Loc

Traffic Engineering and Parking Divisions

David C. Dryer, P.E., City Traffic Engineer

Madison Municipal Building, Suite 100
215 Martin Luther King, Jr. Boulevard
P.O. Box 2986
Madison, Wisconsin 53701-2986
PH 608/266-4761
TTY 608/267-9623
FAX 608/267-1158

September 14, 2005

COPY

Vern Kempfer, President
Mayfair Park Neighborhood Association
1449 MacArthur Road
Madison WI 53714

Dear Mr. Kempfer:

I have received your correspondence of 8/31/05. I have forwarded a copy to Larry Nelson, City Engineer, to respond to the issues related to the extension of Parkside Drive.

In response to the petition for stop signs at Sycamore, MacArthur and Larson, we have had some discussions related to these signs before. I have attached that correspondence as well as some additional articles and letters relating to unwarranted stop signs, their impacts, compliance rates and their general failure to meet neighborhood expectations.

I cannot in good faith tell you the insertion of three stop signs is going to solve your neighborhood traffic problem. I have endeavored to provide you with information and the experiences of other neighborhoods so that you can avoid similar problems.

I will provide the neighborhoods petition for review to the City's Pedestrian-Bicycle-Motor Vehicle Commission. (I will email you the date of the meeting when it is scheduled.) Staff recommendation to the Commission will be "to receive the petition". To receive the petition means the petition is acknowledged but no change will be made. The Commission will review and, of course, make its own decision. You may wish to send a representative to attend to provide your perspective on the issue.

If upon review of the additional information that I have provided, you wish to seek other options, please let me know.

Regards,

David C. Dryer, P.E.
City Traffic Engineer

DCD:ef

cc: Larry D. Nelson, City Engineer
bc Santiago Rosa

D-17

D 17

Traffic Engineering Division

David C. Dryer, City Traffic Engineer

Suite 100
215 Martin Luther King, Jr. Boulevard
P.O. Box 2986
Madison, Wisconsin 53701-2986
(Phone) 608 266 4761
(TTY) 608 267 9623
(FAX) 608 267-1158

March 15, 2005

Mr. Vern Kempfer, President
Mayfair Park Neighborhood Association
1449 MacArthur Road
Madison, WI 53714

Dear Mr. Kempfer:

We have received your letter requesting that action be taken to control vehicle speeds on Sycamore Avenue. Establishing safe travel speeds in Madison neighborhoods continues to be a high priority and a focus of considerable resources. Speed control solutions that appear at first glance, obvious, often prove ineffective or even counterproductive.

Standards for stop sign installation are established by the Federal Highway Administration and ratified by the State and Madison Common Council. These standards require traffic volumes with delays or a history of crashes that would likely be prevented by the stop sign. Research shows that stop signs are ineffective at reducing midblock speeds and often lead to frustrated drivers, jackrabbit starts, and higher speeds to compensate for the disruption. Installation of stop signs where they are perceived as unnecessary by motorists often leads to non-compliance and potentially additional crashes.

The Traffic Engineering Division continues to devote sizable resources to our Neighborhood Traffic Management Program (NTMP). This program has been successfully managing speeds in locations throughout the city using a variety of proven traffic calming methods. This program requires the presence of curb and gutter on the project street. Unfortunately, Sycamore and MacArthur are unimproved streets and would require curb and gutter before we would be able to enroll them in the NTMP. I would encourage your neighborhood to consider this and let me or the City Engineer know how you wish to proceed.

We have forwarded your request for repairs at Ellenwood and MacArthur to the Streets Division for their attention.

Sincerely,

David C. Dryer, P.E.
City Traffic Engineer

DCD:JAL:gep
c: Ald. Santiago Rosas, Dist. 17

file

REC'D NOV 2 9 2004 D17

Madison

Office of the Common Council

City-County Building, Room 417
210 Martin Luther King, Jr. Blvd.
Madison, Wisconsin 53703-3445
Office: 608 266 4071
FAX: 608 267 8669
TTY: 608 267 8670
council@ci.madison.wi.us

November 29, 2004

DEC - 1 2004

Vern Kempfer, President
Mayfair Park Neighborhood Association
1449 MacArthur Road
Madison, WI 53714

Dear Mr. Kempfer:

I received your letter along with the petition in support of the request for specific park equipment for Mayfair Park. Thank you for the letter and for obtaining the support needed via the petition. I have had several conversations with James Morgan, Parks Superintendent, regarding the equipment the neighborhood would like to have at Mayfair Park. Mr. Morgan has assured me that one of his staff is looking at the request and will send you a letter to that effect.

At our November 9, 2004, Common Council meeting, I also submitted your correspondence regarding the pedestrian island on Mendota Street to City Engineering for their review and recommendations. As we discussed several weeks ago, if the City moves forward in making all of the improvements at Mayfair Park, we would need to seriously consider adding sidewalks to accommodate folks with disabilities and this, of course, would require funding. I have been working hard to secure funds for the specific park equipment the neighborhood wants and for the pedestrian island at Mayfair Park, and I ask for your patience. As you may know, it's not the requests for park equipment that are the challenge; it's finding the funds to make the requests a reality. I will keep you updated on any new developments.

Thank you for your correspondence.

Sincerely,

Santiago Rosas

Ald. Santiago Rosas
District 17

Route:
Buchmann
Dreyer (TE)

11/30/04

cc: Mayor Dave Cieslewicz
James Morgan, Parks Superintendent
Larry Nelson, City Engineer

F:\CNCOMMON\councildocs\17\kempfer17.doc

From Welton loc file

Richard L. Berg

7418 New Washburn Way
Madison, WI 53719

PBMVC
12/10/02
ITEM 3

June 11, 1993

Mr. James Cobb
Apartment #1
839 Williamson Street
Madison, WI 53703

Dear Mr. Cobb: Jim

Although I very much wanted to attend the June 8 meeting of the Madison Transportation Commission to address traffic problems on New Washburn Way, I was unable to do so due to a last-minute schedule conflict.

If I had appeared, I would have urged you to approve the request for a three-way stop at New Washburn Way and Welton Drive. Since the city Transportation Department had not recommended in favor of this request (which was made through 65 signatures obtained from High Point Estates residents), I was concerned that the Transportation Commission might not see the common-sense wisdom of placing stop signs at this intersection.

Therefore, I was pleasantly surprised when I heard that the commission had decided to support the resident's request over the recommendation from the Transportation Department.

I want to thank the members of the commission who were so responsive to resident's concerns and wishes. It's nice to know that citizens can still influence government in a positive way with rational requests. It's my hope the full council will support the commission's recommendation and that these stop signs can be placed soon.

Thanks again Jim on behalf of my children and all other High Point residents who have worked diligently to address the traffic problems facing our neighborhood. I would appreciate it if you would circulate a copy of this letter to other commission members.

Sincerely,

Rick

Richard Berg

cc: Alderman Wayne Bigelow
Mayor Paul Soglin

Richard L. Berg
7418 New Washburn Way
Madison, WI 53719

September 8, 1993

Mr. Wayne Bigelow
1109 Woodland Way
Madison, WI 53711

Dear Mr. Bigelow:

This letter follows up on our recent discussions regarding the somewhat widespread disregard for vehicular traffic laws on New Washburn Way.

As I indicated to you, I have been shocked by the on-going refusal on the part of a startlingly large number of drivers to obey the stop signs placed over a month ago at the intersection of Welton Drive and New Washburn Way. While I am convinced these signs are having the desired effect on slowing traffic, I am concerned about the trust that children and pedestrians place in these stop signs where they expect traffic to stop and crossings to be safe.

