Walter P Reuther Fwy
E Eleven Mile Rd
Mackersie Ave
Sherwood Ave
Mound Rd
Stephens Rd
Center Line High School
Center Line
1
2
3
4
E 10 Mile Rd
Stephens

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May 7, 2020

DRAFT DRAFT DRAFT DRAFT DRAFT

Chief Paul Myszenski
Center Line Police Department
City of Centerline
16901 E. 10 Mile Road
Center Line, MI
48015

**RE: Stop Sign Study Quadrant 1**

Dear Chief Myszenski:

At your request, the Transportation Improvement Association (TIA) conducted an evaluation of local street intersections throughout the city. This letter covers the northwest quadrant of the city (quadrant 1). The objective was to determine if the traffic control is appropriate. Our evaluation included 24-hour vehicular approach counts, an examination of the crash history, and a field visit of the intersections to qualitatively assess sight distance.

## METHODOLGY

The process for determination of the proper traffic control followed the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). The applicable pages regarding stop or yield control are attached.

The first determination is if the basic entering volume per day, for 1-way or 2-way yield or stop control, exceeds 2,000 units. Generally speaking, traffic control (stop or yield) is needed for the intersection at this point. The control is then placed on the lower volume approach(es).

In looking at all way stop control criteria, the intersection would need to meet the minimum criteria laid out in MMUTCD 2B.07. This involves a minimum hourly traffic volume, the crash history (over 5 per 12 months) and the availability of sight distance.

If the optional criteria is reviewed, the criteria for two residential streets, based on improved operations may apply. The daily approach volumes between approaches should roughly equal to satisfy this condition.

## TRAFFIC VOLUMES

In Summer of 2018 through Spring of 2019, 24-hour traffic volume counts were performed for locations throughout the City. In general, two way volumes were collected every two blocks. The daily traffic was then measured and reported for use in the analysis.

**CRASH HISTORY**

The three-year crash history (2016-2018) were examined for the intersection using a 200 feet radius. Crashes within this area were logged for the intersection. It should be noted this is independent of whether the traffic control was causative of the crash (i.e. a parked vehicle 100 feet from the intersection).

**SITE OBSERVATIONS**

A windshield survey of each intersection was conducted and Google Earth imagery consulted for review. The main goal was to assess whether adequate sight distance was available at the intersection. This may include stopping beyond the stop line but in a safe location to observe oncoming traffic. Features such as ADA compliant ramps, vegetation and parking encroachments were noted.

**CONCLUSION**

The majority of intersections had a total daily entering volume greater than 2,000 units. At the intersections such as this yield or stop control is recommended. For those intersections less than 2,000 units traffic control (stop or yield) is not required for the intersection. However, in these instances the traffic control appropriate to the operations (such as at a tee intersection). Two (2) all way stop control intersections are present, one with heavy truck traffic. Specific criteria is laid out the MMUTCD and these intersections were examined with this warranting criteria in mind.

**RECOMMENDATIONS**

The complete traffic control recommendations are attached in the Quadrant 1 summary table. All way stop control is recommended to be retained at two (2) locations. Due to the heavy truck traffic at Lawrence / Bernice it appears need to facilitate gaps. No change is suggested at 12 other intersections.

Based on the review some general recommendations were formed and include:

- Adding "All Way" plaques beneath the stop signs of all way stop control intersections. This is required per the 2011 MMUCTD (along with the subsequent version).
- As they are replaced, street name signs should include upper case / lower case lettering style.

If you have any questions, or if we can be of any further assistance, please don't hesitate to contact us at (248) 334-4971. Thank you for your continued commitment to public safety.

Respectfully,

PATRICK M. CAWLEY, P.E., PTOE
Manager of Engineering
Traffic Engineer

the driver of the vehicle on the left to yield the right-of-way to the vehicle on the right. The right-of-way can be modified at through streets or highways by placing YIELD (R1-2) signs (see Sections 2B.08 and 2B.09) or STOP (R1-1) signs (see Sections 2B.05 through 2B.07) on one or more approaches.

*Guidance:*

02 *Engineering judgment should be used to establish intersection control. The following factors should be considered:*

*A. Vehicular, bicycle, and pedestrian traffic volumes on all approaches;*
*B. Number and angle of approaches;*
*C. Approach speeds;*
*D. Sight distance available on each approach; and*
*E. Reported crash experience.*

03 *YIELD or STOP signs should be used at an intersection if one or more of the following conditions exist:*

*A. An intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law;*
*B. A street entering a designated through highway or street; and/or*
*C. An unsignalized intersection in a signalized area.*

04 *In addition, the use of YIELD or STOP signs should be considered at the intersection of two minor streets or local roads where the intersection has more than three approaches and where one or more of the following conditions exist:*

*A. The combined vehicular, bicycle, and pedestrian volume entering the intersection from all approaches averages more than 2,000 units per day;*
*B. The ability to see conflicting traffic on an approach is not sufficient to allow a road user to stop or yield in compliance with the normal right-of-way rule if such stopping or yielding is necessary; and/or*
*C. Crash records indicate that five or more crashes that involve the failure to yield the right-of-way at the intersection under the normal right-of-way rule have been reported within a 3-year period, or that three or more such crashes have been reported within a 2-year period.*

**Standard:**

05 **YIELD or STOP signs shall not be used for speed control.**

Support:

06 Section 2B.07 contains provisions regarding the application of multi-way STOP control at an intersection.

*Guidance:*

07 *Once the decision has been made to control an intersection, the decision regarding the appropriate roadway to control should be based on engineering judgment. In most cases, the roadway carrying the lowest volume of traffic should be controlled.*

08 *A YIELD or STOP sign should not be installed on the higher volume roadway unless justified by an engineering study.*

Support:

09 The following are considerations that might influence the decision regarding the appropriate roadway upon which to install a YIELD or STOP sign where two roadways with relatively equal volumes and/or characteristics intersect:

A. Controlling the direction that conflicts the most with established pedestrian crossing activity or school walking routes;
B. Controlling the direction that has obscured vision, dips, or bumps that already require drivers to use lower operating speeds; and
C. Controlling the direction that has the best sight distance from a controlled position to observe conflicting traffic.

