City of Gahanna

Traffic Impact Study Guidelines

by

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Traffic Impact Study Guidelines

Introduction

Purpose of Transportation Impact Studies

The City of Gahanna Engineering Department is responsible for ensuring the safety and welfare of the public on the City street system. The staff reviews proposed development and redevelopment plans for compliance to City Code and impacts to the transportation infrastructure. The City of Gahanna supports businesses that promote economic growth. However, new developments also bring increases in traffic volume on corridors that are experiencing congestion and delay.

Traffic impact studies provide the following guidance to a city when evaluating proposed development plans:

- Evaluating the traffic generated by a new development and the ability to accommodate new traffic within the existing transportation system.
- Evaluate proposed site access and driveway location for safety.
- Identifying any improvements beyond current planned projects that would need to be constructed to accommodate the new development.
- Provide guidance to City officials on a fair way to evaluate traffic impacts and determine funding participation by the developer.

The goal of the transportation impact study is to provide an objective evaluation of the proposed development on the adjacent roadway/intersection.

There are a variety of ways that traffic impact studies can be prepared and approved for developments within a City. The Institute of Transportation Engineers has studied many municipal, county, and state plans and summarized best practices in a publication titled *Transportation Impact Analyses for Site Development*. This publication, along with the City of Columbus Traffic Standards Code, and City of Hilliard Traffic Impact Study Guidelines serve as guidance in preparing this document.

The Preparer of the Traffic Impact Study is recommended to utilize industry accepted methodology, which is documented in the ITE publication *Transportation Impact Analyses for Site Development*, ITE's *Trip Generation*, and the ITE *Trip Generation Handbook*, in preparing this submittal.

Role of the City of Gahanna Engineering Department

The City of Gahanna Engineering Department is responsible for reviewing and approving traffic impact studies. The Traffic Impacts Study shall be reviewed by one or more members of the professional staff with experience in land-use planning, traffic operations, and safety. The City Engineer may also request a review by the Planning Department for land-use and development issues. The review process will include the following:

- Determine if a traffic impact study is required.
- Determine the extent of the study required. The City may only request a driveway analysis.
- Hold a Scoping Meeting with the preparer to discuss requirements and available data.
- Review the Traffic Impact Study in accordance with the study checklist.
- Either accept the study or return to the preparer with requested revisions.
- Notify the Planning Commission of concurrence with study results.

Preparer Qualifications

Traffic impact studies shall be prepared by professionals with training and experience in traffic engineering. The preparer shall either be a registered professional engineer in the State of Ohio or under the supervision of a registered professional engineer.

Study Area

The size of the study area can vary with the size of the proposed development. The City Engineer shall determined the limits of the study and meet with the preparer to finalize. An appropriate study area will need to evaluate the off-site access needs and impact. This would include all site access points (driveways, full or partial access) and roadway intersections adjacent to the site (signalized and unsignalized).

The reviewers will determine if additional intersections need to be analyzed. The goal is to be certain critical intersections and high impact areas are included in the analysis. All study intersections will be determined at the scoping meeting before the study begins.

Study Horizon Years and Analysis Periods

The selection of the horizon year for the study is based on the opening year of the development and potentially a full build-out year (if the development is phased over a number of years). The following study years are to be evaluated in the traffic impact study:

- Opening year of the development.
- Horizon year of twenty (20) years beyond the current year.

When there are several planned phases within the site development, the City may request an evaluation at each phase. The analysis years and time periods will be finalized at the Scoping Meeting.

The existing and horizon years will be analyzed based on the following peak hour periods:

- AM peak hour (for the street system).
- PM peak hour (for the street system).
- Additional period(s), in the event the land use generates significant volumes at non-traditional peak hours.

The analysis time periods will be discussed and agreed to at the Scoping Meeting. The additional analyses may be needed for land uses such as shopping centers, schools, seasonal uses, and recreational uses (theatre, zoo, sports facilities).

Site and Off-Site Development to be Analyzed

The Traffic Impact Study needs to provide an accurate evaluation of the potential traffic generated by the Applicant's proposed site. This will provide data to the City to evaluate the infrastructure needs in the horizon year. As part of this process, the traffic impacts under the No Build (base) and Build conditions are evaluated.

The No Build evaluation for the opening year and the horizon year is considered to be a baseline condition. The base condition evaluates the impact of non-site traffic within the study area separately from the proposed site development. This provides the opening year and horizon year conditions that are expected to be present without the development. It should include all major developments anticipated to be approved by the horizon year (the City Planning Department can provide data). The two components in developing the off-site traffic are through existing traffic and traffic generated by other development in the study area.

The site traffic evaluation for the opening year and horizon year will evaluate the specific impact of all development on the proposed site. This will provide the City information on the anticipated impact of the site directly on the study area traffic and provide an understanding of the additional infrastructure needs related directly to the proposed site development. The anticipated traffic for the proposed development can be evaluated for each land use based on the methodology of the *ITE Trip Generation Handbook*.

The analysis of the study area will be completed based on the planned infrastructure present in the current year and horizon year. The following analysis will be completed for the peak hour periods:

- Capacity Analysis for the opening year under base conditions (without the proposed site).

- Capacity Analysis for the opening year with the proposed development.

- Capacity Analysis for the horizon year under base conditions (without the proposed site).

- Capacity Analysis for the horizon year with the proposed development.

Trip Generation

ITE's *Trip Generation* and *Trip Generation Handbook* provide methodology, procedures, and guidelines for estimating trips at a proposed site. The report was developed based on actual sample counts and includes data for a wide range of sites. The material includes:

- Discussion on the application and use of trip generation rates and equations.

- Descriptions of land uses included in the report.

- Data on the trip generator and adjacent street that includes trip rates (maximum, minimum, and average) for peak hours, weekdays, and weekends.

- Statistical data on the equations and their applicability (regression data and weighted averages).

The ITE publications are the recommended method of developing site generated traffic. In the event the proposed land use is too specialized to be appropriately represented, another method (such as obtaining data from another study) may be used.

Traffic Distribution and Assignment

The traffic expected to be generated by the site development is assigned to the roadway system to allow for the evaluation of the roadway and adjacent intersections. The traffic distributions may vary depending on the site and surrounding attractions, size of development, surrounding land uses and population, and conditions on the street network. The Institute of Transportation Engineer's *Transportation Impact Analyses for Site Development* and *Trip Generation Handbook* are recommended sources for details on trip distribution and assignment for site and off-site trips.

When evaluating the trips entering and exiting a new development, there are three types of trips that need to be considered.

- Primary Trips: these trips to the development were made from the origin to the site (an example would be from home to the supermarket).

- Pass-by Trips: trips that are attracted to the development from traffic passing by the site on the adjacent roadway. These trips are new to the sites driveway (entry/exit), but are not new to the adjacent roadway.

- Diverted Linked Trips: are attracted to the development from traffic on the roadways in the vicinity of the site. They are new to the driveway and adjacent roadway.

The *Trip Generation Handbook* provides guidance and estimated percentages for pass-by and diverted linked trips. The data is generally limited and should be applied carefully and only where applicable. This is provided for specific land uses consisting of shopping centers, fast food, gas stations, supermarkets, banks, and other types of retail/service.

It should also be noted that if a roadway extension or new section of roadway is planned as part of the site development, the City may request the involvement of the Mid-Ohio Regional Planning Commission (MORPC) to perform a select link analysis. If additional analysis is required for roadway extensions, the applicant will be required to pay any associated fees to MORPC.