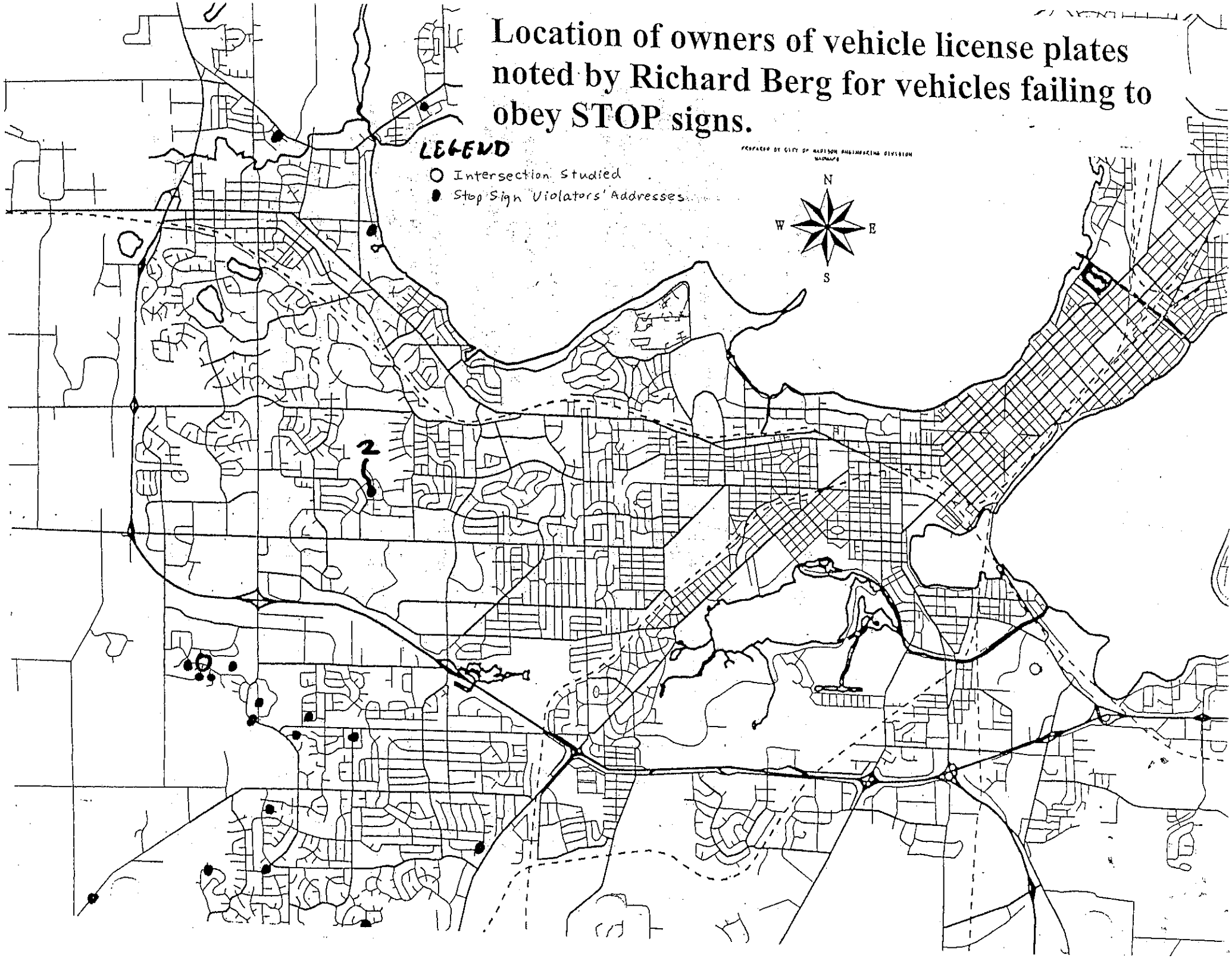
In an effort to give this intersection more visibility, we discussed placing "stop sign ahead" signs to the east, south and west of this intersection and placing pedestrian crossing strips on the pavement at the stop signs. Although these things are not yet in place, I assume you are following through.

However, to add some concrete dimension to the scope of this problem, I have made recent efforts to observe and record the license numbers of vehicles which refuse to stop at this intersection. I have attached a list of vehicle license numbers, time of infraction and direction travelling for your review.

These observations were made at different times of day and different days of the week. In my opinion, this tally is pretty typical of the problem although the percentage of drivers refusing to obey the stop signs seems higher in the morning and in the evening.

Before you jump to the conclusion that I was harsh in deciding who was "stopping" and who wasn't, you should know that the drivers I recorded are those who made little or no attempt to stop. In other words, only the most flagrant abusers.

Location of owners of vehicle license plates noted by Richard Berg for vehicles failing to obey STOP signs.



CITY OF MADISON

INTER-DEPARTMENTAL

CORRESPONDENCE

Date: October 14, 1993

To: Warren Somerfeld, Director of Transportation

From: Ald. Wayne Bigelow, District One WB

Subject: Traffic Violation Letters

It is my understanding that your Department is willing to send out "informational" letters to people who are violating traffic laws, but who are not caught by the police.

Recently, stop signs were installed at the intersection of New Washburn and Welton, in High Point Estates. More recently, we've put in advance signs warning of the upcoming stop signs, given complaints from area residents concerning the fact that many people aren't stopping at all.

Rick Berg, who resides at/near this intersection, spent a great deal of time tracking who was not stopping at the stop sign. I would appreciate it if you would send out letters to the vehicles indicated in Mr. Berg's letter.

Thank you.

WS:jm

cc: Captain Walden, MPD

Multi-way Stops - The Research Shows the MUTCD is Correct!

W. Martin Bretherton Jr., P.E.(M)

Abstract

This paper reviewed over 70 technical papers covering all-way stops (or multi-way stops) and their success and failure as traffic control devices in residential areas. This study is the most comprehensive found on multi-way stop signs

The study looked at how multi-way stop signs have been used as traffic calming measures to control speed. There have been 23 hypotheses studied using multi-way stop as speed control. The research found an additional 9 hypotheses studied showing the effect multi way stops have on other traffic engineering problems.

The research found that, overwhelmingly, multi-way stop signs do NOT control speed except under very limited conditions. The research shows that the concerns about unwarranted stop signs are well founded.

Introduction

Many elected officials, citizens and some traffic engineering professionals feel that multi-way stop signs should be used as traffic calming devices. Many times unwarranted stop signs are installed to control traffic. The Manual on Uniform Traffic Control Devices (MUTCD)(16) describes warrants for installing multi-way stop signs. However, it does not describe many of the problems caused by the installation of unwarranted stop signs. These problems include concerns like liability issues, traffic noise, automobile pollution, traffic enforcement and driver behavior.

This paper is a result of searching over 70 technical papers about multi-way stop signs. The study concentrated on their use as traffic calming devices and their relative effectiveness in controlling speeds in residential neighborhoods. The references found 23 hypotheses on their relative effectiveness as traffic calming devices. One study analyzed the economic cost of installing a multi-way stop at an intersection. The reference search also found 9 hypotheses about traffic operations on residential streets.

The literature search found 85 papers on the subject of multi-way stops. There are probably many more references available on this very popular subject. The seventy-one references are shown in Appendix A. There was a problem finding the 14 papers found in literature searches. The 14 papers are listed in Appendix B for information only. Most of the papers were from old sources and are probably out of print.

Multi-Way Stop Signs as Speed Control Devices

A summary of the articles found the following information about the effectiveness of multi-way stop signs and other solutions to controlling speeds in residential neighborhoods.

1. Multi-way stops do not control speeds. Twenty-two papers were cited for these findings. (Reference 1, 2, 7, 8, 10, 12, 13, 14, 15, 16, 17, 19, 20, 39, 45, 46, 51, 55, 62, 63, 64, 66 and 70).

2. Stop compliance is poor at unwarranted multi-way stop signs. Unwarranted stop signs means they do not meet the warrants of the MUTCD. This is based on the drivers feeling that the signs have no traffic control purpose. There is little reason to yield the right-of -way because there are usually no vehicles on the minor street. Nineteen references found this to be their finding. (Reference 7, 8, 10, 12, 13, 14, 15, 17, 19, 20, 39, 45, 46, *51, 55,* 61, 62, 63 and 64).

3. Before-After studies show multi-way stop signs do not reduce speeds on residential streets. Nineteen references found this to be their finding. (Reference 19 (1 study), 55 (5 studies), 60 (8 studies) and 64(5 studies)).

4. Unwarranted multi-way stops increased speed some distance from intersections. The studies hypothesizing that motorists are making up the time they lost at the "unnecessary" stop sign. Fifteen references found this to be their finding.(Reference 1, 2, 7, 8, 10, 13, 14, 17, 19, 20,39, 45,46, 51, 55, 70 and 71).

5. Multi-way stop signs have high operating costs based on vehicle operating costs, vehicular travel times, fuel consumption and increased vehicle emissions. Fifteen references found this to be their finding. (Reference 3, 4, 7, 8, 10, 14, 15, 17, 45, 55 ,61, 62, 63, 67 and 68).

6. Safety of pedestrians is decreased at unwarranted multi-way stops, especially small children. It seems that pedestrians expect vehicles to stop at the stop signs but many vehicles have gotten in the habit of running the "unnecessary" stop sign. Thirteen references found this to be their finding. (References 7, 8, 10, 13, 14, 15, 17, 19, 20, 45, 51, 55 and 63).

7. Citizens feel "safer" in communities "positively controlled" by stop signs. Positively controlled is meant to infer that the streets are controlled by unwarranted stop signs. Homeowners on the residential collector feel safer on a 'calmed' street. Seven references found this to be their finding. (Reference 6, 14, 18, 20, 51, 58 and 66).
Hypothesis twelve (below) lists five references that dispute the results of these studies.

8. Speeding problems on residential streets are associated with" through" traffic. Frequently homeowners feel the problem is created by 'outsiders'. Many times the problem is the person complaining or their neighbor. Five references found this to be their finding. (References 2, 15, 45, 51 and 55).

9. Unwarranted multi-way stops may present potential liability problems for undocumented exceptions to accepted warrants. Local jurisdictions feel they may be incurring higher liability exposure by 'violating' the MUTCD. Many times the unwarranted stop signs are installed without a warrant study or some documentation. Cited by six references. (Reference 7, 9, 19, 46, 62 and 65).

10. Stop signs increase noise in the vicinity of an intersection. The noise is created by the vehicle braking noise at the intersection and the cars accelerating up to speed. The noise is created by the engine exhaust, brake, tire and aerodynamic noises. Cited by five references. (Reference 14, 17, 20, 45, 55).

11. Cost of installing multi-way stops are low but enforcement costs are prohibitive. many communities do not have the resources to effectively enforce compliance with the stop signs. Five references found this to be their finding. (Reference 1, 10, 45, 51, 55).

12. Stop signs do not significantly change safety of intersection. Stop signs are installed with the hope they will make the intersection and neighborhood safer. Cited by five references. (Reference 55, 60, 61, 62, 63).

Hypothesis seven (above) lists seven references that dispute the results of these studies.

13. Unwarranted multi-way stops have been successfully removed with public support and result in improved compliance at justified stop signs. Cited by three references. (Reference 8, 10, 12).