**Standard:**

10 **Because the potential for conflicting commands could create driver confusion, YIELD or STOP signs shall not be used in conjunction with any traffic control signal operation, except in the following cases:**

**A. If the signal indication for an approach is a flashing red at all times;**
**B. If a minor street or driveway is located within or adjacent to the area controlled by the traffic control signal, but does not require separate traffic signal control because an extremely low potential for conflict exists; or**
**C. If a channelized turn lane is separated from the adjacent travel lanes by an island and the channelized turn lane is not controlled by a traffic control signal.**

11 **Except as provided in Section 2B.09, STOP signs and YIELD signs shall not be installed on different approaches to the same unsignalized intersection if those approaches conflict with or oppose each other.**

12 **Portable or part-time STOP or YIELD signs shall not be used except for emergency and temporary traffic control zone purposes.**

13 **A portable or part-time (folding) STOP sign that is manually placed into view and manually removed from view shall not be used during a power outage to control a signalized approach unless the maintaining agency establishes that the signal indication that will first be displayed to that approach upon restoration of power is a flashing red signal indication and that the portable STOP sign will be manually removed from view prior to stop-and-go operation of the traffic control signal.**

Option:

14 A portable or part-time (folding) STOP sign that is electrically or mechanically operated such that it only displays the STOP message during a power outage and ceases to display the STOP message upon restoration of power may be used during a power outage to control a signalized approach.

Support:

15 Section 9B.03 contains provisions regarding the assignment of priority at a shared-use path/ roadway intersection.

## Section 2B.05 STOP Sign (R1-1) and ALL WAY Plaque (R1-3P)

**Standard:**

01 **When it is determined that a full stop is always required on an approach to an intersection, a STOP (R1-1) sign (see Figure 2B-1) shall be used.**

02 **The STOP sign shall be an octagon with a white legend and border on a red background.**

03 **Secondary legends shall not be used on STOP sign faces.**

04 **At intersections where all approaches are controlled by STOP signs (see Section 2B.07), an ALL WAY supplemental plaque (R1-3P) shall be mounted below each STOP sign. The ALL WAY plaque (see Figure 2B-1) shall have a white legend and border on a red background.**

05 **The ALL WAY plaque shall only be used if all intersection approaches are controlled by STOP signs.**

06 **Supplemental plaques with legends such as 2-WAY, 3-WAY, 4-WAY, or other numbers of ways shall not be used with STOP signs.**

Support:

07 The use of the CROSS TRAFFIC DOES NOT STOP (W4-4P) plaque (and other plaques with variations of this word message) is described in Section 2C.59.

*Guidance:*

08 *Plaques with the appropriate alternative messages of TRAFFIC FROM LEFT (RIGHT) DOES NOT STOP (W4-4aP) or ONCOMING TRAFFIC DOES NOT STOP (W4-4bP) should be used at intersections where STOP signs control all but one approach to the intersection, unless the only non-stopped approach is from a one-way street.*

Option:

09 An EXCEPT RIGHT TURN (R1-10P) plaque (see Figure 2B-1) may be mounted below the STOP sign if an engineering study determines that a special combination of geometry and traffic volumes is present that makes it possible for right-turning traffic on the approach to be permitted to enter the intersection without stopping.

Support:

10 The design and application of Stop Beacons are described in Section 4L.05.

**Figure 2B-1. STOP and YIELD Signs and Plaques**

R1-1 R1-3P R1-2 R1-2aP R1-10P

## Section 2B.06 STOP Sign Applications

*Guidance:*

01 *At intersections where a full stop is not necessary at all times, consideration should first be given to using less restrictive measures such as YIELD signs (see Sections 2B.08 and 2B.09).*

02 *The use of STOP signs on the minor-street approaches should be considered if engineering judgment indicates that a stop is always required because of one or more of the following conditions:*

*A. The vehicular traffic volumes on the through street or highway exceed 6,000 vehicles per day;*
*B. A restricted view exists that requires road users to stop in order to adequately observe conflicting traffic on the through street or highway; and/or*
*C. Crash records indicate that three or more crashes that are susceptible to correction by the installation of a STOP sign have been reported within a 12-month period, or that five or more such crashes have been reported within a 2-year period. Such crashes include right-angle collisions involving road users on the minor-street approach failing to yield the right-of-way to traffic on the through street or highway.*

Support:

03 The use of STOP signs at grade crossings is described in Sections 8B.04 and 8B.05.

## Section 2B.07 Multi-Way Stop Applications

Support:

01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.

02 The restrictions on the use of STOP signs described in Section 2B.04 also apply to multi-way stop applications.

*Guidance:*

03 *The decision to install multi-way stop control should be based on an engineering study.*

04 *The following criteria should be considered in the engineering study for a multi-way STOP sign installation:*

*A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.*
*B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*
*C. Minimum volumes:*
*1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
*2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
*3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*
*D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

Option:

05 Other criteria that may be considered in an engineering study include:

A. The need to control left-turn conflicts;
B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and
D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

## Quadrant 4 - Summary

| Intersection | Control | Entering Volume (VPD) | Greater than 2,000 vpd ? | Crash Frequency (3 Yr) | MMUTCD All Way - Volume Criteria ? | Sight Distance Adequate | Optional Criteria –AWS- Similar Volumes | Pedestrian Conflicts | Recommended Traffic Control |
|---|---|---|---|---|---|---|---|---|---|
| **Bernice / Lawrence** | AWS | 2,751 | Yes | 1 | No | Yes | No | No | No change<br>Add All Way plaques |
| **Helen / Lawrence** | 1 way stop | 2,028 | Yes | 0 | No | Yes | No | No | No change |
| **Dale / Lawrence** | 1 way stop | 1,976 | No | 3 | No | Yes | No | No | No change |
| **Voerner / Lawrence** | 1 way stop | 1,921 | No | 1 | No | Yes | No | No | No change |
| **Gronow / Lawrence** | 1 way stop | 2,005 | Yes | 3 | No | Yes | No | No | No change |
| **Engleman (west leg)/ Lawrence** | 1 way stop | 3,156 | Yes | 1 | No | Yes | No | No | No change |
| **Engleman (east leg) / Lawrence** | AWS | 3,901 | Yes | 3 | No | Yes | Yes | No | No change<br>Add All way plaques |
| **Wiegand / Lawrence** | 1 way stop | 3,111 | Yes | 0 | No | Yes | No | No | No change |
| **Braun / Lawrence** | 1 way stop | 3,556 | Yes | 1 | No | Yes | No | No | No change |
| **Wiengartz / Lawrence** | 1 way stop | 3,124 | Yes | 1 | No | Yes | No | No | No change |
| **Jenerous / Lawrence** | 1 way stop | 3,133 | Yes | 0 | No | Yes | No | No | No change |
| **Braun / Sherwood** | 1 way stop | 3,270 | Yes | 8* | No | Yes | No | No | No change<br>Improve curve signage north of intersection |
| **Engleman / Paul Hazen** | 1 way stop | 1,801 | No | 0 | No | Yes | No | No | No change |
| **Wiegand / Paul Hazen** | 1 way stop | 234 | No | 0 | No | Yes | No | No | No change |
| **Bernice / Liberal (Mopar gate)** | 2 way stop | 748 | No | 1 | No | Yes | No | No | No change |