Capacity Analysis

Capacity analyses are to be performed and levels of service defined for each intersection in the study area. The concept of level of service uses qualitative measures that characterize conditions within a traffic stream and their perceptions by motorists. The descriptions of individual levels of service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic density, and comfort and convenience.

Six levels of service are defined for each type of facility for which analysis procedures are available. They are given letter designations, from A to F, with level of service (LOS) A representing the best operating conditions and LOS F the worst. LOS E corresponds to the maximum flow rate of capacity. Each level of service represents a range of operating conditions.

The methodology of the signalized intersection analysis in the Highway Capacity Manual analyzes lane groups, intersection approaches, and the overall intersection approach. The level of service is calculated based on the average control delay per vehicle. For the purpose of the analysis, the signal timing is estimated to balance the levels of service between the intersection approaches. Table 1 shows the applicable ranges of level of service criteria for signalized intersections.

Table 1
Level of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (s/veh)
A	</= 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

Source: Exhibit 16-2 Highway Capacity Manual 2000

The methodology of the unsignalized intersection analysis in the Highway Capacity Manual analyzes intersections with one or more approaches under stop sign control. The HCM results are based on gap acceptance theories. For a two-way stop control intersection it is defined by control delay per vehicle. The LOS is defined for each minor movement and not the overall intersection. Table 2 shows the applicable ranges of level of service criteria for unsignalized intersections under two-way stop control.

Table 2
Level of Service Criteria for Two-way Stop Control Intersections

Level of Service	Control Delay per Vehicle (s/veh)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

Source: Exhibit 17-2 Highway Capacity Manual 2000

The study will compare traffic operations between the base and build conditions for both the opening and horizon year. The levels of service at the study area intersections under the build conditions shall not be worse than the base conditions. In addition, all intersections analyzed within the study area shall operate at a level of service of D or better, with no individual movement less the LOS E for the design hours in the opening and horizon years.

Site Design and Mitigation

The traffic analysis and general operation of the access system within the study area is evaluated as part of the Traffic Impact Study for the horizon years. The design recommendations for the site need to meet the opening and horizon year operational needs. This may include some or all of the following:

- Improvements to the public roadway system (segment and/or intersections) to meet intersection level of service D and movement LOS E requirements in the design hours. This is only required for the impacts of the site traffic in the horizon year.
- Placement of driveway(s) to meet City codes and provide safe ingress/egress into the site. The sight distance requirements of the ODOT Location and Design Manual are used as City standards.
- All site designs must meet zoning code and City roadway design standards. This includes providing safe circulation within the site.
- Installation or modification of traffic signals in accordance with the Ohio MUTCD.
- Design of drives for safe turning radius and sufficient throat length to minimize internal circulation conflicts. (City criteria to be discussed at the Scoping Meeting.)

Improvements to the public roadway system may involve the design of left and/or right turn lanes. Appendix D includes charts from the ODOT Location and Design Manual to be used in determining when to install turn lanes. Additionally, the City establishes design minimums for turn lanes. The City of Gahanna requires a minimum left turn storage length of 100 feet with a 50 foot approach taper and 50 foot deceleration taper.

Scoping Meeting

The preparer of a Traffic Impact Study (typically a representative of the Applicant) will schedule a Scoping Meeting with the City of Gahanna Engineering Department prior to initiating traffic evaluation for the proposed site. The meeting will include discussion of the following items to provide the Preparer and the City the opportunity to agree to the items required for site approval. The discussion will include:

- Determining if a Traffic Impact Study is required.
- If a formal study is not required, analysis or site design that should be submitted with the Preliminary Plat.
- Review the traffic Impact Study Scoping Meeting Checklist to determine the contents required for the Traffic Impact Study submittal.
- Sign-off by the Preparer and City Engineer concurring with the requirements This will serve as a Memorandum of Understanding between the City and the Applicant.
- The Preparer shall provide meeting notes to the Applicant and copy the City, within one week of the meeting.

Appendix A includes the scoping meeting checklist.

Need for a Traffic Impact Study

The need for submitting a transportation impact study may be identified when a developer submits a preliminary plat to the zoning department. The size of the development will indicate the need for a TIS and the level of detail required. The City shall request a traffic impact study if any one or more of the following conditions are met:

1. Significantly sized project

   The recommended size of development for requiring a Traffic Impact Study is when 100 or more new trips are generated during the adjacent roadway's peak hour or the development's peak hour. The addition of 100 trips in the peak hour can significantly impact capacity by changing the LOS and meeting the need for turn lanes to minimize impacts to the mainline.

   Table 3 is developed from the ITE Guidelines and presents suggestions on when the trip threshold may be met.

Table 3
Land Use Thresholds Based on Trip Generation Characteristics

Land Use	*Estimate for 100 Peak hour trips*
Residential: Single Family Home Apartment Condominium/Townhouse	 90 units 150 units 190 units
Shopping Center (Gross Leasable Area, GLA)	6,000 Sq. Ft.
Fast-food Restaurant with Drive-thru (Gross Floor Area, GFA)	3,000 Sq. Ft.
Gas Station with Convenience Store (Fueling Positions)	7 fueling positions
Bank with Drive-thru (GFA)	2,000 Sq. Ft.
General Office (GFA)	67,000 Sq. Ft.
Medical/Dental Office (GFA)	29,000 Sq. Ft.
Research and Development Facility (GFA)	71,000 Sq. Ft.
Light Industrial/Warehousing (GFA)	185,000 Sq. Ft.
Manufacturing Plant (GFA)	144,000 Sq. Ft.

Source: ITE Transportation Impact for Site Development

2. Existing Roadway Congestion or Safety Problems

There may be a segment or intersection where there is significant congestion and/or has experienced accident problems. Intersections operating at level of service D or worse in any hour of the day will trigger the need for an analysis of the No Build and proposed build conditions for the site (regardless of the number of trips generated). The level of service is to be determined based on the methodology of the current Highway Capacity Manual (Transportation Research Board).

Areas with existing crash problems will also need to be evaluated to determine if driveway placement and traffic volumes will impact safety. This criteria includes the addition of a site on a minor or major arterial that is shown in the City of Gahanna Thoroughfare Plan with a volume-to-capacity ratio of 1.0 or greater. This will be evaluated at the Scoping Meeting based on City records.

3. Significant Transportation Improvements

A Traffic Impact Study will be required if the proposed development is expected to significantly impact current street or intersection operations. Improvements considered to be significant include the following: addition of turn lanes, traffic signals, or more than one new driveway.

4. Development in a Sensitive Area

Proposed developments in environmental, cultural, and socially sensitive areas may require a traffic impact study. This includes schools, parks, historic districts or other areas that are impacted by traffic generators.

Traffic Impact Study Report Guidelines

There are many ways to prepare acceptable traffic impact studies that will address the study area transportation needs. The City of Gahanna can provide an outline to the Preparer that follows the suggested format of the Institute of Transportation Engineer's *Transportation Impact Analyses for Site Development*. The outline will be reviewed in the scoping meeting and only the applicable items will be expected to be included in the report. The sample outline is included in Appendix B.

Submittal Requirements

The City of Gahanna Engineering Department requests the following to be submitted as part of a Traffic Impact Study:

- Cover letter from the Preparer identifying contact person.
- Three (3) copies of the site plan.
- Three (3) copies of the Traffic Impact Study.

Review Process

The City of Gahanna Engineering Department is responsible for reviewing and approving traffic impact studies. The TIS shall be reviewed by one or more members of the professional staff with experience in land-use planning, traffic operations, and safety. The City Engineer may also request a review by the Planning Department for land-use and development issues. The review process will take a maximum of 30 calendar days.