14. Unwarranted multi-way stops reduce accidents in cities with intersection sight distance problems and at intersections with parked cars that restrict sight distance. The stop signs are unwarranted based on volume and may not quite meet the accident threshold. Cited by three references. (Reference 6, 18, 68).

15. Citizens feel stop signs should be installed at locations based on traffic engineering studies. Some homeowners realize the importance of installing 'needed' stop signs. Cited by two references. (References 56, 57).

16. Multi-way stops can reduce cut-through traffic volume if many intersections along the road are controlled by stop signs. If enough stop signs are installed on a residential or collector street motorists may go another way because of the inconvenience of having to start and stop at so many intersections. This includes the many drivers that will not stop but slowly 'cruise' through the stop signs. This driving behavior has been nicknamed the 'California cruise'. Cited by two references. (Reference 14, 61).

17. Placement of unwarranted stop signs in violation of Georgia State Law 32-6-50 (a) (b) (c). This study was conducted using Georgia law. Georgia law requires local governments to install all traffic controls devices in accordance with the MUTCD. This is probably similar to traffic signing laws in other states. Cited by two references. (Reference 19, 62).

18. Special police enforcement of multi-way stop signs has limited effectiveness. This has been called the 'hallo' effect. Drivers will obey the 'unreasonable' laws as long as a policemen is visible. Cited by two references. (Reference 39, 46).

19. District judge orders removal of stop signs not installed in compliance with city ordinance. Judges have ordered the removal of 'unnecessary' stop signs. The problem begins when the traffic engineer and/or elected officials are asked to consider their intersection a 'special case'. This creates a precedent and results in a proliferation of 'special case' all-way stop signs. Cited by two references. (Reference 59, 62).

20. Some jurisdictions have created warrants for multi-way stops that are easier to meet than MUTCD. The jurisdiction feel that

the MUTCD warrants are too difficult to meet in residential areas. The reduced warrants are usually created to please elected officials. Cited by two references. (Reference 61 and 70).

21. Citizens perceive stop signs are effective as speed control devices because traffic "slows" at stop sign. If everybody obeyed the traffic laws, stop signs would reduce speeds on residential streets. Cited by one reference. (Reference 55).

22. Removal of multi-way stop signs does not change speeds but they are slightly lower without the stop signs. This study findings support the drivers behavior referenced in item #4, speed increases when unwarranted stop signs are installed. Speed decreases when the stop signs were removed! Cited by one reference. (Reference 64).

23. Multi-way stops degrade air quality and increase CO, HC, and Nox. All the starting and stopping at the intersection is bad for air quality. Cited by one reference. (Reference 68).

Speed Control Issues

24. There area many ways to "calm" traffic. Cited by twenty-two references. (Reference 1, 14, 20, 32, 33, 34, 35, 36, 37, 38, 40,41,42, 44, 45, 46, 47, 48, 50, 51, 53 and 66).

They include:

(a) Traffic Chokers (f) Sidewalks and Other Pedestrian Solutions

(b) Traffic Diverters (g) Neighborhood Street Design

(c) Speed Humps (h) On-Street Parking

(d) Roundabouts (i) One Way Streets

(e) Neighborhood Speed Watch (j) Street Narrowing

25. Other possible solutions to residential speed. Most speeding is by residents - Neighborhood Speed Watch Programs may work. This program works by using the principle of 'peer' pressure. Cited by seven references. (Reference 2, 30, 31, 36, 42, 48 and 53).

26. Reduced speed limits are not effective at slowing traffic. Motorists do not drive by the number on the signs, they travel a safe speed based on the geometrics of the roadway. Cited by five references. (Reference 1, 20, 39, 46 and 69).

27. Local streets should be designed to discourage excessive speeds. The most effective way to slow down traffic on residential streets is to design them for slow speeds. Cited by two references. (Reference 43, 52).

28. Speeding on residential streets is a seasonal problem. This is a myth. The problem of speeding is not seasonal, it's just that homeowners only see the problem in 'pleasant' weather. That's the time they spend in there front yard or walking the neighborhood. Cited by one reference. (Reference 2).

29. Speed variance and accident frequency are directly related. The safest speed for a road is the speed that most of the drivers feel safest driving. This speed creates the lowest variance and the safest road. Cited by one reference. (Reference 47).

30. The accident involvement rate is lowest at the 85th percentile speed. The 85th percentile speed is the speed that most drivers feel comfortable driving. The lowest variance is usually from the 85th percentile speed and the 10 mph less. Cited by one reference. (Reference 47).

31. Psycho-perceptive transverse pavement markings are not effective at reducing the 85th percentile speed but do reduce the highest speed percentile by 5 MPH. Cited by one reference. (Reference 47).

32. The safest residential streets would be short (0.20 miles) non-continuous streets that are 26 to 30 feet from curb to curb width. The short streets make it difficult of drivers to get up to speed. Cited by one reference. (Reference 52).

Economics of Multi-Way Stop Signs

Studies have found that installing unwarranted stop signs increases operating costs for the traveling public. The operating costs involve vehicle operating costs, costs for increased delay and travel time, cost to enforce signs, and costs for fines and increases in insurance premiums.

The total costs are as follows (Reference 55):

Operating Costs (1990) ($.04291/Stop)	$ 111,737/year
Delay & Travel Costs (1990) ($.03401/Stop)	$ 88,556 /year
Enforcement Costs (1990)	$ 837/year
Cost of Fines (19 per year)	$ 1,045/year
Cost of 2 stop signs (1990)	$ 280
Costs of increased insurance (1990)	$7,606/year
Total (1990)	**$210,061/year/intersection**

The cost to install two stops signs is $280. The cost to the traveling public is $210,061 (1990) per year in operating costs. This cost is based on about 8,000 vehicles entering the intersection per day.

Another study (62) found that the average annual road user cost increased by $2,402.92 (1988 cost) per intersection when converting from two to four way stop signs for low volume intersections.

Summary of Stop Signs as Speed Control Devices

Researchers found that multi-way stop signs do not control speed. In analyzing the 23 hypotheses for multi-way stop signs, five were favorable and 18 were unfavorable toward installing unwarranted all-way stop signs. The Chicago study (6) was the only research paper that showed factual support for "unwarranted" multi-way stop signs. They were found to be effective at reducing accidents at intersections that have sight distance problems and on-street parking.

It is interesting to note that residential speeding problems and multi-way stop sign requests date back to 1930 (63). The profession still has not "solved" this perception problem.

Summary of Economic Analysis

Benefits to control speeds by installing multi-way stop signs are perceived rather than actual and the costs for the driving public are far greater than any benefits derived from the installation of the multi-way stop signs.

W. Martin Bretherton Jr., P.E.

Chief Engineer, Traffic Studies Section

Gwinnett County Department of Transportation

75 Langley Drive

Lawrenceville, Georgia 30045

770-822-7412

brethema@co.gwinnett.ga.us

Appendix A

References used in Research of Multi-Way Stop Signs

1. Gerald L. Ullman, "Neighborhood Speed Control - U.S. Practices", ITE Compendium of Technical Papers, 1996, pages 111-115.

2. Richard F. Beaubein, "Controlling Speeds on Residential Streets", ITE Journal, April 1989, pages 37-39.

3. "4 Way Stop Signs Cut Accident Rate 58% at Rural Intersections", ITE Journal, November 1984, pages 23-24.

4. Michael Kyte & Joseph Marek, "Collecting Traffic Data at All-Way Stop Controlled Intersections", ITE Journal, April 1989, pages 33-36.

5. Chan, Flynn & Stocker, "Volume Delay Relationship at Four Way Stop Controlled Intersections: A Response Surface Model", ITE Journal, March 1989, pages 27-34.

6. La Plante and Kripidlowkdki, "Stop Sign Warrants: Time for Change", ITE Journal, October 1992, pages 25-29.

7. Patricia B. Noyes, "Responding to Citizen Requests for Multi Way Stops", ITE Journal, January 1994, pages 43-48.

8. Chadda and Carter, "Multi-Way Stop Signs - Have We Gone Too Far?", ITE Journal, May 1983, pages 19-21.

9. Gary Moore,"Gwinnett County Legal Opinions on Unwarranted Multi-Way Stops", March 6,1990.

10. Chadda and Carter, " The Changing Role of Multi-Way Stop Control", ITE Compendium of Technical Papers, 1983, pages 4-31 to 4-34.

11. Lovell and Haver, "The Safety Effect of Conversion to All-Way Stop Control", Transportation Research Record 1068, pages 103-107.

12. "Indiana Suggests Ways to Halt Stop Sign Misuse", Transafety Reporter, February 1989, page 7.

1978.

14. "State of the Art: Residential Traffic Management", US DOT, FHWA/RD-80/092, December 1980, pages 63-65, 22-23.

15. Dick Williams, "A New Direction for Traffic Dispute", Atlanta Journal, January 14, 1988, Section E, page 1.

16. "Warrants for Multi-Way Stop Signs" (2B-6), Manual on Uniform Traffic Control Devices, US DOT , FHWA, pages 2B-3 to 2B-4.

17. "Stop and Yield Sign Control", Traffic Control Devices Handbook, US DOT, FHWA, 1983, pages 2-14 to 2-16.