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Sheriff
Wayne County

BARBARA ROSSMANN
President and Chief Executive Officer
Henry Ford Macomb Hospitals
Chief Nursing Officer
Henry Ford Health System

ANTHONY M. WICKERSHAM
Sheriff
Macomb County

May 4, 2020

DRAFT DRAFT DRAFT DRAFT DRAFT

Chief Paul Myszenski
Center Line Police Department
City of Centerline
16901 E. 10 Mile Road
Center Line, MI
48015

**RE: Stop Sign Study Quadrant 2**

Dear Chief Myszenski:

At your request, the Transportation Improvement Association (TIA) conducted an evaluation of local street intersections throughout the city. This letter covers the northeast quadrant of the city (quadrant 2). The objective was to determine if the traffic control is appropriate. Our evaluation included 24-hour vehicular approach counts, an examination of the crash history, and a field visit of the intersections to qualitatively assess sight distance.

## METHODOLGY

The process for determination of the proper traffic control followed the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). The applicable pages regarding stop or yield control are attached.

The first determination is if the basic entering volume per day, for 1-way or 2-way yield or stop control, exceeds 2,000 units. Generally speaking, traffic control (stop or yield) is needed for the intersection at this point. The control is then placed on the lower volume approach(es).

In looking at all way stop control criteria, the intersection would need to meet the minimum criteria laid out in MMUTCD 2B.07. This involves a minimum hourly traffic volume, the crash history (over 5 per 12 months) and the availability of sight distance.

If the optional criteria is reviewed, the criteria for two residential streets, based on improved operations may apply. The daily approach volumes between approaches should roughly equal to satisfy this condition.

## TRAFFIC VOLUMES

In Summer of 2018 through Spring of 2019, 24-hour traffic volume counts were performed for locations throughout the City. In general, two way volumes were collected every two blocks. The daily traffic was then measured and reported for use in the analysis.

Limited volume data was collected for Lorraine Avenue. Given the higher order roadway and jurisdictional boundary it was assumed to keep the status quo and those intersections.

## CRASH HISTORY

The three-year crash history (2016-2018) were examined for the intersection using a 200 feet radius. Crashes within this area were logged for the intersection. It should be noted this is independent of whether the traffic control was causative of the crash (i.e. a parked vehicle 100 feet from the intersection).

## SITE OBSERVATIONS

A windshield survey of each intersection was conducted and Google Earth imagery consulted for review. The main goal was to assess whether adequate sight distance was available at the intersection. This may include stopping beyond the stop line but in a safe location to observe oncoming traffic. Features such as ADA compliant ramps, vegetation and parking encroachments were noted.

## CONCLUSION

Several intersections have a total daily entering volume less than 2,000 units thus traffic control (stop or yield) is not required for the intersection. In most instances the current traffic control is however harmless to the operations. An excess of all way stop control intersections appear to be present in the area. Due to the more precise nature of the criteria laid out the MMUTCD, these intersections were more strictly adhered to the warrants.

## RECOMMENDATIONS

The complete traffic control recommendations are attached in the Quadrant 2 summary table. All way stop control is recommended to be changed to two way stop control at seven (7) locations. No change is suggested at 32 intersections. Two (2) intersections were low volume stop control intersection which may function as yield control. Three (3) intersections are near pedestrian generators and may assist pedestrian crossings. Insufficient data was available to determine the pedestrian flows and the traffic control was left as is.

Based on the review some general recommendations were formed and include:

- Adding "All Way" plaques beneath the stop signs of all way stop control intersections. This is required per the 2011 MMUCTD (along with the subsequent version).
- Install "Cross Traffic Does Not Stop" to all installations where all way control is changed to 2 way control.
- As they are replaced, street name signs should include upper case / lower case lettering style.
- Install stop bars and crosswalks to reinforce stopping behavior at high impact pedestrian locations.

If you have any questions, or if we can be of any further assistance, please don't hesitate to contact us at (248) 334-4971. Thank you for your continued commitment to public safety.

Respectfully,

PATRICK M. CAWLEY, P.E., PTOE
Manager of Engineering
Traffic Engineer

the driver of the vehicle on the left to yield the right-of-way to the vehicle on the right. The right-of-way can be modified at through streets or highways by placing YIELD (R1-2) signs (see Sections 2B.08 and 2B.09) or STOP (R1-1) signs (see Sections 2B.05 through 2B.07) on one or more approaches.

*Guidance:*

02 *Engineering judgment should be used to establish intersection control. The following factors should be considered:*

*A. Vehicular, bicycle, and pedestrian traffic volumes on all approaches;*
*B. Number and angle of approaches;*
*C. Approach speeds;*
*D. Sight distance available on each approach; and*
*E. Reported crash experience.*

03 *YIELD or STOP signs should be used at an intersection if one or more of the following conditions exist:*

*A. An intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law;*
*B. A street entering a designated through highway or street; and/or*
*C. An unsignalized intersection in a signalized area.*

04 *In addition, the use of YIELD or STOP signs should be considered at the intersection of two minor streets or local roads where the intersection has more than three approaches and where one or more of the following conditions exist:*

*A. The combined vehicular, bicycle, and pedestrian volume entering the intersection from all approaches averages more than 2,000 units per day;*
*B. The ability to see conflicting traffic on an approach is not sufficient to allow a road user to stop or yield in compliance with the normal right-of-way rule if such stopping or yielding is necessary; and/or*
*C. Crash records indicate that five or more crashes that involve the failure to yield the right-of-way at the intersection under the normal right-of-way rule have been reported within a 3-year period, or that three or more such crashes have been reported within a 2-year period.*