The Preparer will receive a letter from the City approving the Traffic Impact Study (with possible mitigation noted in the letter) or a request for revisions/additional analysis and resubmittal. The Traffic Impact Study Review Checklist is included in Appendix C.

Final Approval

The final approval of the Traffic Impact Study shall be granted by the City Engineer. This may include some or all of the following items:

- Approval of the Traffic Impacts Study as presented by the Preparer.
- Approval of the Traffic Impact study with specific conditions, which could include modifications to roadways and/or intersections.
- Approval of the Traffic Impact Study with the understanding that modification will need to be incorporated at a later date. In this case, the City may require the cost of the Applicant's share of the improvement be held in a fund until the infrastructure modifications are constructed (by a separate contract).

Appendix A

Traffic Impact Study
Scoping Meeting Checklist

CITY OF GAHANNA
TRAFFIC IMPACT STUDY SCOPING MEETING CHECKLIST

Date (attach signin sheet)	
Project	
Location	
Applicant	
Preparer	
Traffic Impact Study Required (If yes, attached table of contents)	Yes ☐ No ☐
If no, list the analysis required for submittal to the City Engineer's Office	

Roadway Characteristics

Proposed site name	
Proposed use	
Zoning	
Description of proposed site	
Study Area	

CITY OF GAHANNA
TRAFFIC IMPACT STUDY SCOPING MEETING CHECKLIST

Data Sources and Evaluation

Traffic Counts	
Base Mapping & Site Plans	
Previous Studies & Plans	
Zoning & Development Requirements	
Roadway Design Criteria	
Trip Generation (site & off-site)	
Other Items	

CITY OF GAHANNA
TRAFFIC IMPACT STUDY SCOPING MEETING CHECKLIST

Traffic Analysis

Intersections to be Analyzed (& traffic control)	
Opening year of site	
Horizon year	
Peak hours to be analyzed	
Intersections to be Analyzed (& traffic control)	

Study Requirements

	Section and sub-sections to be included in report	
I. INTRODUCTION & SUMMARY	Yes	No
A. Purpose of Report & Study Objectives		
B. Executive Summary		
II. PROPOSED DEVELOPMENT (SITE & NEARBY)		
A. Off-Site (or background) Development		
B. Description of On-Site Development		
1. Land use & intensity		
2. Location		
3. Site Plan		
4. Zoning		
5. Phasing & Timing		

CITY OF GAHANNA
TRAFFIC IMPACT STUDY SCOPING MEETING CHECKLIST

	Section and sub-sections to be included in report	
	Yes	No
III. EXISTING AREA CONDITIONS	☐	☐
A. Study Area	☐	☐
1. Area of Influence	☐	☐
2. Area of significant Transportation Impact	☐	☐
B. Study Area Land Use	☐	☐
1. Existing Land Uses	☐	☐
2. Existing Zoning	☐	☐
3. Anticipated future development	☐	☐
C. Site Accessibility		
1. Area roadway system	☐	☐
2. Traffic volumes & conditions	☐	☐
3. Pedestrian & bicycle facilities	☐	☐
4. Other as applicable	☐	☐
IV. PROJECTED TRAFFIC	☐	☐
A. Site traffic (each horizon year)	☐	☐
1. Trip generation	☐	☐
2. Trip distribution	☐	☐
3. Trip Assignment	☐	☐
B. Through traffic (each horizon year)	☐	☐
1. Method of projection	☐	☐
2. Non-site traffic for anticipate development	☐	☐
3. Through Traffic	☐	☐
4. Estimated volumes	☐	☐
C. Total traffic (each horizon year)	☐	☐

CITY OF GAHANNA
TRAFFIC IMPACT STUDY SCOPING MEETING CHECKLIST

	Section and sub-sections to be included in report	
	Yes	No
V. TRANSPORTATION ANALYSIS	☐	☐
A. Site access	☐	☐
B. Capacity & level of service	☐	☐
1. Existing conditions	☐	☐
2. Background conditions for horizon years	☐	☐
3. Total traffic for horizon years	☐	☐
C. Traffic Safety	☐	☐
D. Traffic Signals	☐	☐
E. Site circulation & parking	☐	☐
VI. IMPROVEMENT ANALYSIS	☐	☐
A. Improvements to accommodate existing traffic	☐	☐
B. Improvements to accommodate background traffic	☐	☐
C. Additional improvements to accommodate site traffic	☐	☐
D. Alternative improvements	☐	☐
E. Status of imp. Funded, programmed or planned	☐	☐
F. Evaluation	☐	☐
VII. FINDINGS	☐	☐
A. Site accessibility	☐	☐
B. Traffic impacts	☐	☐
C. Need for improvements	☐	☐
D. Compliance with City codes	☐	☐

CITY OF GAHANNA
TRAFFIC IMPACT STUDY SCOPING MEETING CHECKLIST

	Section and sub-sections to be included in report	
	Yes	No
VIII. RECOMMENDATIONS	☐	☐
A. Site access/circulation plan	☐	☐
B. Roadway improvements	☐	☐
1. On-site	☐	☐
2. Off-site	☐	☐
3. Phasing, if appropriate	☐	☐
C. Transit, pedestrians, & bicycles	☐	☐
D. Other (TDM, etc).	☐	☐
IX. CONCLUSIONS	☐	☐
APPENDICES	☐	☐

Memorandum of Understanding

The Scoping Meeting notes and this checklist shall serve as a memorandum of understanding between the City of Gahanna Engineering Department and the Applicant who is represented by the Preparer for the approval of the Traffic Impact Study. All items agreed to by the City and the Preparer shall be incorpated into the Traffic Impact Study for final approval by the City Engineer.

_____ _____
Preparer (representing Applicant) Date

_____ _____
City Engineer, Gahanna, Ohio Date

Appendix B

Traffic Impact Study
Sample Table of Contents

Traffic Impact Study Sample Table of Contents

The following is a suggested table of contents for a transportation impact study (generally following ITE's *Transportation Impact Analyses for Site Development*). It should be noted that not all items will apply to each study. The City and preparer will discuss the requirements in the Scoping Meeting and items may be deleted that are not applicable or necessary for the report.

I. Introduction and Summary

A. Purpose of Report and Study Objectives

B. Executive Summary

II. Proposed Development (Site and nearby)

A. Off-Site (or background) Development

B. Description of On-Site Development

1. Land use and intensity
2. Location
3. Site plan
4. Zoning
5. Phasing and timing

III. Existing Area Conditions

A. Study Area

1. Area of influence (limits, intersections, etc.)
2. Area of significant transportation impact (may also be part of Chapter IV)

B. Study Area Land Use

1. Existing land uses
2. Existing zoning
3. Anticipated future development

C. Site Accessibility

1. Area roadway system
2. Traffic volumes and conditions
3. Pedestrian and bicycle facilities
4. Other as applicable (Transportation System Management programs, transit, etc.)