18. La Pante & Kropidlowdki, "Stop Sign Warrants ", Presented at ITE Conference, San Diego, CA, September 18, 1989.

19. Walt Rekuc, "Traffic Engineering Study of Multi-Way Stop Signs", City of Roswell, February 15, 1988.

20. Homburger, etal, Residential Street Design and Traffic Control, ITE, Washington, DC, 1989.

21. Speed Zone Guidelines, ITE, Washington, DC, 1993.

22. A Policy on Geometric Design of Highways and Streets, AASHTO, Washington, DC, 1994.

23. A.J. Ballard, "Efforts to Control Speeds on Residential Collector Streets", ITE Compendium of Technical Papers, 1990, pages 445-448.

24. C.E. Walter, "Suburban Residential Traffic Calming", ITE Compendium of Technical Papers, 1994, pages 445-448.

25. K.L. Gonzalez, " Neighborhood Traffic Control: Bellevue's Approach", ITE Journal, Vol. 43, No.5, May 1993, pages 43-45.

26. Brian Kanely & B.E. Ferris, "Traffic Diverter's for Residential Traffic Control - The Gainesville Experience", ITE Compendium of Technical Papers, 1985, pages 72-76.

27. Marshall Elizer, "Guidelines for the Design and Application of Speed Humps", ITE Compendium of Technical Papers, 1993, pages 11-15.

28. T. Mazella & D. Godfrey, "Building and Testing a Customer Responsive Neighborhood Traffic Control Program", ITE Compendium of Technical Papers, 1995, pages 75-79.

29. W.M. Bretherton and J.E. Womble, "Neighborhood Traffic Management Program", ITE Compendium of Technical Papers, 1992, pages 398-401.

30. J.E. Womble, "Neighborhood Speed Watch: Another Weapon in the Residential Speed Control Arsenal", ITE Journal, Vol. 60, No. 2, February 1990, pages 1- 17.

31. Michael Wallwork, "Traffic Calming", The Genesis Group, unpublished.

32. Doug Lemov, "Calming Traffic", Governing, August 1996, pages 25-27.

33. Michael Wallwork, "Traffic Calming", The Traffic Safety Toolbox, ITE, Washington, DC, 1993, pages 234-245.

34. Ransford S. McCourt, Neighborhood Traffic Management Survey, ITE District 6, Technical Chair, unpublished, June 3, 1996.

35. Halbert, etal, "Implementation of Residential Traffic Control Program in the City of San Diego", District 6 Meeting, July 1993.

36. Anton Dahlerbrush, "Speed Humps & Implementation and Impact on Residential Traffic Control", City of Beverly Hills, California, District 6 Meeting, July 1993.

37. Firoz Vohra, "Modesto Speed Hump Experience", District 6, ITE Meeting, July 1993.

38. Patricia Noyes, "Evaluation of Traditional Speed Reduction in Residential Area", District 6 ITE Meeting, July 1993.

39. Cynthia L. Hoyle, Traffic Calming, American Planning Association, Report No 456, July 1995.

40. Sam Yager, Use of Roundabouts, ITE Technical Council Committee, 5B- 17, Washington, DC, February 1992.

41. Guidelines for Residential Subdivision Street Design, ITE, Washington, DC, 1993.

42. Residential Streets, 2nd Edition, ASCE, NAHB & ULI, 1990.

43. Traffic Calming, Citizens Advocating Responsible Transportation, Australia, 1989.

44. Traffic Calming in Practice, Department of Transport, etal, London, November 1994.

45. Todd Long, "The Use of Traffic Control Measures in the Prevention of Through Traffic Movement on Residential Streets", unpublished, Masters Thesis, Georgia Tech, September 1990.

46. Patricia Noyes, "Evaluation of Traditional Speed Reduction Efforts in Residential Areas", ITE Compendium of Technical

Papers, District 6 Meeting, 1993, pages 61-66.

47. G.E. Frangos, "Howard County's Speed Control in Residential Areas Utilizing Psycho-perceptive Traffic Controls", ITE Compendium of Technical Papers, 1985, pages 87-92.

48. Halbert, etal, "Implementation of Residential Traffic Control Program in the City of San Diego", ITE Compendium of Technical Papers, District 6, 1993, pages 23-60.

49. Radwan & Sinha, "Gap Acceptance and Delay at Stop Controlled Intersections on Multi-Lane Divided Highways", ITE Journal, March 1980, page 38.

50. Borstel, "Traffic Circles : Seattle's Experience", ITE Compendium of Technical Papers,

1985, page 77.

51. D. Meier, "The Policy Adopted in Arlington County, VA, for Solving Real and Perceived Speeding Problems on Residential Streets", ITE Compendium of Technical Papers, 1985, page 97.

52. Jeff Clark, "High Speeds and Volumes on Residential Streets: An Analysis of PhysicalCharacteristics as Causes in Sacramento, California", ITE Compendium of Technical Papers, 1985, page 93.

53. Wiersig & Van Winkle, "Neighborhood Traffic Management in the Dallas/Fort Worth Area", ITE Compendium of Technical Papers, 1985, page 82.

54. Improving Residential Street Environments, FHWA RD-81-031, 1981.

55. Carl R. Dawson, Jr., "Effectiveness of Stop Signs When Installed to Control Speeds Along Residential Streets", Proceedings from Southern District ITE Meeting, Richmond, Virginia, April 17, 1993.

56. Arthur R. Theil, "Let Baton Rouge's Traffic Engineers Decide Whether Signs Are Needed", State Times, LA, August 30, 1983.

57. Gary James, "Merits Being Totally Ignored in This Instance", Morning Advocate, Baton Rouge, LA, July 30,1983.

58. James Thomason, "Traffic Signs Allow Crossing", Morning Advocate, Baton Rouge, LA, July 30, 1983.

59. "City-Parish Must Move Stop Signs", Morning Advocate, Baton Rouge, LA, 1983.

60. Synthesis of Safety Research Related to Traffic Control and Roadway Elements, Vol. 2, FHWA Washington, D. C., 19982.

61. B.H. Cottrell, Jr.,"Using All-Way Stop Control for Residential Traffic Management",

Report No. FHWA VTRC 96-R17, Virginia Transportation Research Council, Charlottesville, Virginia, January, 1996.

62. Eck & Diega, "Field Evaluation at Multi-Way Versus Four-Way Stop Sign Control at Low Volume Intersections in Residential Areas", Transportation Research Record 1160, Washington, DC, 1988, pages 7-13.

63. Hanson, "Are There Too Many Four-Way Stops?", Traffic Engineering, November 1957, pages 20-22, 42.

64. Beaubien, "Stop Signs for Speed Control", ITE Journal, November 1976, pages 26-28,

65. Antwerp and Miller, "Control of Traffic in Residential Neighborhoods : SomeConsiderations for Implementation", Transportation 10, 1981, pages 35-49.

66. Lipinski, "Neighborhood Traffic Controls", Transportation Engineering Journal, May 1979, pages 213-221.

67. Richardson,"A Delay Model for Multi-Way Stop Sign Intersections", TransportationResearch Record 1112, Washington, DC, 1987, pages 107-114.

68. Briglin, "An Evaluation of Four-Way Stop Sign Control", ITE Journal, August 1982,

pages 16-19.

69. Ullman and Dudek, "Effects of Reduced Speed Limits in Rapidly Developing Urban Fringe Areas", Transportation Research Record 1114, 1989, pages 45-53.

70. Robert Rees, "All-Way STOP Signs Installation Criteria", Westernite, Jan-Feb 1999, Vol 53, No. 1, pg 1-4.

71. Wes Siporski, "Stop Sign Compliance", posting on Traffic Engineering Council List Serve, Jan 15, 1999.

Appendix B

Additional References for Multi-Way Stop Signs

Not included in Analysis - Reports not available

1. Improving Traffic Signal Operations, ITE Report IR-081, August 1995.

2. Kunde, " Unwarranted Stop Signs in Cities", ITE Technical Notes, July 1982, page 12.

3. "In search of Effective Speed Control", ITE Technical Notes, December 1980, pages 12-16.

4. "Stop Signs Do Not Control Speed", ITE Technical Notes, July 1978, pages 6-7.

5. "An Evaluation of Unwarranted Stop Signs", ITE San Francisco Bay Area, February 1979.

6. "Cost of Unnecessary Stops", Auto Club of Missouri, Midwest Motorists, 1974.

7. Nitzel, Schatter & Mink, "Residential Traffic Control Policies and Measures", ITE Compendium of Technical Papers, 1988.

8. Weike and Keim, "Residential Traffic Controls", ITE Compendium of Technical Papers, Washington DC, August 1976.

9. Landom and Buller, "The Effects on Road Noise in Residential Areas", Watford, United Kingdom, October 1977.

10. Wells and Joyner, "Neighborhood Automobile Restraints", Transportation Research Record 813, 1981.

11. Byrd and Stafford, "Analysis of Delay and User Costs of Unwarranted Four Way Stop Sign Controlled Intersections", TRR 956, Washington, DC, 1984, pages 30-32.

12. Marconi, "Speed Control Measures in Residential Areas", Traffic Engineering, Vol. 47, No. 3, March 1977, pages 28-30.

13. Mounce, "Driver's Compliance with Stop Sign Control at Low Volume Intersections", TRR 808, TRB, Washington, DC, 1981, pages 30-37.

14. Orlob, "Traffic Diversion for Better Neighborhoods", Traffic Engineering, ITE, Vol. 45, No. 7, July 1975, pages 22-25.