**Standard:**

05 **YIELD or STOP signs shall not be used for speed control.**

Support:

06 Section 2B.07 contains provisions regarding the application of multi-way STOP control at an intersection.

*Guidance:*

07 *Once the decision has been made to control an intersection, the decision regarding the appropriate roadway to control should be based on engineering judgment. In most cases, the roadway carrying the lowest volume of traffic should be controlled.*

08 *A YIELD or STOP sign should not be installed on the higher volume roadway unless justified by an engineering study.*

Support:

09 The following are considerations that might influence the decision regarding the appropriate roadway upon which to install a YIELD or STOP sign where two roadways with relatively equal volumes and/or characteristics intersect:

A. Controlling the direction that conflicts the most with established pedestrian crossing activity or school walking routes;
B. Controlling the direction that has obscured vision, dips, or bumps that already require drivers to use lower operating speeds; and
C. Controlling the direction that has the best sight distance from a controlled position to observe conflicting traffic.

**Standard:**

10 **Because the potential for conflicting commands could create driver confusion, YIELD or STOP signs shall not be used in conjunction with any traffic control signal operation, except in the following cases:**

**A. If the signal indication for an approach is a flashing red at all times;**
**B. If a minor street or driveway is located within or adjacent to the area controlled by the traffic control signal, but does not require separate traffic signal control because an extremely low potential for conflict exists; or**
**C. If a channelized turn lane is separated from the adjacent travel lanes by an island and the channelized turn lane is not controlled by a traffic control signal.**

11 **Except as provided in Section 2B.09, STOP signs and YIELD signs shall not be installed on different approaches to the same unsignalized intersection if those approaches conflict with or oppose each other.**

12 **Portable or part-time STOP or YIELD signs shall not be used except for emergency and temporary traffic control zone purposes.**

13 **A portable or part-time (folding) STOP sign that is manually placed into view and manually removed from view shall not be used during a power outage to control a signalized approach unless the maintaining agency establishes that the signal indication that will first be displayed to that approach upon restoration of power is a flashing red signal indication and that the portable STOP sign will be manually removed from view prior to stop-and-go operation of the traffic control signal.**

Option:

14 A portable or part-time (folding) STOP sign that is electrically or mechanically operated such that it only displays the STOP message during a power outage and ceases to display the STOP message upon restoration of power may be used during a power outage to control a signalized approach.

Support:

15 Section 9B.03 contains provisions regarding the assignment of priority at a shared-use path/ roadway intersection.

## Section 2B.05 STOP Sign (R1-1) and ALL WAY Plaque (R1-3P)

**Standard:**

01 **When it is determined that a full stop is always required on an approach to an intersection, a STOP (R1-1) sign (see Figure 2B-1) shall be used.**

02 **The STOP sign shall be an octagon with a white legend and border on a red background.**

03 **Secondary legends shall not be used on STOP sign faces.**

04 **At intersections where all approaches are controlled by STOP signs (see Section 2B.07), an ALL WAY supplemental plaque (R1-3P) shall be mounted below each STOP sign. The ALL WAY plaque (see Figure 2B-1) shall have a white legend and border on a red background.**

05 **The ALL WAY plaque shall only be used if all intersection approaches are controlled by STOP signs.**

06 **Supplemental plaques with legends such as 2-WAY, 3-WAY, 4-WAY, or other numbers of ways shall not be used with STOP signs.**

Support:

07 The use of the CROSS TRAFFIC DOES NOT STOP (W4-4P) plaque (and other plaques with variations of this word message) is described in Section 2C.59.

*Guidance:*

08 *Plaques with the appropriate alternative messages of TRAFFIC FROM LEFT (RIGHT) DOES NOT STOP (W4-4aP) or ONCOMING TRAFFIC DOES NOT STOP (W4-4bP) should be used at intersections where STOP signs control all but one approach to the intersection, unless the only non-stopped approach is from a one-way street.*

Option:

09 An EXCEPT RIGHT TURN (R1-10P) plaque (see Figure 2B-1) may be mounted below the STOP sign if an engineering study determines that a special combination of geometry and traffic volumes is present that makes it possible for right-turning traffic on the approach to be permitted to enter the intersection without stopping.

Support:

10 The design and application of Stop Beacons are described in Section 4L.05.

---

**Figure 2B-1. STOP and YIELD Signs and Plaques**

R1-1 R1-3P R1-2 R1-2aP R1-10P

## Section 2B.06 STOP Sign Applications

*Guidance:*

01 *At intersections where a full stop is not necessary at all times, consideration should first be given to using less restrictive measures such as YIELD signs (see Sections 2B.08 and 2B.09).*

02 *The use of STOP signs on the minor-street approaches should be considered if engineering judgment indicates that a stop is always required because of one or more of the following conditions:*

*A. The vehicular traffic volumes on the through street or highway exceed 6,000 vehicles per day;*
*B. A restricted view exists that requires road users to stop in order to adequately observe conflicting traffic on the through street or highway; and/or*
*C. Crash records indicate that three or more crashes that are susceptible to correction by the installation of a STOP sign have been reported within a 12-month period, or that five or more such crashes have been reported within a 2-year period. Such crashes include right-angle collisions involving road users on the minor-street approach failing to yield the right-of-way to traffic on the through street or highway.*

Support:

03 The use of STOP signs at grade crossings is described in Sections 8B.04 and 8B.05.

## Section 2B.07 Multi-Way Stop Applications

Support:

01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.

