Kuznicki, Fred Ranck, Dave Woosley, James Sullivan, Jason Kennedy

TRANSMITTAL TO SPONSORS DATE: NOT APPLICABLE DUE TO NPA

TOPIC: Intersection Conflict Warning Systems

AFFECTED PORTIONS OF MUTCD: Section 1A.13 and Section 2C.XX

BACKGROUND:

Jon Jackels of MnDOT gave a presentation on Intersection Conflict Warning Systems (ICWS) to the Regulatory and Warning Sign Technical Committee (RWSTC) and other Technical Committees of the National Committee on Uniform Traffic Control Devices (NCUTCD) at its June 2012 meeting. The focus of this presentation was the work being performed through the ENTERPRISE Transportation Pooled Fund (TPF-5(231)) study. The RWSTC formed this Task Force after this presentation.

Discussions at the January 2013 RWSTC meeting resulted in the consensus opinion that:

1) It should be emphasized that all ICWS signs and sign placements should conform to the principles of the MUTCD
2) That the RWSTC wanted the Enterprise study to determine based on solid research, which signs are the best signs. The RWSTC would then propose the addition of these signs to the MUTCD.

This position was reconfirmed at the June 2013 meeting.

In an effort to have material available for the 2015 MUTCD, the RWSTC modified its position on these points at its January 2014 meeting. Instead the Task Force is to use
the ongoing research to identify successful signs that meet the basic requirements of the MUTCD. Then, once identified by the Task Force, prepare material to include in the MUTCD for these signs. The use of these signs will be presented as an Option statement.

The following summary of signs and accident history was then complied. It should be noted that the studies, as best as can be determined are "simple before/after studies". This means that no control sites were used and regression to the mean has not been addressed.

The Pooled Fund Study entitled Evaluation of Low Cost Safety Improvements (TPF-5(099)) (ELCSF) is also collecting and analyzing the data on Intersection Conflict Warning Systems. They should be producing some data in the near future.

**Signs on Major Road**

**North Carolina**

VEHICLE ENTERING (WHEN FLASHING) Majority included WHEN FLASHING
2 and 4 lane divided roadways, Diamond signs with flashing beacons
CRF total 32.5%, Frontal 32.1% Injury 26.8% Severe Injury 30.1%

**North Carolina** (May be some of the same sites as above
VEHICLE ENTERING (WHEN FLASHING)
2 and 4 lane divided roadways, Diamond signs with flashing beacons
4 sites 2 Lane with 2 lane side road simple before and after CRF 46.1%
7 Sites 4 Lane with 2 lane side road simple before and after CRF 19.9%

**Missouri**

WATCH FOR ENTERING TRAFFIC or VEHICLES ENTERING WHEN FLASHING
Rectangular signs with flashing beacons. Divided and undivided. Four way and T intersections. All at 2 lane side roads. Nine locations
Simple before and after CRF total 28%, Angle 37%, Severe 72%, Severe Angle 75%

**Signs on Minor Road**

**North Carolina**

VEHICLE ENTERING (WHEN FLASHING)
WATCH FOR APPROACHING VEHICLES
Overhead at intersection
Simple before and after CRF total 3.5%, frontal impact +4.3%

**Iowa and Missouri**

TRAFFIC APPROACHING WHEN FLASHING
Diamond sign with flashing beacons placed 50 to 70 feet to left of intersection. Sign placement not in general conformance with principles of MUTCD. Night time illumination and washout issues need to be considered.
Simple before and after CRF total 32%, Angle 44%, Severe 33%, Severe Angle 8%
**Missouri**

TRAFFIC APPROACHING WHEN FLASHING

Diamond sign with flashing beacons. Divided and undivided. Four way and T intersections. Sign on far side of intersection(?). Ten locations

Simple before and after CRF total 29%, Angle 36%, Severe 29%, Severe Angle 28%

**Minnesota**

Side Road: LOOK FOR TRAFFIC WHEN FLASHING

Thru Road: “Intersection” warning sign

Four locations, all four way single lane

Formal before and after being included in ELCSI-PFS

Unofficial simple before and after CRF total 59%

**NOTE:** Being removed summer of 2014. Being replaced with diamonded shaped VMS with ENTERING TRAFFIC legend and WHEN FLASHING plaque.