C:\WPERF60\MARTIN\MULTIWAY.WPD

Responding to Citizen Requests for Multiway Stops

BY PATRICIA B. NOYES

The use of multiway stops for speed control is a subject that has received a great deal of attention from citizens and far too little conclusive discussion by traffic engineers. In an effort to address the ongoing surge of citizen requests to install four-way stops for speed control, the staff of the Boulder (Colo.) Transportation Division completed a literature search on the use of multiway stops and conducted local studies on their effectiveness and driver compliance. The purpose of this study was to identify the issues related to the use of multiway stops and to help citizens understand some of the negative side effects of their use. The effort was intended to develop an information piece that could be used in discussions with citizens. The remainder of this article is intended for that use and can be used as a basis for other local efforts to develop public information strategies.

Considerations for the Installation of Stop Signs

Multiway stop signs usually are requested to address speeding and safety problems in residential areas. Boulder's studies on compliance and speed were an attempt to examine the effectiveness of stop signs for these uses. In addition to these issues, there are several other areas that need to be examined and discussed in considering the use of multiway stops. A number of these are outlined below.

Conversion Factors		
To convert from	to	multiply by
ft	m	0.3048
mph	kmh	1.609

Compliance

Stop signs are used to improve the safety of an intersection by assigning right-of-way; therefore, compliance with stop signs is essential for their effectiveness. Several studies have shown that in situations where stop signs are installed but are not warranted, based on nationally adopted standards, there is a low level of compliance. In these cases, motorists were observed either rolling or running a stop sign. When a driver does not believe that a restrictive sign appropriately reflects the conditions, the driver often disregards it.

This was studied in Boulder and the results are summarized in Table 1. Stop sign compliance studies were completed at nine four-way and four three-way stop locations. Of the 900 cars observed at the four-way locations, 23 percent made a full stop. Of the 350 vehicles observed at three-way locations, 7 percent stopped. The majority of the observed cars at all locations made a rolling stop (slowed to less than 3 miles per hour (mph) but did not come to a complete stop).

The highest compliance levels occurred at the higher volume, four-way stop locations. The three locations that significantly exceeded the average compliance rate involved higher volumes with higher percentage side street traffic. These locations experienced 39 percent to 40 percent compliance. The one other location that exceeded the average compliance level experienced 26 percent compliance. This location would require tree trimming for sight distance in order to remove the stops from the main street.

Three-way stops showed the lowest compliance with 11 percent of the 350 cars observed driving through the stop sign in excess of 3 mph.

Speed Control

There is a common belief among the general public that stop signs provide relief from traffic speeding problems. On the face, it would appear reasonable that when approaching a stop sign, motorists have to slow down. However, studies conducted nationwide have shown that the speeds within a block of the stop sign are either unaffected by the stop sign or, in some cases, actually increase. At the point of installation, speeds are reduced, but the effect on traffic approaching or leaving the controlled location is negligible. Some motorists actually increase their speed to make up for the inconvenience.

Speeds approaching and downstream of multiway stop signs in Boulder were studied are summarized in Table 2. Speed studies were conducted an average of 500 feet (ft) from the stop sign on the approach to, and downstream from, four four-way and two three-way stop locations. The average 85th percentile speeds (85 percent of the vehicles traveled that speed or less) were 35 mph on the approach and 34

Table 1. City of Boulder Stop Sign Compliance Study

Four-Way Stops Location Date/Time	Stop %	Roll %	No Stop %	Total Observed
	Stop Sign Compliance			
Maxwell & 9th 6-20/3:30-3:39	21	75	4	100
Manhattan & Illini 6-19/4:30	26	71	3	100
Alpine & 13th 6-19/3:42-3:58	39	60	1	100
Balsam & 19th 6-19/3:30-3:38	40	59	1	100
Walnut & 33rd 6-19/3:12-3:22	19	79	2	100
Arapahoe & 6th 6-19/2:50-3:05	39	60	1	100
Wonderland & Poplar 6-29/8:08-8:40	11	82	7	100
Brooklawn & Laurel 6-28/4:20-5:05	7	88	5	100
College & 7th 6-29/4:20-5:30	6	79	15	100
Average Compliance	23	73	4	900
Three-way Stops				
Kalmia & 26th 6-20/3:47-4:14	9	76	15	100
Gallaspie & Julliard 6-22/4:00-4:55	11	80	9	100
Albion & Toedtli 6-26/4:30-5:30	8	82	10	50
Manhattan & Cimmaron 6-21/4:33-5:15	2	89	9	100
Average Compliance	7	82	11	350

mph downstream from the stop sign. The mean vehicular speeds were 31 mph and 30 mph, respectively.

Two of the six locations were posted 30 mph and the others were posted 25 mph. The average 85th percentile speed for the 30 mph locations was 36 mph and the mean speed was 32 mph. The average 85th percentile speed for the 25 mph locations was 34 mph and the mean speed was 30 mph. These are comparable or greater than speeds observed on other Boulder residential streets.

Safety

Studies have shown differing effects on accident rates at intersections before and after the installation of multiway stops. In some cases the accident rates

increased, in others they decreased and in still others there were no significant changes. General engineering belief is that the unwarranted use of stop signs potentially decreases safety at the intersection because of the disregard of these controls as observed in the compliance studies; however, no study has definitively proved this. A recent article on Chicago's (Ill.) experience with the use of multiway stops indicates that the accident rates might be reduced at low-volume intersections (see LaPlante and Kropidlowski[1]).

Motorist Delay

The unwarranted use of stop signs increases vehicle delay. Where the proper use of multiway stops occurs, the increase in delay on the main street is offset somewhat by the reduced delay on the side street. However, in an unwarranted situation, there is minimal delay on the side street and overall delay is increased significantly by the required stop of all traffic on the main street.

Excessive Restrictions on the Public

The unwarranted use of stop signs creates excessive restrictions on the motoring public. This creates a great deal of frustration and, as previously mentioned, disrespect for traffic control devices. It also is contradictory to the legislative intent of the Uniform Vehicle Code and Model Traffic Ordinance 1987, which states that, "The proper purpose of all traffic legislation is not to impose unnecessary or unreasonable restrictions on highway traffic, but to insure, as far as this can be done by law and its application, that traffic shall move smoothly, expeditiously and safely."

The motto of the committee is "Safety with Freedom Through Law," which summarizes its philosophy "to provide to every highway user, through law, a maximum degree of safety within the framework of traditional freedoms."

The *Traffic Control Devices Handbook* states, "The most effective traffic control device is that which is the least restrictive while still accomplishing the intended purpose."[2]

Environmental Effects

The unwarranted use of stop signs affects the environment in terms of air pollution, noise impacts and fuel consumption.

Air Pollution

The effects of stopping and idling increase automobile exhaust. A study of 10 four-way stop intersections in Michigan found: "The total additional emissions of carbon monoxide were 1,287,500 pounds per year, hydrocarbons totaled 79,200 pounds per year and oxides of nitrogen totalled 83,000 pounds per year. These quantities indicate the magnitude of the additional emissions attributable to four-way stop sign control at these intersections."

Noise Impacts

Additional traffic noise also is associated with stopping and starting. Braking and acceleration increase tire noise and engine noise. Stop signs also increase the amount of time any one vehicle is at a particular point. Therefore, residents living near the stop controlled intersection will experience an increase in traffic noise.

Fuel Consumption

Stopping, accelerating and idling also increase the amount of fuel consumed by a vehicle. A California study in 1982 found that deceleration and acceleration for each stop an average passenger car makes, 0.0173 gallons of fuel is consumed. This would mean that for every unwarranted stop sign installed on a street with 10,000 cars per day, 173 additional gallons of gasoline would be consumed in a day, or 63,145 additional gallons would be consumed in a year.

Pedestrian Exposure

Although it is commonly believed that stop-controlled intersections provide increased safety for pedestrians, this might not be accurate at locations where adequate gaps in traffic exist and the stop signs are unwarranted. If a stop sign is installed under these conditions, a vehicle is present at the intersection for a much longer period while it slows, stops and accelerates. This actually causes an increase in the exposure time

Table 2. City of Boulder Speed Study

Stop Location Street/posted speed	Speed Studies Approach Speed 85th%	Average	Downstream Speed 85th%	Average
Balsam & 19th	38		39	
19th Street/30 mph	33		35	
Walnut & 33rd	35		32	
Walnut/30 mph	31		29	
Brooklawn & Laurel	33		32	
Brooklawn/25 mph	30		29	
Arapahoe & 6th	33		31	
Arapahoe/25 mph	29		28	
N. 26th & Kalmia	37		37	
N. 26th/25 mph	32		32	
Gillaspie & Emerson	33		32	
Gillaspie/25 mph	29		29	
Average 85th	35		34	
Mean Speed	31		30	

100 Observations were made at each location, 50 each direction.
Speeds were shot 400ft.-600 ft. from stop sign.

of the pedestrian to vehicles and reduces or eliminates the natural gaps in traffic at the intersection by increasing the time each vehicle is present.

The other major exposure issue is that of the pedestrians to drivers who will violate the stop control. As has been observed, compliance at unwarranted stops is low and this leaves pedestrians vulnerable to these violations. This presents a particular hazard to children, whose size might make them less immediately visible to drivers.

Clarity of Traffic Control

Traffic control devices are designed to inform drivers of roadway and traffic conditions with minimal opportunity for confusion or misinterpretation. Stop signs are used to assign right-of-way to a through street by stopping traffic on the minor street. The motoring public expects the uniform application of traffic control devices and would not expect a stop sign on the major street. This potential for confusion aggravates the observed compliance problem and cre-

ates a potential safety hazard.