IV. Projected Traffic

A. Site Traffic (each horizon Year)

1. Trip generation
2. Trip distribution
3. Trip assignment

B. Through Traffic (each horizon year)

1. Method of projection
2. Non-site traffic for anticipated development in the study area
3. Through traffic
4. Estimated volumes

C. Total Traffic (each horizon year)

V. Transportation Analysis

A. Site Access

B. Capacity and Level of Service

1. Existing conditions
2. Background conditions (existing plus growth) for each horizon year
3. Total traffic (existing, background, and site) for each horizon year

C. Traffic Safety

D. Traffic Signals

E. Site Circulation and Parking

VI. Improvement Analysis

A. Improvements to Accommodate Existing Traffic

B. Improvements to Accommodate Background Traffic

C. Additional Improvements to Accommodate Site Traffic

D. Alternative Improvements

E. Status of Improvements Already Funded, Programmed, or Planned

F. Evaluation

VII. Findings

A. Site Accessibility

B. Traffic Impacts

C. Need for Improvements

D. Compliance with Applicable City Codes

VIII. Recommendations

A. Site Access/Circulation Plan

B. Roadway Improvements

1. On-site
2. Off-site
3. Phasing, if appropriate

C. Transit, Pedestrians, and Bicycles

D. Other (Transportation System Management, etc.)

IX. Conclusions

Appendix C

Traffic Impact Study Review Checklist

CITY OF GAHANNA
TRAFFIC IMPACT STUDY REVIEW CHECKLIST

Proposed Site:

Current Zoning

Proposed Use

Driveway Type (volume)

Initial Submittal to City of Gahanna Engineering Revised Submittal

Roadway:

Location:

Site on roadway segment Yes No

Site at an intersection Yes No

Roadway Classification:

Major Arterial
Minor Arterial
Collector
Local

Roadway Characteristics

Number of lanes

Signalized intersection Yes No

Left turn lanes Yes No

Locations

Right Turn Lanes Yes No

Locations

CITY OF GAHANNA
TRAFFIC IMPACT STUDY REVIEW CHECKLIST

Driveway Access

Number of Drives proposed		
Distance to upstream intersection/drive		Feet
Distance to downstream intersection/drive		Feet

Study Requirements

I. INTRODUCTION & SUMMARY	Complete	N/A
A. Purpose of Report & Study Objectives		
B. Executive Summary		

Section Comments

II. PROPOSED DEVELOPMENT (SITE & NEARBY)	Complete	N/A
A. Off-Site (or background) Development		
B. Description of On-Site Development		
1. Land use & intensity		
2. Location		
3. Site Plan		
4. Zoning		
5. Phasing & Timing		

Section Comments

CITY OF GAHANNA
TRAFFIC IMPACT STUDY REVIEW CHECKLIST

III. EXISTING AREA CONDITIONS	Complete	N/A
A. Study Area		
1. Area of Influence	☐	☐
2. Area of significant Transportation Impact	☐	☐
B. Study Area Land Use		
1. Existing Land Uses	☐	☐
2. Existing Zoning	☐	☐
3. Anticipated future development	☐	☐
C. Site Accessibility		
1. Area roadway system	☐	☐
2. Traffic volumes & conditions	☐	☐
3. Pedestrian & bicycle facilities	☐	☐
4. Other as applicable	☐	☐

Section Comments

IV. PROJECTED TRAFFIC	Complete	N/A
A. Site traffic (each horizon year)		
1. Trip generation	☐	☐
2. Trip distribution	☐	☐
3. Trip Assignment	☐	☐

B. Through traffic (each horizon year)	Complete	N/A
1. Method of projection		
2. Non-site traffic for anticipate development		
3. Through Traffic		
4. Estimated volumes		
C. Total traffic (each horizon year)		

Section Comments

V. TRANSPORTATION ANALYSIS	Complete	N/A
A. Site access		
B. Capacity & level of service		
1. Existing conditions		
2. Background conditions for horizon years		
3. Total traffic for horizon years		
C. Traffic Safety		
D. Traffic Signals		
E. Site circulation & parking		

Section Comments

CITY OF GAHANNA
TRAFFIC IMPACT STUDY REVIEW CHECKLIST

VI. IMPROVEMENT ANALYSIS	Complete	N/A
A. Improvements to accommodate existing traffic	☐	☐
B. Improvements to accommodate background traffic	☐	☐
C. Additional improvements to accommodate site traffic	☐	☐
D. Alternative improvements	☐	☐
E. Status of imp. Funded, programmed or planned	☐	☐
F. Evaluation	☐	☐

Section Comments

VII. FINDINGS	Complete	N/A
A. Site accessibility	☐	☐
B. Traffic impacts	☐	☐
C. Need for improvements	☐	☐
D. Compliance with City codes	☐	☐

Section Comments

CITY OF GAHANNA
TRAFFIC IMPACT STUDY REVIEW CHECKLIST

VIII. RECOMMENDATIONS	Complete	N/A
A. Site access/circulation plan	☐	☐
B. Roadway improvements		
1. On-site	☐	☐
2. Off-site	☐	☐
3. Phasing, if appropriate	☐	☐
C. Transit, pedestrians, & bicycles	☐	☐
D. Other (TDM, etc).	☐	☐

Section Comments

IX. CONCLUSIONS	Complete	N/A
	☐	☐

Section Comments

APPENDICES	Complete	N/A
	☐	☐

Section Comments

CITY OF GAHANNA
TRAFFIC IMPACT STUDY REVIEW CHECKLIST

Summary Comments

All comments incorporated from the Kickoff Meeting Memorandum of Understanding — Yes ☐ No ☐ If no, please attach comments