02 The restrictions on the use of STOP signs described in Section 2B.04 also apply to multi-way stop applications.

*Guidance:*

03 *The decision to install multi-way stop control should be based on an engineering study.*

04 *The following criteria should be considered in the engineering study for a multi-way STOP sign installation:*

*A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.*
*B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*
*C. Minimum volumes:*
*1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
*2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
*3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*
*D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

Option:

05 Other criteria that may be considered in an engineering study include:

A. The need to control left-turn conflicts;
B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and
D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

## Quadrant 2 - Summary

| Intersection | Control | Entering Volume (VPD) | Greater than 2,000 vpd ? | Crash Frequency (3 Yr) | MMUTCD All Way - Volume Criteria ? | Sight Distance Adequate | Optional Criteria –AWS- Similar Volumes | Pedestrian Conflicts | Recommended Traffic Control |
|---|---|---|---|---|---|---|---|---|---|
| Potomac / Evelyn | 2 way stop | 786 | No | 1 | No | Yes | No | No | No change |
| Potomac / Arsenal | AWS | 1,565 | No | 1 | No | Yes | No | No | No change |
| Potomac / Sylvan | 2 way stop | 366 | No | 1 | No | Yes | No | No | No change |
| Menge / Evelyn | 2 way stop | 856 | No | 0 | No | Yes | No | No | No change |
| Menge / Arsenal | AWS | 1,356 | No | 1 | No | Yes | No | No | 2 way Stop (east-west) |
| Menge / Sylvan | 2 way stop | 387 | No | 0 | No | Yes | No | No | No change |
| Menge / Potomac | 1 way stop | 350 | No | 0 | No | Yes | No | No | No change<br>Add no parking signs |
| McKinley / Evelyn | 2 way stop | 998 | No | 0 | No | Yes | No | No | No change |
| McKinley / Arsenal | AWS | 1,461 | No | 1 | No | Yes | No | No | No change |
| McKinley / Sylvan | AWS (3 way) | 703 | No | 0 | No | Yes | No | Yes | No change |
| McKinley / Potomac | 1 way stop | 700 | No | 0 | No | No | No | No | No change |
| McKinley / Lorraine | AWS | - | - | 0 | No | Yes | No | Yes | No change |
| Bernice / Evelyn | AWS | 770 | No | 0 | No | Yes | Yes | No | No change |
| Bernice / Arsenal | 1 way stop | 862 | No | 0 | No | Yes | No | No | No change |
| Virginia Park / Evelyn | AWS | 740 | No | 0 | No | Yes | Yes | No | No change |
| Virginia Park / Arsenal / Virginia Park Pk (school) | AWS | 1,120 | No | 0 | No | Yes | Yes | Yes | No change |
| Lillian / Evelyn | AWS | 857 | No | 1 | No | Yes | No | No | 2 way Stop (north-south) |
| Lillian / Arsenal | 1 way stop | 1,209 | No | 0 | No | Yes | No | No | No change |
| Sunburst / Evelyn | AWS | 750 | No | 2 | No | Yes | No | No | No change |
| Sunburst / Arsenal | 1 way stop | 850 | No | 1 | No | Yes | No | No | No change |
| Busch / Evelyn | AWS | 867 | No | 0 | No | Yes | No | No | 2 way Stop (east-west) |
| Busch / Arsenal | AWS | 859 | No | 0 | No | Yes | No | No | No change |

## Quadrant 2 - Summary

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Busch / Sylvan /driveway | AWS | 741 | | No | 0 | No | Yes | No | Yes | No change |
| Helen / Evelyn | 2 way stop | 1,140 | | No | 1 | No | Yes | Yes | No | No change |
| Helen / Sylvan | AWS | 1,010 | | No | 0 | No | Yes | No | No | 2 way Stop (north-south) |
| Helen / Lorraine | 2 way stop | - | | - | 1 | No | Yes | No | Yes | No change |
| Dale / Evelyn | AWS | 1,168 | | No | 3 | No | Yes | No | No | 2 way Stop (east-west) |
| Dale / Sylvan | AWS | 783 | | No | 0 | No | Yes | No | No | 2 way Stop (north-south) |
| Dale / Lorraine | 2 way stop | - | | No | 3 | No | Yes | No | No | No change |
| Central / Evelyn | 2 way stop | 1,283 | | No | 1 | No | Yes | No | No | No change |
| Central / Sylvan | AWS | 680 | | No | 0 | No | Yes | No | No | No change |
| Central / Lorraine | 2 way stop | - | | - | 2 | No | Yes | - | No | No change |
| Harding / Evelyn | AWS | 1086 | | No | 1 | No | Yes | No | No | 2 way Stop (east-west) |
| Harding / Sylvan | AWS | 701 | | No | 1 | No | No | No | No | No change |
| Harding / Lorraine | 1 way stop | - | | No | 0 | No | Yes | No | No | No change |
| Engleman / Evelyn | 1 way stop | 1,350 | | No | 1 | No | Yes | No | No | No change |
| Engleman / Sylvan | 1 way stop | 1,203 | | No | 0 | No | Yes | No | Yes | No change |
| Engleman / Alex | 1 way stop | 800 | | No | 0 | No | Yes | No | No | Yield |
| Engleman / Lorraine | 1 way stop | - | | No | 1 | No | Yes | No | No | No change |
| Ritter / Burt | 1 way stop | 675 | | No | 0 | No | Yes | No | No | Yield |

# TRANSPORTATION IMPROVEMENT ASSOCIATION

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Macomb County


April 29, 2020

DRAFT DRAFT DRAFT DRAFT DRAFT

Chief Paul Myszenski
Center Line Police Department
City of Centerline
16901 E. 10 Mile Road
Center Line, MI
48015

**RE: Stop Sign Study Quadrant 3**

Dear Chief Myszenski:

At your request, the Transportation Improvement Association (TIA) conducted an evaluation of local street intersections throughout the city. This letter covers the southwest quadrant of the city (quadrant 3). The objective was to determine if the traffic control is appropriate. Our evaluation included 24-hour vehicular approach counts, an examination of the crash history, and a field visit of the intersections to qualitatively assess sight distance.

## METHODOLGY

The process for determination of the proper traffic control followed the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). The applicable pages regarding stop or yield control are attached.

The first determination is if the basic entering volume per day, for 1-way or 2-way yield or stop control, exceeds 2,000 units. Generally speaking, traffic control (stop or yield) is needed for the intersection at this point. The control is then placed on the lower volume approach(es).

In looking at all way stop control criteria, the intersection would need to meet the minimum criteria laid out in MMUTCD 2B.07. This involves a minimum hourly traffic volume, the crash history (over 5 per 12 months) and the availability of sight distance.

If the optional criteria is reviewed, the criteria for two residential streets, based on improved operations may apply. The daily approach volumes between approaches should roughly equal to satisfy this condition.

## TRAFFIC VOLUMES

In Summer of 2018 through Spring of 2019, 24-hour traffic volume counts were performed for locations throughout the City. In general, two way volumes were collected every two blocks. The daily traffic was then measured and reported for use in the analysis.