Legal Responsibilities

Variations from accepted warrants without documented exceptional conditions present potential liability concerns for the responsible jurisdiction. If a stop sign installation could be considered irresponsible or in clear contradiction to accepted standards, liability suits could result.

Summary

Existing studies and information on the use of multiway stop signs are far from conclusive. There are however, a variety of studies that provide some important insights into their use. The recent article by LaPlante and Kropidlowski provides a comprehensive review of the use of accident experience associated with the use of multiway stop signs. It recommends that the existing *Manual on Uniform Traffic Control Devices* warrants for multiway stops be reviewed and potentially revised to address local residential streets in urban areas more effectively. Although a review of the warrants might be appropriate, it should be done with respect to a variety of implications.

The issues for consideration discussed in this article include:

- Compliance
- Speed Control
- Safety
- Motorist Delay
- Excessive Restrictions on the Public
- Environmental Effects
- Pedestrian Exposure
- Clarity of Traffic Control
- Legal Responsibilities

These issues should be included in any discussion on the use of multiway stop signs. This list and the discussion of these issues is an attempt to open the discussion in a way that helps engineers and citizens alike examine the implications of using multiway stops. There are certainly other concerns that could be added to this list based on the experience of others.

The engineering community and the public need to consider all of the implications of multiway stop sign use and continue to study the impacts of their use so in order to work together to appropriately address specific traffic control issues.

References

1. LaPlante, John N. and Chester R. Kropidlowski. "Stop Sign Warrants: Time for Change." *ITE Journal*, Vol. 62, No. 10 (October 1992): 25-29.
2. U.S. Department of Transportation. *Traffic Control Devices Handbook*. Washington, DC: Federal Highway Administration, 1983.

Bibliography

American Traffic Safety Services Association Inc. *ATSSA Newsletter*, 1989.

Baumgaertner, William E. "In Search of Effective Speed Control." *Institute of Transportation Engineers Technical Notes*, December 1980, 12-16.

Beaubien, Richard F. "Citizen Participation in Traffic Safety." *ITE Journal*, Vol. 52, No. 3 (March 1982): 29-31.

Beaubien, Richard F. "Controlling Speeds on Residential Streets." *ITE Journal*, Vol. 59, No. 4 (April 1989): 37-39.

Beaubien, Richard F. "Stop Signs for Speed

Control?" *Traffic Engineering*, November 1976, 26-28.
Briglia, Peter M., Jr. "An Evaluation of 4-Way Stop Sign Control." *ITE Journal*, Vol. 52, No. 8 (August 1982): 16-19.
Chadda, Himmat S. and Everett C. Carter. "Multi-Way Stops—Have We Gone Too Far?" *ITE Journal*, Vol. 53, No. 5 (May 1983): 19-21.
Holmburger, Wolfgang S., et al. *Residential Street Design and Traffic Control*. Englewood Cliffs, NJ: Prentice-Hall, 1989.
"Indiana Suggests Ways to Halt Stop Sign Misuse." *TRANSAFETY Reporter*. Vol. VII, No.2 (February 1989): 7.
Lum, Harry S. and Martin R. Parker Jr. "Intersection Control and Accident Experience in Rural Michigan." *ITE Journal*, Vol. 53, No. 5 (May 1983): 27-29.
National Committee on Uniform Traffic Laws and Ordinances. *Uniform Vehicle Code and Model Traffic Ordinance*, 1987.
U.S. Department of Transportation. *Manual on Uniform Traffic Control Devices*. Washington, DC: Federal Highway Administration, 1988.

Patricia B. Noyes is a principal in the engineering and management consulting firm of Pat Noyes & Associates. Previously, she was traffic operations engineer for the city of Boulder, Colo., for eight years and transportation planning engineer for Boulder County before that. She currently serves as secretary/treasurer for the Colorado/Wyoming Section of ITE and chaired the section's Technical Committee on Residential Speed Control in 1987-88. She received an M.S.C.E. from the University of Colorado, Boulder; and M.A. from McMaster University, Hamilton, Ontario; and a B.A. from Northwestern University, Evanston, Ill. She is an Associate Member of ITE.

ITE's Electronic Bulletin Board

The ITE Bulletin Board System can be accessed by anyone with a modem and PC by dialing 800/982-4683. The bulletin board allows users to:

- Exchange technical information
- Make technical inquiries
- Leave or get messages
- Download files
- Get the latest information on Positions available or wanted up to six weeks before publication in *ITE Journal*
- Access lists of *Journal* articles
- Review "Washington Reports"
- And much more

If you need more information about what the BBS has to offer or have questions about using it, call the systems operator at ITE Headquarters at 202/554-8050.

Traffic Calming

Stop Signs

The Portland Bureau of Transportation System Management encourages safe and calm travel on Portland streets. So when F Bureau about a traffic or safety problem, an investigation is conducted to determine the best solution -- such as a sign or sign

The city installs stop signs where there might be a question about who should have the right-of-way to prevent crashes. Howe placed at intersections where they're not needed could tempt drivers to run stop signs or cut through other neighborhood stre

One problem often reported to the Bureau is speeding--so residents ask for a stop sign. Stop signs may often seem like a goo neighborhood speeding, but traffic studies and experience show that using stop signs to control speeding doesn't necessarily signs are installed to slow down speeders, drivers may actually increase their speed between signs to compensate for the tim stopping. Some drivers tend to accelerate rapidly after a stop, possibly creating an even more dangerous situation. In fact, m their top speed within 100 feet of a stop sign.

So why not have a stop sign at every intersection? Too many stop signs could cause motorists to ignore the right-of-way rule may simply choose to ignore the stop sign. More stop signs in a neighborhood can result in higher levels of pollution and mor providing stop signs at all intersections would be very expensive.

The Bureau considers where to place stop signs so they provide the best benefit for the neighborhood. Stop signs in one loca traffic on nearby streets. Drivers may seek new routes to avoid stop signs, which can lead to new traffic problems in adjacent Also, putting a stop sign on one street could foster higher speeds on the intersecting streets.

The final decision to install a stop sign is made after traffic engineers at the City of Portland's Bureau of Transportation Syste consider the flow and volume of traffic, the configuration of the intersection and crash reports. If you believe your street might sign, please review the following criteria before you contact the Bureau with your concerns.

The primary reason for stop signs in the City of Portland --

Stop signs are installed at intersections where drivers cannot safely apply the right-of-way rule, resulting in an increase in cra

Criteria for Two-Way Stop Signs --Two-way stop signs are used:

- Where a street enters a Through street; or
- Where a safe approach speed is less than 10 mph due to permanent visibility obstructions -- such as buildings, trees or shrubs; or
- Where crash history indicates three or more reported crashes over the last three years, and the crashe could have been avoided by the use of a stop sign; or
- Where circumstances and crash history indicate that observing the normal right-of-way rule could still b hazardous, resulting in crashes.

4-WAY Criteria for Four-Way or All-Way Stops:

In most cases, a two-way stop sign is sufficient to define who has the right-of-way. A four-way or all-way stop is considered o intersection with a two-way stop is the site of numerous crashes or traffic congestion problems. Four-way stop signs are used

- Where traffic signals are needed; four-way or all-way stops may be used as an interim measure; or
- On local streets, where there has been five or more reported crashes in a two-year period. These crasl would likely have been prevented by an all-way stop; or
- On through streets, where within a two-year period the intersection had at least 1.5 crashes per million vehicles entering the intersection, and the crashes would likely have been prevented by all-way stops;
- Where the number of vehicles entering an intersection averages at least 500 vehicles per hour for any hours of a typical day, and the combined vehicular and pedestrian volumes from the minor street avera at least 200 per hour for the same eight hours.

Right of Way Rule - The failure to yield the right of way at an uncontrolled intersection.

A person commits the offense of failure to yield the right of way at an uncontrolled intersection (an intersection without any tra if the person is operating a vehicle that is approaching an uncontrolled intersection and the person does not look out for and g any driver on the right simultaneously approaching a given point, regardless of which driver first reaches and enters the inters 811.275)

Go To Top

Print-friendly version

Legal

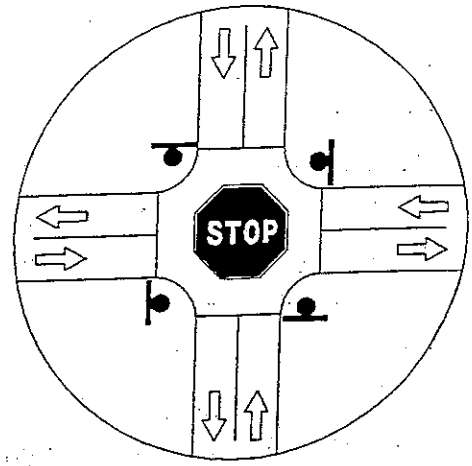
ALL-WAY STOPS

CHAPTER 15

The Manual on Uniform Traffic Control Devices (MUTCD) and Traffic Engineers Handbook (TEH) have established specific warrants for installation of 4 way or all way stops. These warrants were developed to assist in determining whether or not 4 way stop signs could help assign right of way at higher volume intersections reduce an accident problem, or fill in as an interim measure until traffic signals could be installed. Considerations outside established warrants are restricted intersection sight distances, and school crossings. Studies have shown that 4 way stop signs are not an effective technique for controlling speeds and should not be used to reduce traffic volumes, or simply to satisfy citizen demands. It should be remembered that stop signs constitute one of the most significant means of separating and controlling traffic movements and should be carefully considered.