APPROVED — Yes ☐ No ☐ If no, please attach comments

Approval Granted with the following improvements to be provided by the applicant

Engineering Department Approval

City Engineer, Gahanna, Ohio _____ Date _____

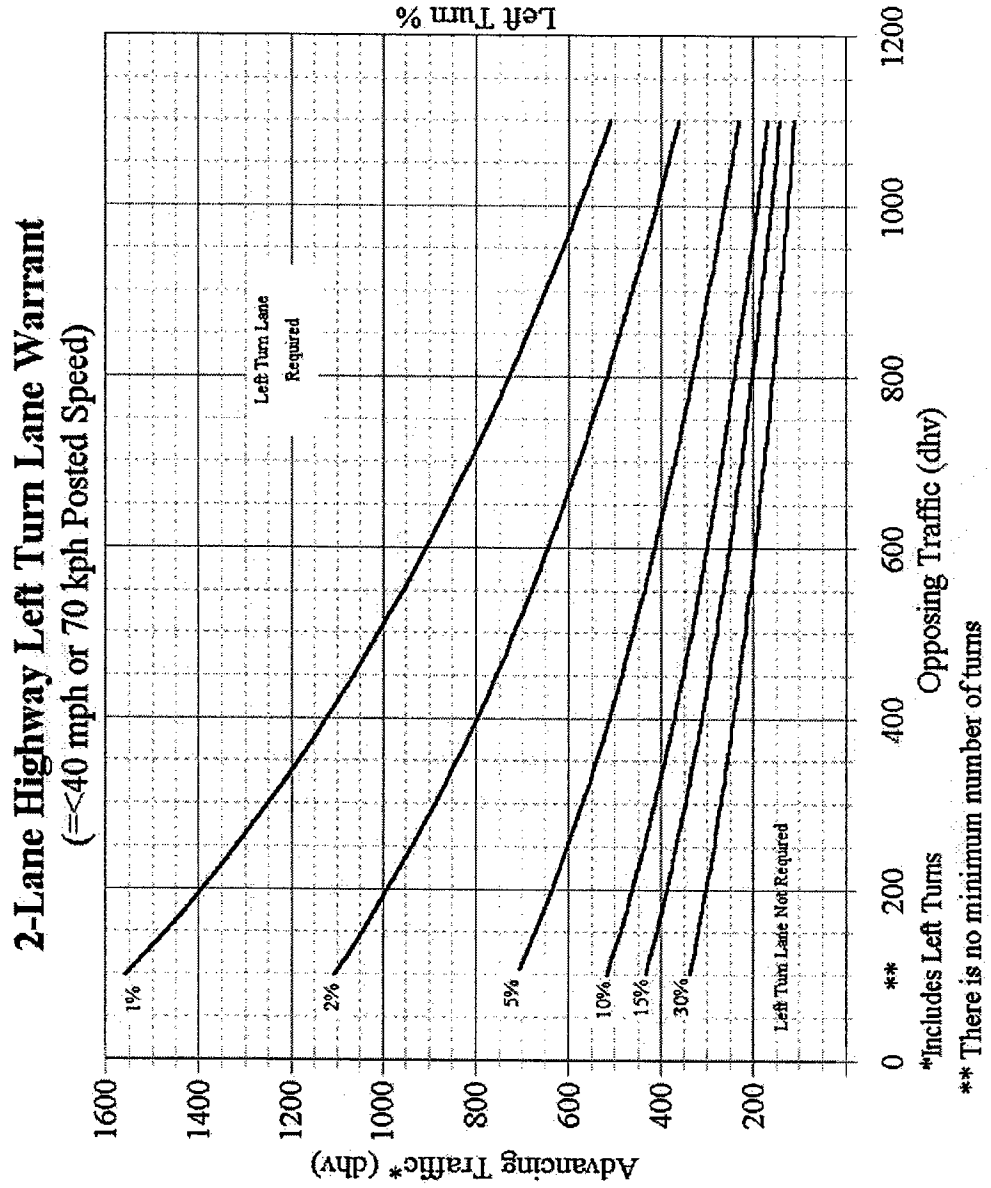
Appendix D

ODOT Turn Lane Standards

2-LANE LEFT TURN LANE WARRANT (LOW SPEED)

401-5aE

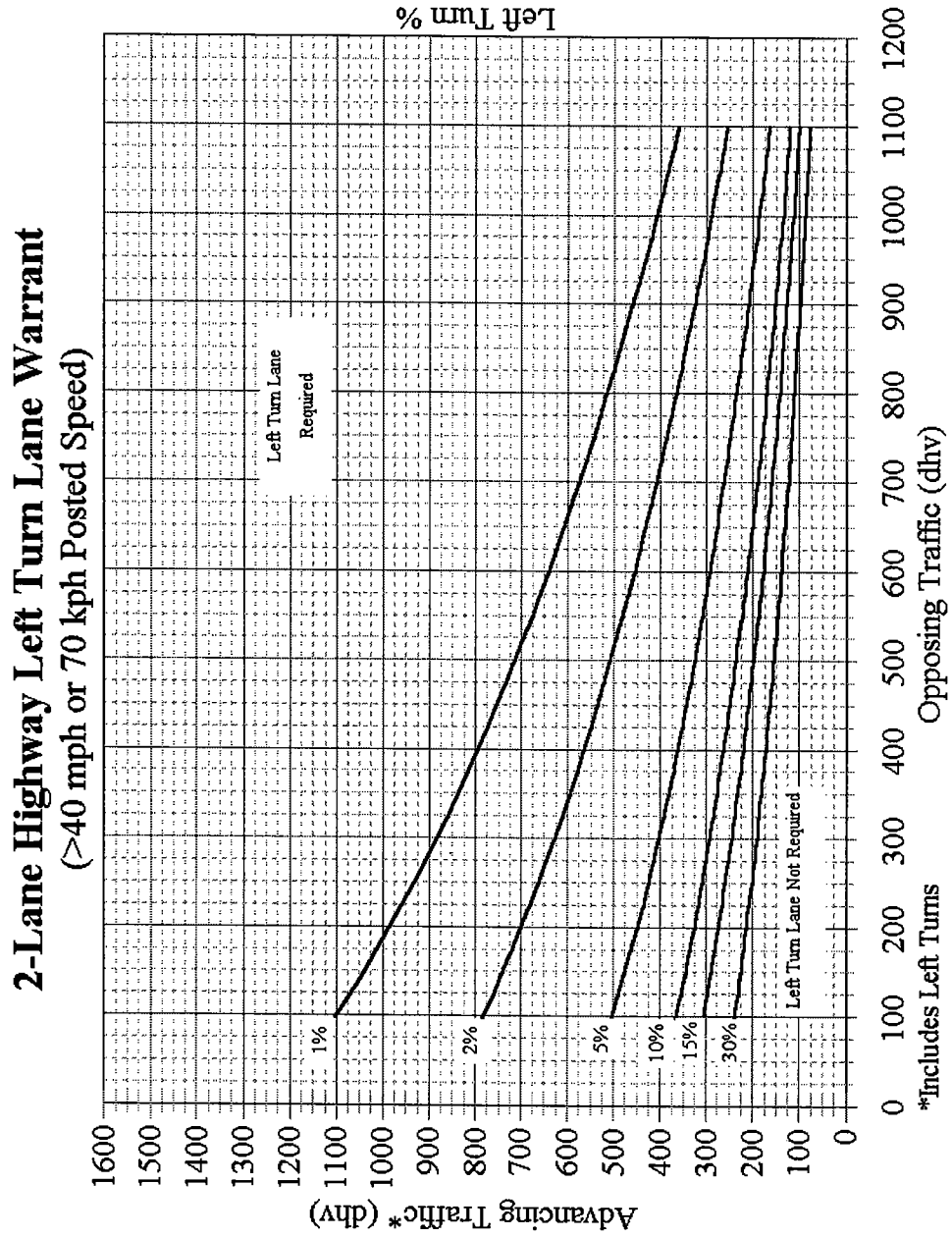
REFERENCE SECTION
401.6.1



2-LANE LEFT TURN LANE WARRANT (HIGH SPEED)