## CRASH HISTORY

The three-year crash history (2016-2018) were examined for the intersection using a 200 feet radius. Crashes within this area were logged for the intersection. It should be noted this is independent of whether the traffic control was causative of the crash (i.e. a parked vehicle 100 feet from the intersection).

## SITE OBSERVATIONS

A windshield survey of each intersection was conducted and Google Earth imagery consulted for review. The main goal was to assess whether adequate sight distance was available at the intersection. This may include stopping beyond the stop line but in a safe location to observe oncoming traffic. Features such as ADA compliant ramps, vegetation and parking encroachments were noted.

## CONCLUSION

Several intersections have a total daily entering volume less than 2,000 units thus traffic control (stop or yield) is not required for the intersection. In most instances the traffic control is however innocuous to the operations. An overabundance of all way stop control intersections is present. Due to the more precise nature of the criteria laid out the MMUTCD, these intersections were more strictly adhered to the warrants.

## RECOMMENDATIONS

The complete traffic control recommendations are attached in the Quadrant 3 summary table. All way stop control is recommended to be changed to two way stop control at four (4) locations. No change is suggested at 15 intersections. Three (3) intersections are near pedestrian generators and may assist pedestrian crossings. Insufficient data was available to determine the pedestrian flows and the traffic control was left as is.

Based on the review some general recommendations were formed and include:

- Adding "All Way" plaques beneath the stop signs of all way stop control intersections. This is required per the 2011 MMUCTD (along with the subsequent version).
- Install "Cross Traffic Does Not Stop" to all installations where all way control is changed to 2 way control.
- As they are replaced, street name signs should include upper case / lower case lettering style.
- Install stop bars and crosswalks to reinforce stopping behavior at high impact pedestrian locations.

If you have any questions, or if we can be of any further assistance, please don't hesitate to contact us at (248) 334-4971. Thank you for your continued commitment to public safety.

Respectfully,

PATRICK M. CAWLEY, P.E., PTOE
Manager of Engineering
Traffic Engineer

the driver of the vehicle on the left to yield the right-of-way to the vehicle on the right. The right-of-way can be modified at through streets or highways by placing YIELD (R1-2) signs (see Sections 2B.08 and 2B.09) or STOP (R1-1) signs (see Sections 2B.05 through 2B.07) on one or more approaches.

*Guidance:*

02 *Engineering judgment should be used to establish intersection control. The following factors should be considered:*

*A. Vehicular, bicycle, and pedestrian traffic volumes on all approaches;*
*B. Number and angle of approaches;*
*C. Approach speeds;*
*D. Sight distance available on each approach; and*
*E. Reported crash experience.*

03 *YIELD or STOP signs should be used at an intersection if one or more of the following conditions exist:*

*A. An intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law;*
*B. A street entering a designated through highway or street; and/or*
*C. An unsignalized intersection in a signalized area.*

04 *In addition, the use of YIELD or STOP signs should be considered at the intersection of two minor streets or local roads where the intersection has more than three approaches and where one or more of the following conditions exist:*

*A. The combined vehicular, bicycle, and pedestrian volume entering the intersection from all approaches averages more than 2,000 units per day;*
*B. The ability to see conflicting traffic on an approach is not sufficient to allow a road user to stop or yield in compliance with the normal right-of-way rule if such stopping or yielding is necessary; and/or*
*C. Crash records indicate that five or more crashes that involve the failure to yield the right-of-way at the intersection under the normal right-of-way rule have been reported within a 3-year period, or that three or more such crashes have been reported within a 2-year period.*

**Standard:**

05 **YIELD or STOP signs shall not be used for speed control.**

Support:

06 Section 2B.07 contains provisions regarding the application of multi-way STOP control at an intersection.

*Guidance:*

07 *Once the decision has been made to control an intersection, the decision regarding the appropriate roadway to control should be based on engineering judgment. In most cases, the roadway carrying the lowest volume of traffic should be controlled.*

08 *A YIELD or STOP sign should not be installed on the higher volume roadway unless justified by an engineering study.*

Support:

09 The following are considerations that might influence the decision regarding the appropriate roadway upon which to install a YIELD or STOP sign where two roadways with relatively equal volumes and/or characteristics intersect:

A. Controlling the direction that conflicts the most with established pedestrian crossing activity or school walking routes;
B. Controlling the direction that has obscured vision, dips, or bumps that already require drivers to use lower operating speeds; and
C. Controlling the direction that has the best sight distance from a controlled position to observe conflicting traffic.

**Standard:**

10 **Because the potential for conflicting commands could create driver confusion, YIELD or STOP signs shall not be used in conjunction with any traffic control signal operation, except in the following cases:**

**A. If the signal indication for an approach is a flashing red at all times;**
**B. If a minor street or driveway is located within or adjacent to the area controlled by the traffic control signal, but does not require separate traffic signal control because an extremely low potential for conflict exists; or**
**C. If a channelized turn lane is separated from the adjacent travel lanes by an island and the channelized turn lane is not controlled by a traffic control signal.**

11 **Except as provided in Section 2B.09, STOP signs and YIELD signs shall not be installed on different approaches to the same unsignalized intersection if those approaches conflict with or oppose each other.**

12 **Portable or part-time STOP or YIELD signs shall not be used except for emergency and temporary traffic control zone purposes.**

13 **A portable or part-time (folding) STOP sign that is manually placed into view and manually removed from view shall not be used during a power outage to control a signalized approach unless the maintaining agency establishes that the signal indication that will first be displayed to that approach upon restoration of power is a flashing red signal indication and that the portable STOP sign will be manually removed from view prior to stop-and-go operation of the traffic control signal.**

Option:

14 A portable or part-time (folding) STOP sign that is electrically or mechanically operated such that it only displays the STOP message during a power outage and ceases to display the STOP message upon restoration of power may be used during a power outage to control a signalized approach.