Effects

Volumes. Four-way stop signs produce no net reduction of traffic volumes if traffic is primarily local in make-up. Where there is existing shortcutting thru traffic, stop signs may reduce volumes; however, the effectiveness of the 4-way stop as a deterrent to thru traffic is dependent on stop sign saturation, heavy enforcement and the availability of useful alternative routes. Often the alternative route is another adjacent residential street, and problem traffic is merely displaced, not eliminated.



Speeds. Studies have typically shown 4-way stops do not have a significant impact on vehicular speeds. Overall area speeds have shown minimal reductions near the intersection. In midblock areas, where most accidents involving young pedestrians occur, speed increases are frequently the result.

Safety. It is not clear whether 4-way stop signs will improve safety when they do not meet established warrants. In some cases accidents actually increase, possibly due to the stop signs being unexpected or deemed unnecessary thereby encouraging rolling stops, or by instilling a false sense of security in crossing motorists and pedestrians. Studies have shown that stop signs that do not meet warrants are basically ignored by many drivers. Also as mentioned before, speeds tend to increase in the mid block areas where most young pedestrian accidents occur. However, if warrants are met or where sight distances are poor - an all way stop may increase safety.

Traffic Noise, Air Quality, Energy Consumption. Noise is increased near the intersection due to the increased activity of acceleration (many drivers speed up to make up for time lost at the stop sign) and added braking. Adjacent residents may complain about the additional noise.

Air quality is worsened and fuel consumption is increased due to added deceleration, acceleration and idling. Unnecessary stops reduce the efficient movement of traffic flow, by increasing travel time on the route.

Community Reaction. Mixed. Some residents would feel "anything is better than nothing" or are misinformed about the potential impacts. Some view this measure as a safety improvement. Others view this measure as an unnecessary impediment to reasonable movement thru the area and an encouragement to "blow the stop signs" in the area. Many residents in the immediate vicinity of all-way stop signs view them in a positive manner. It is up to traffic engineers or other governing agents to responsibly determine the best traffic control under the specific circumstances based on reasonable guidelines.

Additional Considerations

Installation of all-way stop signs is often used by a governing body as an immediate, tangible and inexpensive response to a neighborhood's concern about safety on a local residential street. The use of stop signs creates a solution which is one of perception rather than effective improvement. This misuse of stop signs should be resisted by the local traffic engineer and governing body. Some studies have shown that the warrants for stop signs can be expanded to include other considerations such as presence of designated school crossings and sight distance problems. The failure to follow the established warrants, to install stop signs without specific justification, may have legal implications to the local government agency.

Warrants for All-Way Stops (Section 2B-6 MUTCD)

1) Where traffic signals are warranted and urgently needed, the multiway stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for signal installation.

2) An accident problem, as indicated by five or more reported accidents of a type susceptible of correction by a multiway stop installation in a 12 month period. Such accidents include right and left turn collisions, as well as right angle collisions.

3) Minimum traffic volumes:

a) The total vehicular volumes entering the intersection from all approaches must average at least 500 vehicles per hour for any eight hours of an average day and

b) The combined vehicular and pedestrian volumes from the minor street or highway must average at least 200 units per hour for the same eight hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the maximum hour, but

c) When the 85 percentile approach speed of the major street exceeds 40 mph, the minimum vehicular volume warrant is 70 percent of the above requirements.

Reference

Manual on Uniform Traffic Control Devices

Wingra/Mills Corridor.

From: Matt Sloan <district13@council.ci.madison.wi.us>
To: Operations Center <wuopc@ci.madison.wi.us>
Date: 11/7/02 9:51:50 PM
Subject: Re: Wingra Drive

Hi Tom,

Thanks for your email. I've been working with Dave Vogel, a resident on Wingra, to get the street onto the Neighborhood Traffic Management Program, the city program that funds traffic calming measures. We've also been working on the street as part of the St. Mary's expansion proposal. So, there has been some organization, though I suppose it's been fairly quiet.

Thanks for your thoughts,

Matt

Operations Center wrote:

> Tom Arneson1218 Fish H atchery Rd.ph! 438-4741email:
> tarneson@ci.madison.wi.us To: Matt Sloan Re : Wingra Drive Matt, I
> am inquiring about a notice regarding Wingra Drive sewer replacement.
> There was a meeting regarding this project on July 22 of this year, I
> was unable to attend and am unsure of what transpired.I did call the
> city engineering department a while back, before the July 22 meeting,
> and talked with either Larry Nelson or Ron Loresch about the project.
> The sewer replacement work is not likely to be done until next year
> unless we get unseasonably warm weather.In the proceess of replacing
> the sewer they are going to tear up much of the street and
> consequently going to need to resurface.It would be nice given the
> history of this street if we could get some traffic calming measures
> enacted in the form of small islands or narrowing of the street in
> places etc. .This is the opportune time given that the street isn't
> likely to be resurfaced for another twenty five or thirty years. My
> concern is also that I don't beleive many of the neighbors are aware
> of this or correlate this work being done with the potential of
> adopting measures to slow traffic - probaby many of them the same
> neighbors that pushed for blocking that street off a decade ago.As a
> nearby resident on Fish Hatchery road I think it would be nice to have
> something more aesthetically pleasing on that street other than
> looking like a highway going through a scenic neighborhood. Also, it
> would be nice to have something instead of or in addtion to those
> rediculous stop signs to slow down traffic. Those stops are hated by
> many in the neighborhood -nor are they all that effetive at slowing
> people down and create a lot of noise as vehicles accelerate and
> decelerate.I am hoping you can do somthing to facilitate a process
> here. I am very busy right now doing home remodeling and do not have
> the the time to go about organizing the neighborhood. Maybe some sort
> of meeting could be arranged for the residents living in around Wingra
> Drive to discuss what is possible and how we would like the street to
> look when it is resurfaced for the next thirty years.I would hate to
> see this opportunity to improve our neighborhood squandered. In the
> summer of 2001 Mills street, which then basically becomes Wingra

> drive, was redone with to my knowledge no input from our neighborhood
> and consequently no improvements. It would be nice if this opportunity
> didn't pass us by as well.Your assistance would be much appreciated
> and thanks for your consideration. tarneson@ci.madison.wi.us

CC: David Vogel <atomicinteriors@att.net>, Larry Nelson <LNELSON@ci.madison.wi.us>, David Dryer <ddryer@ci.madison.wi.us>

TRAFFIC AND SAFETY INFORMATIONAL SERIES
FREQUENTLY ASKED QUESTION #13

WHY CAN'T WE HAVE STOP SIGNS TO REDUCE SPEEDING ALONG MY STREET?

One of the complaints that people have in residential areas is that vehicles constantly speed by the front of their house. They are concerned about the safety of their children. These residents frequently request the erection of additional stop signs. The addition of a stop sign, however, usually does not solve the problem.

WHY DON'T WE JUST INSTALL ANOTHER STOP SIGN?

A stop sign is an inconvenience to motorists. Because of this, stop signs should only be placed if they meet a *Manual on Uniform Traffic Control Devices* (MUTCD) warrant. Stop signs are frequently violated if unwarranted. Before warrants are even considered, however, less restrictive measures (such as a yield sign) are usually considered. In certain cases, the use of less restrictive measure or no control at all will accommodate traffic demands safely and effectively.

WARRANTS FOR A STOP SIGN

Because a stop sign is an inconvenience to through traffic, it should be used only where needed. A stop sign may be warranted at an intersection where one or more of the following conditions exist:

- intersection of a less important road with a main road where application of the regular right-of-way rule is hazardous;
- street entering a through highway or street;
- unsignalized intersection in a signalized area;
- other intersections where a combination of high speed, restricted view, and serious accident record indicates a need for control by the stop sign.

A yield sign can also be considered where a full stop is not necessary. Existing sign installations should be reviewed to determine whether the use of a less restrictive control or no control at all could accommodate the existing and projected traffic flow safely and more effectively.

WHERE SHOULD A STOP SIGN BE INSTALLED?

Stop signs should be installed/located where the vehicles are to stop or as near to that point as possible. The sign may also be supplemented with a stop line and/or the word STOP on the pavement. A yield sign is erected in the same manner. Where there is a marked crosswalk, the stop or yield sign should be erected approximately four feet in advance of the crosswalk line.

When only one stop or yield sign is used on an intersection approach it should be on the right side of the roadway. At wide intersections, however, violations of the yield or stop sign may be reduced by the erection of an additional sign on the left side of the approach. If two lanes of traffic exist on an approach, at least one stop sign should be visible to each lane of traffic.

CAN STOP SIGNS CONTROL SPEED?

Many studies have shown that stop signs are not an effective measure for controlling or reducing midblock speeds. In fact, the overuse of stop signs may cause drivers to carelessly stop at the stop signs that are installed. In stop sign observance studies approximately half of all motorists came to a rolling stop and 25 percent did not stop at all. Stop signs can give pedestrians a false sense of safety if it is assumed that all vehicles will come to a complete stop at the proper location. A study conducted by Beaubien also showed that placing stop signs along a street may actually increase the peak speed of vehicles, because motorists tend to increase their speed between stop signs to regain the time spent at the stop signs.

WHAT CAN WE DO INSTEAD OF INSTALLING A NEW STOP SIGN?

There are many alternatives to stop signs. For example, a concept called *traffic calming,* the combination of physical controls and community support, might be a good alternative for some communities. Calming measures can be installed as part of an areawide traffic management plan or on a single street and involve local law enforcement, emergency and maintenance officials, engineers, and the community.