**Minnesota**

Modified R6-3 “Divided Highway” message board sign. LED red slash circle and vehicle indication on occupied approach.

No signing on thru roadway

Three locations, all four way, two through lanes on major, single lane approaches on side road.

Formal before and after being included in ELCSI-PFS

Unofficial simple before and after CRF total 60%

**NOTE:** Being removed summer of 2014. Being replaced with diamonded shaped VMS with ENTERING TRAFFIC legend and WHEN FLASHING plaque.

**Wisconsin**

Divided 4 lane road with 2 lane side road (one lane approach)

Modified R6-3 “Divided Highway” message board sign. LED red slash circle and vehicle indication on occupied approach.

Before After accident analysis incomplete

**Signs on both Major and Minor**

**Missouri**

Major Road: WATCH FOR ENTERING TRAFFIC or VEHICLES ENTERING WHEN FLASHING Rectangular signs with flashing beacons Divided and undivided. Four way and T intersections. All at 2 lane side roads.

Minor Road: TRAFFIC APPROACHING WHEN FLASHING Diamond sign with flashing beacons.

Eight locations Simple before and after CRF total 28%, Angle 37%, Severe 48%, Severe Angle 53%

**Minnesota**
Side Road: LOOK FOR TRAFFIC **NOTE:** Being removed summer of 2014. Being replaced with diamonded shaped VMS with ENTERING TRAFFIC legend and WHEN FLASHING PLAQUE.

Thru Road: ENTERING TRAFFIC WHEN FLASHING.

Five locations, all four way single lane.

Formal before and after being included in ELCSI-PFS.

Unofficial simple before and after CRF total 52%.

**Pennsylvania**

Major Road: Diamond “Intersection” with LED cars on side road, VMS with TRAFFIC Ahead message and 25 MPH advisory speed panel.

Side Road: VMS with CROSSING TRAFFIC legend and car symbols.

Two locations, Five years before and after data. No change in number of accidents at one location. Increase from 6 crashes to 11 crashes at the other.

**Maine**

Main Road: Rectangular overhead TRAFFIC ENTERING WHEN FLASHING sign with flashing beacons.

Side Road: Diamond shaped ground mounted VEHICLE ENTERING with what looks like a rectangular panel with LED FROM RIGHT and FROM LEFT legends.

**Signs Used**

**Main Road**

1. VEHICLE ENTERING
2. VEHICLES ENTERING WHEN FLASHING
3. ENTERING TRAFFIC WHEN FLASHING
4. TRAFFIC ENTERING WHEN FLASHING
5. WATCH FOR ENTERING TRAFFIC

**Side Road**

1. TRAFFIC APPROACHING WHEN FLASHING
2. LOOK FOR TRAFFIC WHEN FLASHING
3. VEHICLE ENTERING (WHEN FLASHING)
4. LOOK FOR TRAFFIC **NOTE:** Being removed summer of 2014.
5. Diamond shaped ground mounted VEHICLE ENTERING with what looks like a rectangular panel with LED FROM RIGHT and FROM LEFT legends.
6. Modified R6-3 “Divided Highway” message board sign. LED red slash circle and vehicle indication on occupied approach. **NOTE:** Being removed summer of 2014.
7. Diamonded shaped VMS with ENTERING TRAFFIC legend and WHEN FLASHING plaque.

**DISCUSSION:**
There was general consensus on the task force that the accident data was adequate to justify some form of signing on both through road and side road applications.

On the through road installations there was considerable disagreement on whether the WHEN FLASHING wording should be included. One side believed that it was necessary to include WHEN FLASHING. Otherwise it would not be an ICWS installation. It would just be another intersection warning sign to use. Drivers would be on their own to recognize that the sign did not always flash and to recognize the significance of the flash.