401-5bE

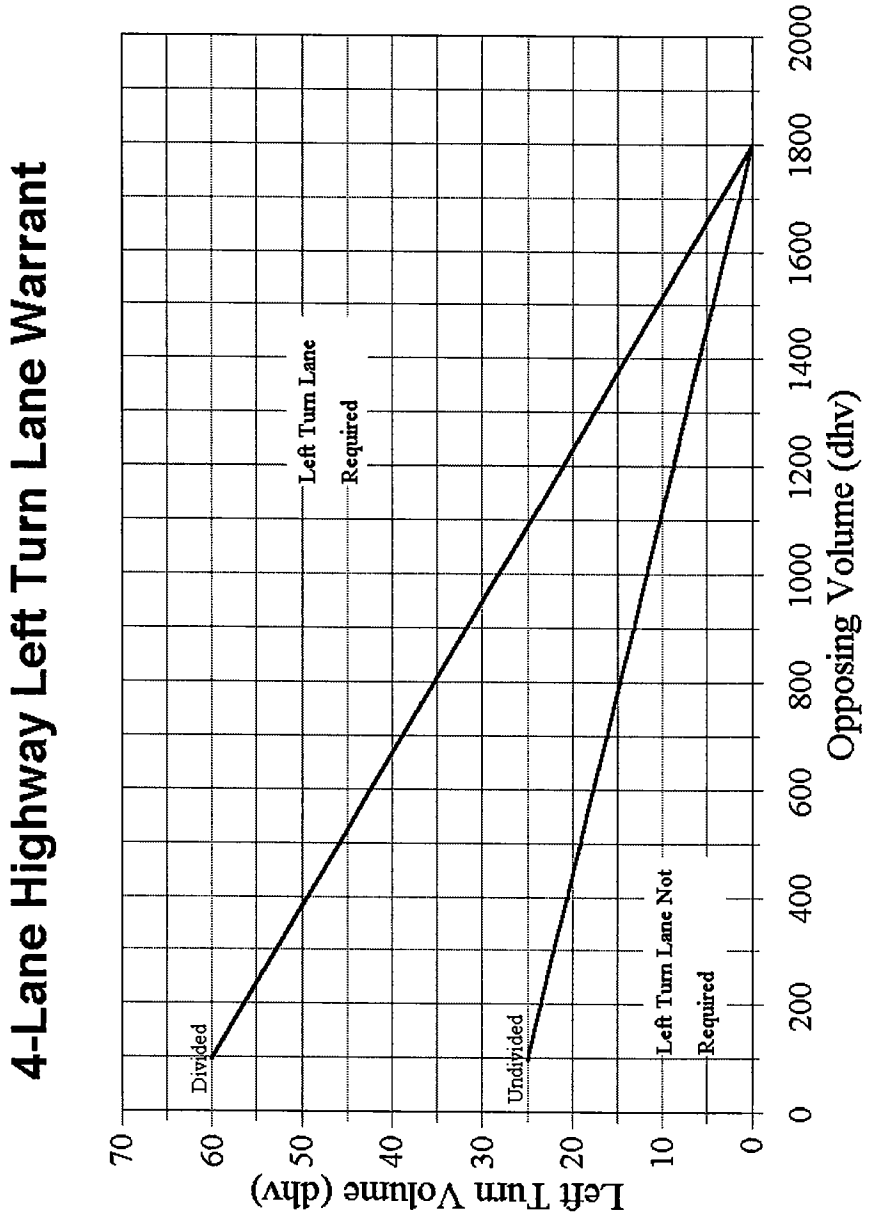
REFERENCE SECTION 401.6.1



4-LANE LEFT TURN LANE WARRANT

401-5cE

REFERENCE SECTION
401.6.1

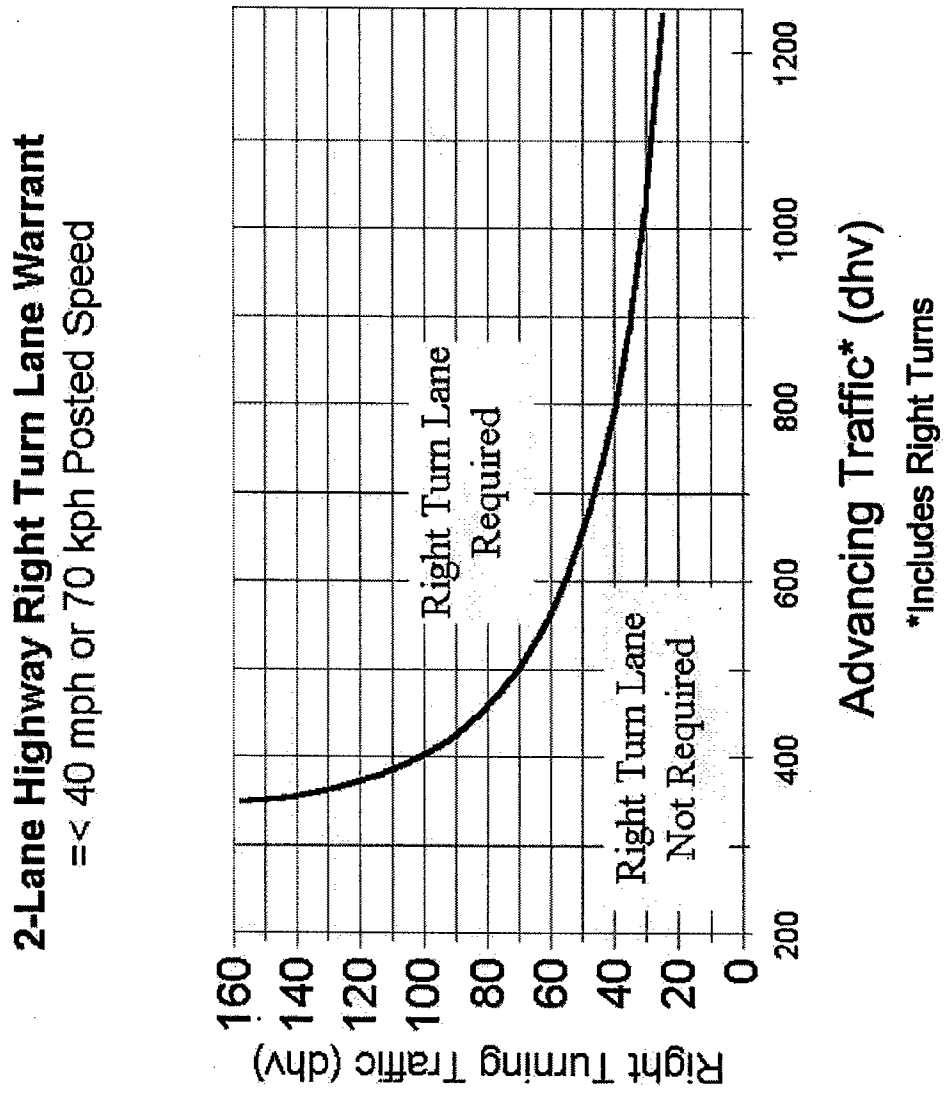


October 2004

2-LANE RIGHT TURN LANE WARRANT (LOW SPEED)