Some communities also start interneighborhood programs to address the problem of the speeding and safety in their neighborhood areas. Often times, the true problem stems mostly from drivers that live in the neighborhood. By simply raising awareness of the issue, drivers in the neighborhood may adjust their driving and decrease their speeds.

Unfortunately, there is no general solution to the problem of speeding traffic. There will always be drivers that speed through residential areas. It is important for residents in a neighborhood to be aware of this issue.

For more information

For more information, please contact _____.

As more and more vehicles are on our streets, traffic volumes seem to continuously grow and speeds seem to increase on many streets. These concerns are reflected in the increasing number of calls being received by the City of Apple Valley. Many of those calls are also asking for installation of stop signs to divert or slow traffic.

Do stop signs really work or are they just another symbol that really does not deter traffic? Does a stop sign installation create larger traffic problems? Are they effective in slowing and diverting traffic?

Several studies of stop signs installed for this very purpose don't back up the commonly held beliefs.

Did you know... Studies generally have shown that too many stop signs and/or unwarranted stop signs create a host of undesirable traffic safety conditions.

A stop sign is one of the most valuable and effective traffic control devices, when used at the right place and under the right conditions. It can also create a dangerous situation and diminish the effectiveness of other signs when improperly used.

So why not have a stop sign installed when a neighborhood requests it?

Speeds aren't reduced by stop sign installation
Studies have shown that speeds can actually increase between stop signs, up to 3-5 mph faster. Some drivers are irritated by "speed control stop signs" and develop tendencies to make up for lost time by over-accelerating or traveling at higher speeds.

INFO FROM OTHER CITY

Diversion of traffic is not often achieved through stop sign use
Most of the traffic on the street is there by choice and installation of a stop sign will not cause the traffic to re-route itself. While stop signs may divert a small amount of traffic, the diverted traffic may simply choose a residential street as easy as choosing a more regional roadway.

Effectiveness of stop signs is much lower than most people believe
At unwarranted stop signs, where the motorists are not certain why the sign has been installed, the compliance is relatively poor.

Did you know... When not required to stop by cross traffic, only 5-20 percent of all drivers will come to a complete stop, 40-60 percent will come to a "rolling" stop below 5 mph, and 20-40 percent will pass through at higher than 5 mph. (National Transportation Engineering Association Study)

Noise, air quality, and accidents from decelerating and accelerating vehicles
Residents adjacent to a stop sign may see lower speeds. There also tends to be more noise, an increased incidence of rear end collisions, and an air quality element associated with vehicle stops at intersections.

Creating a false sense of security
Installation of a stop sign does not improve safety or provide a secure or safe haven for children to play. Children should be actively discouraged from playing in or directly adjacent to any street regardless of volume.

So where are stop signs justified?

Stop signs are installed when meeting the MnDOT guidelines and "warrants" relating to traffic volume, visibility, and traffic flow. These criteria are included as part of a detailed study, which ultimately provide standardization across communities.

Traffic Volume
Traffic volumes may suggest a need for a stop sign, with a lower volume street typically qualifying for a stop sign as it intersects a higher volume street.

Accidents
The frequency of accidents at an intersection may suggest a need for additional traffic control devices.

Other Conditions
Stop signs can also be installed at local street intersections where there is a specific hazard, such as limited sight distance and where volume of traffic and hazard combine to make stop sign controls effective.

Did you know... National studies have shown that accident rates have actually increased at intersections where stop signs have been installed without meeting warrants or where circumstances did not justify the installation. Reasons for this include drivers ignoring what they perceive to be an unnecessary stop sign, too many stop signs along a roadway, or pedestrians believing that vehicles will stop at a stop sign.

If, after reviewing this pamphlet, your neighborhood believes the City should consider the installation of a stop sign, please send or e-mail a letter outlining your request to:

City of Apple Valley
Public Works Department
7100 147th Street West
Apple Valley, MN 55124
pubworks@ci.apple-valley.mn.us

U.S. Department of Transportation
Federal Highway Administration

Intersection Safety Brief

Back to the List of Intersection Safety Briefing Sheets

10

Intersection Safety: Myth Versus Reality

Traffic engineering decisions about intersection safety are often the product of factors and relationships that are more complex than the casual observer may realize. In many cases, evaluating potential solutions to crash or violation problems may reveal aspects of intersection safety and efficiency that are in conflict with one another. In reality, traffic engineers must always consider a balance between managing safety and improving intersection operations before making their final choice for intersection control.

The driving public has developed a number of misconceptions about traffic control solutions over the years. This brief attempts to expose some of those myths and shed light on the rationale behind certain traffic control decisions.

Myth 1: Installing signals always makes intersections safer.

Reality:

The installation of unwarranted signals, or signals that operate improperly, can create situations where overall intersection congestion is increased, which in turn can create aggressive driving behavior.

When more complex signal phasing causes longer waiting times at intersections, both drivers and pedestrians tend to become impatient and violate red lights, or drivers are tempted to cut through neighborhood streets. This subjects local residents to a greater risk of collisions, worse congestion and more air and noise pollution.

Clearly traffic diversion to side streets is an undesirable side effect of long cycle lengths and congestion. This diverted traffic may increase risk on the side streets, but the cause of this increased safety risk should not be attributed to the new signal.

Additional traffic safety measures are sometimes necessary to offset increased traffic and speeding through neighborhood streets. One way of improving waiting times at an intersection with a new signal is to make sure the minor street waiting times are less than they were before installation of the signal. This improvement will encourage motorists to use signals on main roads instead of neighborhood streets.

> **Over the years, a number of misconceptions about traffic-control solutions have become apparent. This briefing sheet attempts to shed some light on the rationale for why certain traffic-control decisions are appropriate and required.**

On occasion, other traffic control options, such as stop control or the introduction of roundabouts can perform as well as, or even better than, signals in managing both vehicle and pedestrian traffic safety at intersections. This is particularly true when signals are inappropriately placed at locations where traffic volume is relatively low. Intersections with signals that have very low traffic volumes tend to tempt drivers and pedestrians to violate that red light.

Myth 2: Having a stop sign is always better than no stop sign, OR, more stop signs are always safer than fewer stop signs.

Reality:

Unwarranted stop signs create problems at both the intersection and along the roadway by:

- Encouraging motorists to drive faster between intersections in order to save time. Placing stop signs on every low-volume local street promotes speeding between the stop signs as drivers try to offset the delays caused by stopping at every intersection;
- Encouraging violation of traffic laws. As the number of stop signs increase so that nearly every intersection has one, the rate of stop sign violations tends to increase;
- Encouraging the use of alternate routes. Placing too many stop signs in some areas often causes traffic to use other neighborhood routes to avoid a sequence of intersections that may be controlled by stop signs; and
- Increasing the chance that drivers will disregard conflicting vehicle and pedestrian traffic, which raises the risk of collisions.

There is no evidence to indicate that stop signs decrease the overall speed of traffic. Impatient drivers view the additional delay caused by unwarranted stop signs as "lost time" to be made up by driving at higher speeds between stop signs.

Unwarranted stop signs breed contempt in motorists who tend to ignore them or only slow down without stopping. This can sometimes lead to tragic consequences.

Stop signs should never be installed as a routine, cure-all approach to curtail speeding, prevent collisions at intersections, or discourage traffic from entering a neighborhood. Stop signs should be installed only after an engineering study determines that there is a need. Stop signs are not a solution to intersection safety problems caused by poor sight distances and deficient road design.

Myth 3: Installing stop signs on all approaches (four-way stop) to an intersection will always result in fewer accidents.

Reality:

Four-way stop signs do not necessarily improve pedestrian or vehicle safety. In fact, pedestrians in stop sign-congested neighborhoods often have a false sense of security about crossing local streets with four-way stop signs. The application of traffic control devices, to the casual observer, often creates this sense of security, but in reality may actually increase safety risk. If control devices are improperly applied, they can create confusion between the pedestrians and the driver as to who has the right-of-way, thereby increasing the risk that one of the two will make an improper decision resulting in serious consequences.

Placing four-way stop signs on roads of very unequal design, speed and traffic volume will tend to promote stop-sign violations by drivers, especially on main roads. Driver expectancies are violated in situations like this and when this occurs, improper actions result which can increase safety risk at intersections.

Placing four-way stop signs at every intersection where there were formerly only two-way stop signs also usually increases congestion. Four-way stop signs should only be considered after an engineering study and a capacity analysis are performed.

Generally, every State requires the installation of traffic control devices, including stop signs, to meet State standards of the department of transportation.

The State standards are based on the Manual on Uniform Traffic Control Devices(MUTCD). The MUTCD is the national standard for traffic control devices. It prescribes standards for the design, location, use and operation of traffic control devices. The MUTCD is located at the following Web site: http://mutcd.fhwa.dot.gov.

Myth 4: Signals are always better than stop signs.

Reality:

Installing stop signs instead of signals when there is no intersection traffic control, increasing the size or visibility of existing stop signs, or placing them in a better location often increases both vehicle and pedestrian safety without the initial expense and later maintenance costs of signals. While waiting for signals to qualify for installation, the substantial amount of money saved can be used to make roads safer.

U.S. Department of Transportation
Federal Highway Administration

ADVOCATES FOR HIGHWAY AND AUTO SAFETY

Institute of Transportation Engineers

Intersection Safety is a National Priority

This page last modified on September 10, 2004