Support:

15 Section 9B.03 contains provisions regarding the assignment of priority at a shared-use path/ roadway intersection.

## Section 2B.05 STOP Sign (R1-1) and ALL WAY Plaque (R1-3P)

**Standard:**

01 **When it is determined that a full stop is always required on an approach to an intersection, a STOP (R1-1) sign (see Figure 2B-1) shall be used.**

02 **The STOP sign shall be an octagon with a white legend and border on a red background.**

03 **Secondary legends shall not be used on STOP sign faces.**

04 **At intersections where all approaches are controlled by STOP signs (see Section 2B.07), an ALL WAY supplemental plaque (R1-3P) shall be mounted below each STOP sign. The ALL WAY plaque (see Figure 2B-1) shall have a white legend and border on a red background.**

05 **The ALL WAY plaque shall only be used if all intersection approaches are controlled by STOP signs.**

06 **Supplemental plaques with legends such as 2-WAY, 3-WAY, 4-WAY, or other numbers of ways shall not be used with STOP signs.**

Support:

07 The use of the CROSS TRAFFIC DOES NOT STOP (W4-4P) plaque (and other plaques with variations of this word message) is described in Section 2C.59.

*Guidance:*

08 *Plaques with the appropriate alternative messages of TRAFFIC FROM LEFT (RIGHT) DOES NOT STOP (W4-4aP) or ONCOMING TRAFFIC DOES NOT STOP (W4-4bP) should be used at intersections where STOP signs control all but one approach to the intersection, unless the only non-stopped approach is from a one-way street.*

Option:

09 An EXCEPT RIGHT TURN (R1-10P) plaque (see Figure 2B-1) may be mounted below the STOP sign if an engineering study determines that a special combination of geometry and traffic volumes is present that makes it possible for right-turning traffic on the approach to be permitted to enter the intersection without stopping.

Support:

10 The design and application of Stop Beacons are described in Section 4L.05.

**Figure 2B-1. STOP and YIELD Signs and Plaques**

R1-1 R1-3P R1-2 R1-2aP R1-10P

## Section 2B.06 STOP Sign Applications

*Guidance:*

01 *At intersections where a full stop is not necessary at all times, consideration should first be given to using less restrictive measures such as YIELD signs (see Sections 2B.08 and 2B.09).*

02 *The use of STOP signs on the minor-street approaches should be considered if engineering judgment indicates that a stop is always required because of one or more of the following conditions:*

*A. The vehicular traffic volumes on the through street or highway exceed 6,000 vehicles per day;*
*B. A restricted view exists that requires road users to stop in order to adequately observe conflicting traffic on the through street or highway; and/or*
*C. Crash records indicate that three or more crashes that are susceptible to correction by the installation of a STOP sign have been reported within a 12-month period, or that five or more such crashes have been reported within a 2-year period. Such crashes include right-angle collisions involving road users on the minor-street approach failing to yield the right-of-way to traffic on the through street or highway.*

Support:

03 The use of STOP signs at grade crossings is described in Sections 8B.04 and 8B.05.

## Section 2B.07 Multi-Way Stop Applications

Support:

01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.

02 The restrictions on the use of STOP signs described in Section 2B.04 also apply to multi-way stop applications.

*Guidance:*

03 *The decision to install multi-way stop control should be based on an engineering study.*

04 *The following criteria should be considered in the engineering study for a multi-way STOP sign installation:*

*A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.*
*B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*
*C. Minimum volumes:*
*1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
*2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
*3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*
*D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

Option:

05 Other criteria that may be considered in an engineering study include:

A. The need to control left-turn conflicts;
B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and
D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

| Intersection | Control | Entering Volume (VPD) | Greater than 2,000 vpd ? | Crash Frequency (3 Yr) | MMUTCD All Way - Volume Criteria ? | Sight Distance Adequate | Optional Criteria –AWS- Similar Volumes | Pedestrian Conflicts | Recommended Traffic Control |
|---|---|---|---|---|---|---|---|---|---|
| Coolidge / Lawrence | 1 way Stop | 2,777 | Yes | 1 | No | Yes | Yes | ? | No Change |
| Coolidge /Godin | 1 way Stop | 1,644 | No | 0 | No | Yes | No | No | No change |
| Coolidge /Landau | AWS | 1,829 | No | 1 | No | Yes | No | No | 2 way Stop (north-south)<br>Add Cross Traffic plaque |
| Coolidge /Wyland | 1 way Stop | 1,100 | No | 0 | No | Yes | No | No | No change |
| Edward / Lawrence | 2 way Stop | 1,343 | No | 0 | No | Yes | No | ? | No change |
| Edward / Landau | AWS | 1,281 | No | 0 | No | Yes | No | No | No change |
| Henry / Lawrence | 1 way Stop | 1,814 | No | 0 | No | Yes | No | No | No change |
| Juliet / Lawrence | 1 way Stop | 1,600 | No | 0 | No | Yes | No | No | No change |
| Rinke / Sherwood | 1 way Stop | 5,893 | Yes | 0 | No | Yes | No | No | No change |
| State Park / Lawrence | 1 way Stop | 1,745 | No | 0 | No | Yes | No | No | No change |
| State Park / Landau | AWS | 352 | No | 1 | No | Yes | No | No | 2 way Stop (north-south)<br>Add Cross Traffic plaque |
| Sterling / Lawrence | 1 way Stop | 1,550 | No | 0 | No | Yes | No | No | No change |
| Sterling / Landau | AWS | 368 | No | 0 | No | Yes | No | No | 2 way Stop (north-south)<br>Add Cross Traffic plaque |
| Superior / Lawrence | 1 way Stop | 1,543 | No | 0 | No | Yes | No | No | No change |
| Superior / Landau | AWS | 275 | No | 0 | No | Yes | No | No | 2 way Stop (north-south)<br>Add Cross Traffic plaque |
| Standard / Lawrence | 1 way Stop | 1,588 | No | 2 | No | Yes | No | No? | No change<br>Improve sidewalk connection |
| Standard/ Landau | 1 way Stop | 331 | No | 0 | No | Yes | No | No | No change |
| Stephens / Lawrence | AWS | 1,766 | No | 0 | No | Yes | No | Yes ? | No change |
| Wood / Lawrence | AWS | 1,900 | No | 0 | No | Yes | No | No | No change |

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Sheriff
Macomb County

April 24, 2020

DRAFT DRAFT DRAFT DRAFT DRAFT

Chief Paul Myszenski
Center Line Police Department
City of Centerline
16901 E. 10 Mile Road
Center Line, MI
48015

**RE: Stop Sign Study Quadrant 4**

Dear Chief Myszenski:

At your request, the Transportation Improvement Association (TIA) conducted an evaluation of local street intersections throughout the city. This letter covers the southeast quadrant of the city (quadrant 4). The objective was to determine if the traffic control is appropriate. Our evaluation included 24-hour vehicular approach counts, an examination of the crash history, and a field visit of the intersections to qualitatively assess sight distance.