The other faction believed that the WHEN FLASHING was unnecessary and opened up the liability issue when the system either failed to detect the side road vehicle or was in some other system failure. The task force favored VEHICLES ENTERING WHEN FLASHING and WATCH FOR ENTERING TRAFFIC.

There was also considerable support to use a large rectangular sign rather than the traditional diamond shaped warning sign. This would distinguish the installation from a normal warning sign installation.

On the side road approach three signs were favored. They were LOOK FOR TRAFFIC WHEN FLASHING, TRAFFIC APPROACHING WHEN FLASHING and WATCH FOR APPROACHING VEHICLES. There is no accident data available for the WATCH FOR APPROACHING VEHICLES sign. Again there is the question of whether to use the WHEN FLASHING portion of the legend. The issue is the same. Is it an ICWS sign or just another warning sign? Is the sign applicable if there is a detection system failure?

It is the task force's position that both of these positions have validity and it is the users responsibility to choose the position that they want to take.

The use of LED and VMS in ICWS installations adds more dimensions and complexity to the situation. The task force has decided to table these type of installations to a future date.

**RECOMMENDATION:**

Intersection Conflict Warning Systems are being used throughout the Country. There is a need for the NCUTCD to provide some guidance on the signs being used. The use of these signs are optional.

Add the TRAFFIC ENTERING WHEN FLASHING sign and the WATCH FOR ENTERING TRAFFIC sign to the MUTCD for use in ICWS installations on the through roadway. Provide for the use of the traditional diamond shaped sign and a large rectangular sign.
Add the TRAFFIC APPROACHING WHEN FLASHING and WATCH FOR APPROACHING VEHICLES signs to the MUTCD for use in ICWS installations on the side road approach.

Note: Proposed changes to the MUTCD are shown in underline red and removed text are shown in strikethrough red.

RECOMMENDED WORDING:

Section 1A.13 Definitions of Headings, Words and Phrases in this Manual

Add a new definition to paragraph 03

XYZ. Intersection Conflict Warning System (ICWS) – A system of signs, vehicle detection, and either flashing warning beacons or active sign element(s) installed at or near an intersection to provide real-time information about intersection conditions.

Section 2C.XY Intersection Conflict Warning System Signs (WX-U through WX-Z)

Support:
01 Intersection Conflict Warning Systems are typically installed to address crashes associated with driver inattention, restricted sight distance, and gap selection at stop controlled intersections.

Option:
02 TRAFFIC ENTERING (WHEN FLASHING) (WX-U1 or WX-U2) sign or a WATCH FOR ENTERING TRAFFIC (WX-V1 or WX-V2) sign (see Figure 2C-X) or similar message may be used on the through roadway approach to a side road stop controlled intersection as part of an Intersection Conflict Warning System to warn of entering traffic from the side road. The sign may be in diamond or rectangular format. [note: place holder for illustration]

03 The TRAFFIC APPROACHING (WHEN FLASHING) (WX-Y1 OR WX-Y2) sign or the WATCH FOR APPROACHING VEHICLES (WX-Z) sign or similar message (see Figure 2C-X) may be used on the side road stop controlled approach of an Intersection Conflict Warning System to warn of approaching traffic on the through road.

Standard:
04 When used as part of an Intersection Conflict Warning System, the TRAFFIC ENTERING (WHEN FLASHING) sign, the WATCH FOR ENTERING TRAFFIC sign, the TRAFFIC APPROACHING WHEN FLASHING sign, and the WATCH FOR APPROACHING VEHICLES sign or similar message shall be supplemented with an active warning system that activates when an approaching vehicle is detected.
(add designs to Figure 2C-9 Intersection Warning Signs)

RWSTC VOTE 6-26-14: For: 23  Opposed: 2  Abstentions: 1

COUNCIL VOTE: 6-28-14  Approved  For: 35  Opposed: 0  Abstentions: 2

C:ncutcd/June 2014/Intersection Conflict Warning System (ICWS) approved by
RWSTC 6-26-14, approved by COUNCIL 6-28-14