401-6aE

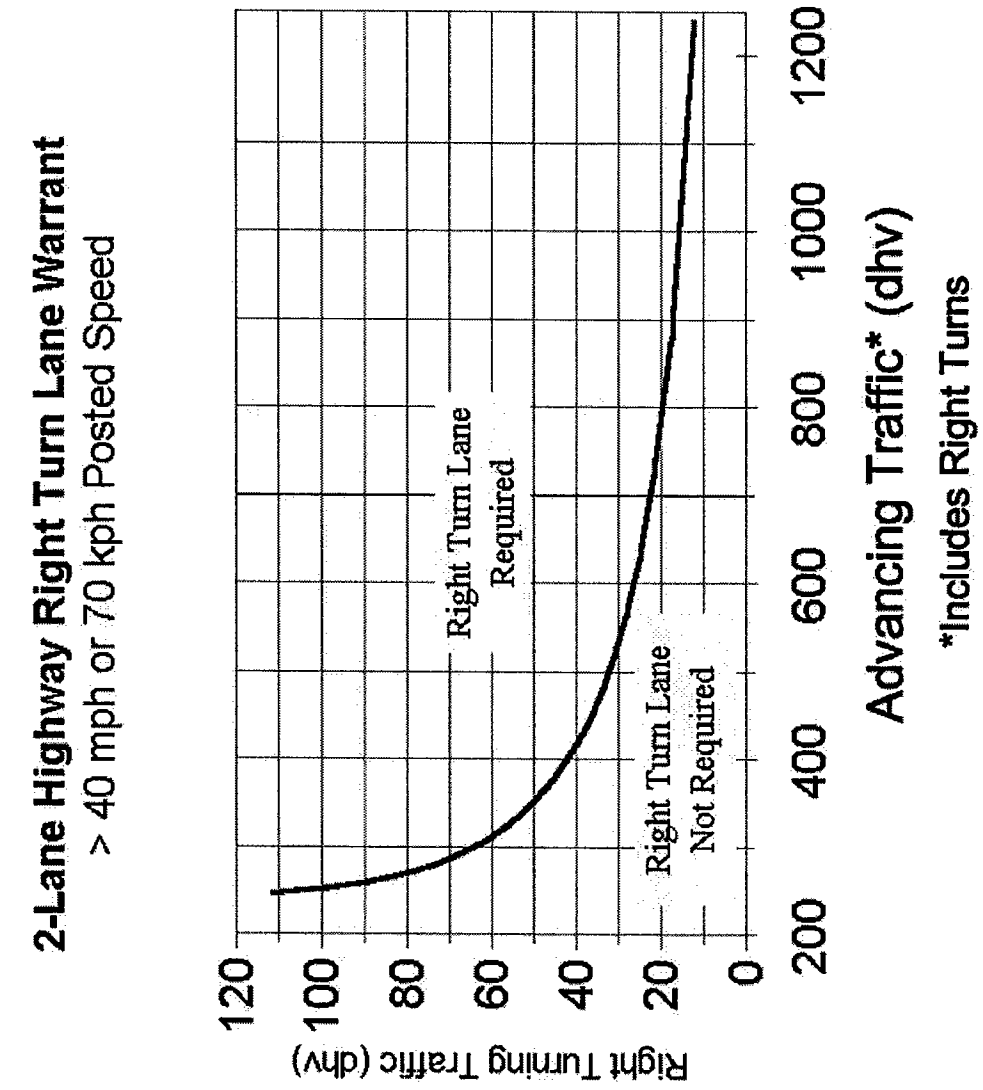
REFERENCE SECTION
401.6.3



2-LANE RIGHT TURN LANE WARRANT (HIGH SPEED)

401-6bE

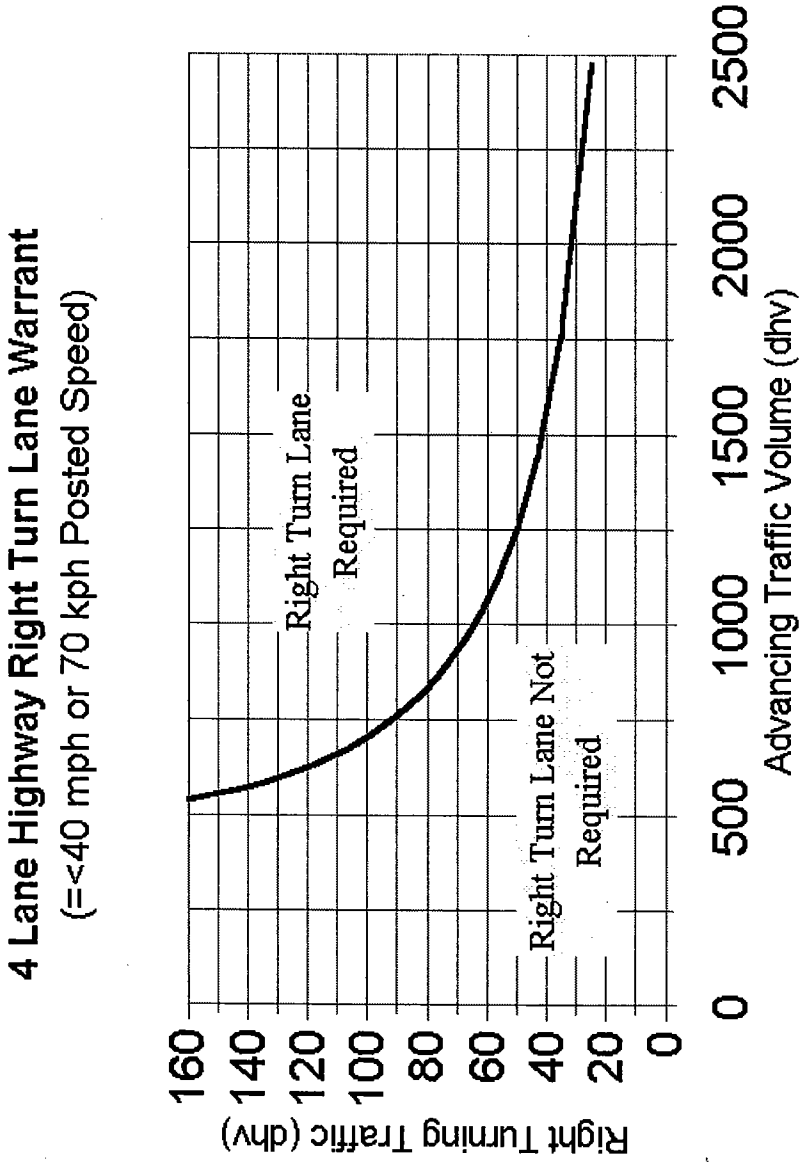
REFERENCE SECTION
401.6.3



4-LANE RIGHT TURN LANE WARRANT (LOW SPEED)