## METHODOLGY

The process for determination of the proper traffic control followed the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). The applicable pages regarding stop or yield control are attached.

The first determination is if the basic entering volume per day, for 1-way or 2-way yield or stop control, exceeds 2,000 units. Generally speaking, traffic control (stop or yield) is needed for the intersection at this point. The control is then placed on the lower volume approach(es).

In looking at all way stop control criteria, the intersection would need to meet the minimum criteria laid out in MMUTCD 2B.07. This involves a minimum hourly traffic volume, the crash history (over 5 per 12 months) and the availability of sight distance.

If the optional criteria is reviewed, the criteria for two residential streets, based on improved operations may apply. The daily approach volumes between approaches should roughly equal to satisfy this condition.

## TRAFFIC VOLUMES

In Summer of 2018 through Spring of 2019, 24-hour traffic volume counts were performed for locations throughout the City. In general, two way volumes were collected every two blocks. The daily traffic was then measured and reported for use in the analysis.

## CRASH HISTORY

The three-year crash history (2016-2018) were examined for the intersection using a 200 feet radius. Crashes within this area were logged for the intersection. It should be noted this is independent of whether the traffic control was causative of the crash (i.e. a parked vehicle 100 feet from the intersection).

## SITE OBSERVATIONS

A windshield survey of each intersection was conducted and Google Earth imagery consulted for review. The main goal was to assess whether adequate sight distance was available at the intersection. This may include stopping beyond the stop line but in a safe location to observe oncoming traffic. Features such as ADA compliant ramps, vegetation and parking encroachments were noted.

## CONCLUSION

Several intersections have a total daily entering volume less than 2,000 units thus traffic control (stop or yield) is not required for the intersection. In most instances the traffic control is however innocuous to the operations. An overabundance of all way stop control intersections is present. Due to the more precise nature of the criteria laid out the MMUTCD, these intersections were more strictly adhered to the warrants.

## RECOMMENDATIONS

The complete traffic control recommendations are attached in the Quadrant 4 summary table. All way stop control is recommended to be changed to two way stop control at nine (9) locations. No change is suggested at 12 intersections. Two intersections are near pedestrian generators and may enable pedestrian crossings. In sufficient data was available to determine the pedestrian flows and they were left as is.

Based on the review some general recommendations were formed and include:

- Adding "All Way" plaques beneath the stop signs of all way stop control intersections. This is required per the 2011 MMUCTD (along with the subsequent version).
- Install "Cross Traffic Does Not Stop" to all installations where all way control is changed to 2 way control.
- As they are replaced, street name signs should include upper case / lower case lettering style.
- Install stop bars and crosswalks to reinforce stopping behavior at high impact pedestrian locations.

If you have any questions, or if we can be of any further assistance, please don't hesitate to contact us at (248) 334-4971. Thank you for your continued commitment to public safety.

Respectfully,

PATRICK M. CAWLEY, P.E., PTOE
Manager of Engineering
Traffic Engineer

## Quadrant 4 - Summary

| Intersection | Control | Entering Volume (VPD) | Greater than 2,000 vpd ? | Crash Frequency (3 Yr) | MMUTCD All Way - Volume Criteria ? | Sight Distance Adequate | Optional Criteria –AWS- Similar Volumes | Pedestrian Conflicts | Recommended Traffic Control |
|---|---|---|---|---|---|---|---|---|---|
| Coolidge / Automobile | AWS | 1,825 | No | 1 | No | Yes | No | No | 2 way Stop (east-west) |
| Coolidge /Federal | 2 way Stop | 1,450 | No | 3 | No | Yes | No | No | No change |
| Edward / Automobile | AWS | 2,300 | Yes | 0 | No | Yes | No | No | 2 way Stop (east-west) Relocate reverse curve sign north |
| Edward /Federal / Wainwright | AWS | 1,750 | No | 0 | No | Yes | No | No | 2 way Stop (east-west) |
| Theisen / Automobile | AWS | 1,800 | No | 1 | No | Yes | No | | 2 way Stop (east-west) |
| Theisen / Federal / O ' Hare | AWS | 1,450 | No | 1 | No | Yes | No | No | 2 way Stop (east-west) |
| O'Hare / MacArthur | 1 way Stop | 525 | No | 1 | No | Yes | No | No | No change |
| Kaltz / Automobile | AWS | 2.050 | Yes | 1 | No | Yes | No | No | |
| Kaltz /Federal | 2 way Stop | 2,100 | Yes | 0 | No | Yes | No | No | No change |
| Kaltz / Mac Arthur | AWS | 1,325 | No | 1 | No | Yes | No | No | |
| Katlz / Lorraine | AWS (offset) | - | | 3 | No | Yes | - | No | No change |
| State Park / Automobile | AWS | 880 | No | 0 | No | Yes | No | No | 2 way Stop (east-west) |
| State Park / Federal | AWS | 1,150 | No | 0 | No | Yes | No | ? | No change |
| State Park / Mac Arthur | 1 way Stop | 700 | No | 0 | No | Yes | No | ? | No change |
| Mac Arthur / Sterling | 1 way Stop | 500 | No | 0 | No | Yes | No | No | No change |
| Sterling / Lorraine | No control | 250 | No | 2 | No | Yes | No | No | No change |
| Superior / Automobile | AWS | 950 | No | 2 | No | Yes | Yes | No | No change |
| Superior / Federal | AWS | 780 | No | 3 | No | Yes | No | No | 2 way Stop (east-west) |
| Superior / Mac Arthur | AWS | 720 | No | 1 | No | Yes | No | No | 2 way Stop (east-west) |
| Superior / Lorraine | 1 way Stop | 250 | No | 1 | No | Yes | No | No | No change |
| Standard / Automobile | AWS | 828 | No | 2 | No | Yes | No | No | 2 way Stop (east-west) |
| Standard / Federal | 1 way Stop | 834 | No | 0 | No | Yes | No | No | No change |

## Quadrant 4 - Summary