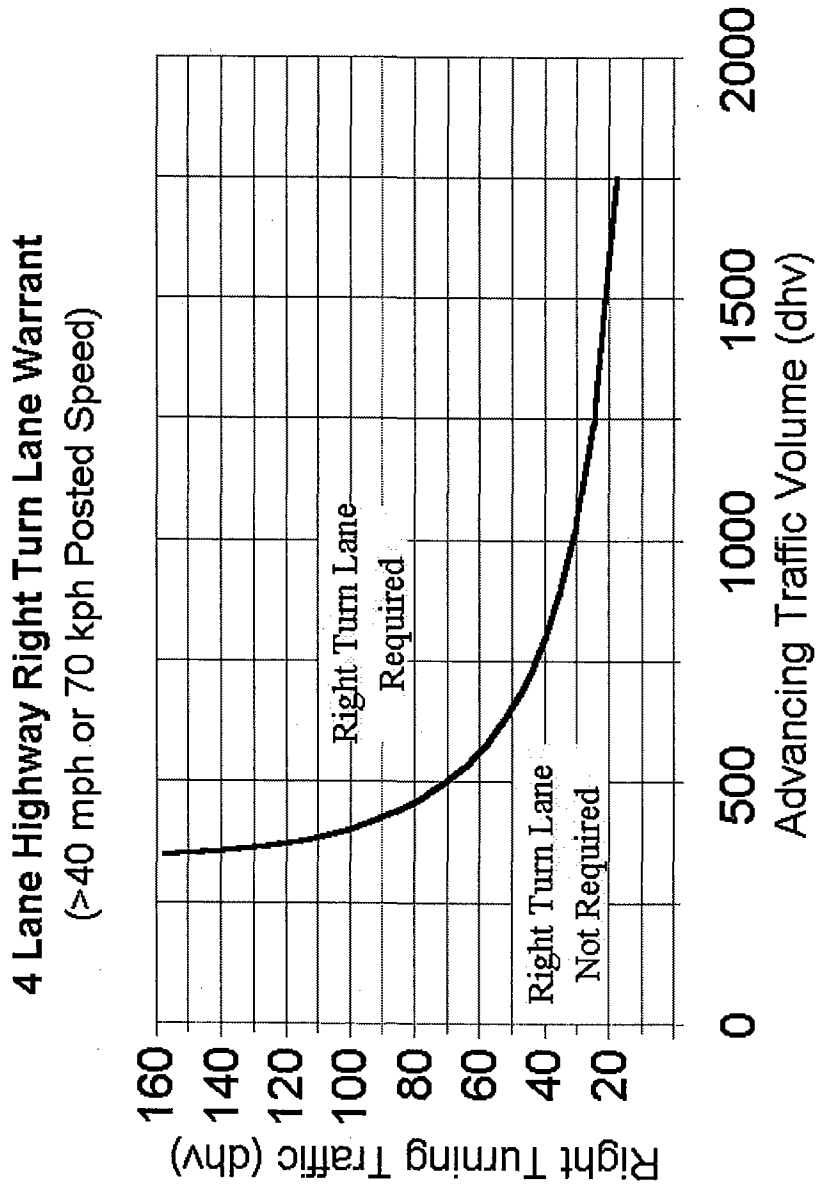
401-6cE

REFERENCE SECTION
401.6.3



October 2004

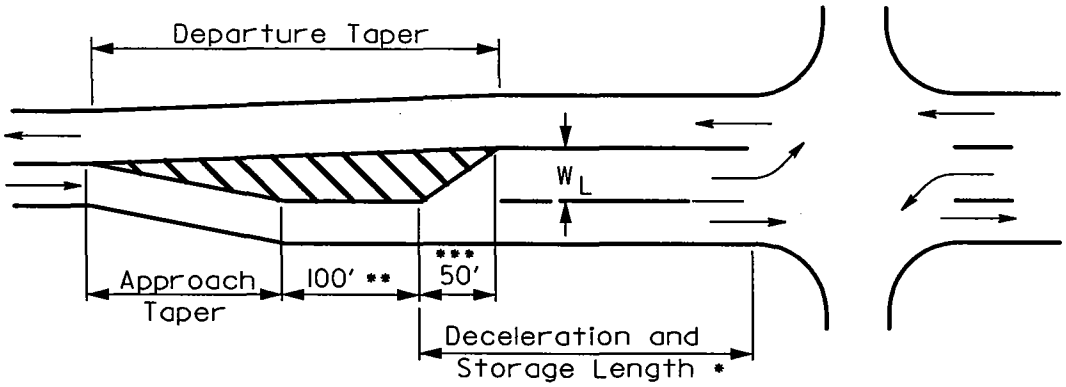
4-LANE RIGHT TURN LANE WARRANT (HIGH SPEED)	401-6dE
	REFERENCE SECTION 401.6.3



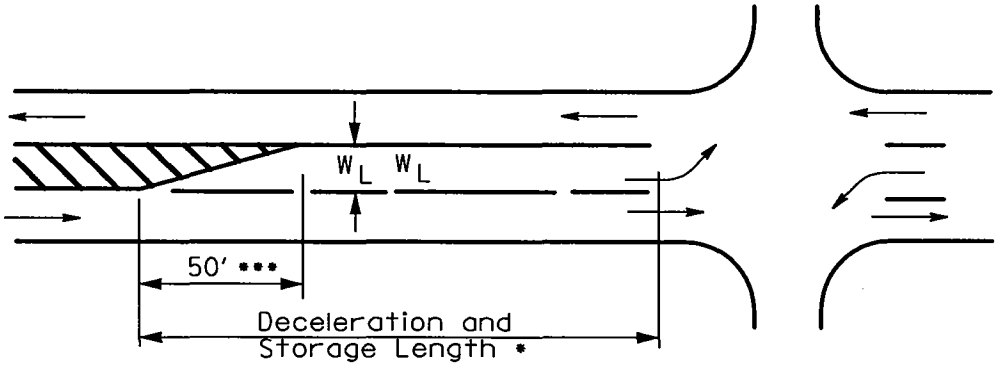
TURNING LANE DESIGN

401-7E

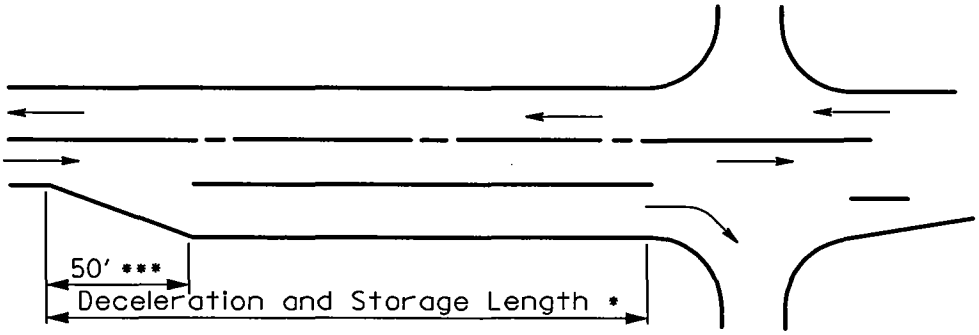
REFERENCE SECTIONS
401.6.1, 401.6.3



LEFT TURN LANE - NO MEDIAN OR MEDIAN WIDTH < W_L



LEFT TURN LANE - MEDIAN WIDTH >= W_L



RIGHT TURN LANE

- * See **Figures 401-9 and 401-10** to copmpute length.
- ** May be reduced or eliminated in urban areas if intersection spacing or storage is constraining
- *** Diverging taper

W_L = Turn Lane Width

BASIS FOR COMPUTING LENGTH OF TURN LANES

401-9E

REFERENCE SECTIONS
401.6.1, 401.6.3

TYPE OF TRAFFIC CONTROL	DESIGN SPEED (mph)					
	30 - 35		40 - 45		50 - 60	
	TURN DEMAND VOLUME					
	HIGH	LOW*	HIGH	LOW*	HIGH	LOW*
SIGNALIZED	Ⓐ	Ⓐ	Ⓑ**or Ⓒ**	Ⓑ**or Ⓒ**	Ⓑ**or Ⓒ**	Ⓑ**or Ⓒ**
UNSIGNALIZED STOPPED CROSSROAD	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ	Ⓐ
UNSIGNALIZED THROUGH ROAD	Ⓐ	Ⓐ	Ⓒ	Ⓑ	Ⓑ**or Ⓒ**	Ⓑ

* LOW is considered 10% or less of approach traffic volume.
** Whichever is greater

CONDITION Ⓐ STORAGE ONLY

Length = 50' (diverging taper) + Storage Length **(Figure 401-10)**

CONDITION Ⓑ HIGH SPEED DECELERATION ONLY

Design Speed	Length (Including 50' Diverging Taper)
40	125
45	175
50	225
55	285
60	345

CONDITION Ⓒ MODERATE SPEED DECELERATION AND STORAGE

Design Speed	Length (Including 50' Diverging Taper)
40	111 + Storage Length **(Figure 401-10)**
45	125 "
50	143 "
55	164 "
60	181 "

For Explanation, See Turn Lane Design Example

STORAGE LENGTH AT INTERSECTIONS

401-10E

REFERENCE SECTIONS
401.6.1, 401.6.3

* AVERAGE No. OF VEHICLES/CYCLE	REQUIRED LENGTH
1	50 ft
2	100 ft
3	150 ft
4	175 ft
5	200 ft
6	250 ft
7	275 ft
8	325 ft
9	350 ft
10	375 ft
11	400 ft
12	450 ft
13	475 ft
14	500 ft
15	525 ft
16	550 ft

* AVERAGE No. OF VEHICLES/CYCLE	REQUIRED LENGTH
17	600 ft
18	625 ft
19	650 ft
20	675 ft
21	725 ft
22	750 ft
23	775 ft
24	800 ft
25	825 ft
30	975 ft
35	1125 ft
40	1250 ft
45	1400 ft
50	1550 ft
55	1700 ft
60	1850 ft

* Average Vehicles per Cycle = $\frac{\text{DHV (TURNING LANE)}}{\text{CYCLES/HOUR}}$

If Cyclels are unknown, assume:
UNSIGNALIZED OR 2 PHASE - 60 CYCLES/HR
3 PHASE - 40 CYCLES/HR
4 PHASE - 30 CYCLES/HR