

# GENERAL POLICY AND PROCEDURE

DEPARTMENT OF PUBLIC SERVICE  
DIVISION OF PLANNING AND OPERATIONS  
CITY OF COLUMBUS, OHIO

**SUBJECT:** Application of Traffic Signal  
Warrants

**EFFECTIVE DATE:** January 1, 2011

**PAGES:** 12 (including checklist)

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**EXHIBIT A:** Checklist

## I. **PURPOSE:**

The purpose of this document is to set forth the Standard Procedure regarding the Division of Planning and Operations' process of recommending approval of the installation and removal of traffic control signals.

## II. **GENERAL:**

The Director of the Department of Public Service, in accordance with City Codes 2105.01 and 2105.06, hereby adopts, establishes, and publishes this standard procedure to be effective at the earliest time allowed by law. This standard procedure is in addition to any requirements presently established or as may be established from time to time by ordinance or resolutions of City Council, rules and regulations of other officers, boards, commissions, agencies, divisions or departments of the City.

## III. **TRAFFIC CONTROL SIGNALS:**

- A. For general background information on Traffic Control Signals, see Chapter 4B of the **OMUTCD** (Ohio Manual of Uniform Traffic Control Devices) prior to reading this General Policy and Procedure. Specifically, the sections on "Basis of Installation or Removal of Traffic Control Signals"(4B.02), "Advantages and Disadvantages of Traffic Control Signals"(4B.03), "Alternatives to Traffic Control Signals"(4B.04), and "Adequate Roadway Capacity"(4B.05) should be studied.

### **Standard:**

**A traffic control signal (or traffic signal) shall be defined (see Sections 1A.13 ad 4A.02) as: "any device, whether manually, electrically or mechanically operated, by which traffic is alternately directed to stop, to proceed, to change direction or not to change direction" (4511.01 (RR), O.R.C.).**

**Traffic shall be defined (see Section 1A.13) as: "Pedestrians, ridden or herded animals, vehicles, streetcars, trackless trolleys, and other devices, either singularly or together, while using any highway for purposes of travel" (4511.01 (TT), O.R.C.).**

Support:

Words such as pedestrians and bicyclists are used redundantly in selected sections of Part 4 to encourage sensitivity to these elements of "traffic."

Standards for traffic control signals are important because traffic control signals need to attract the attention of a variety of road users, including those who are older, those with impaired vision, as well as those who are fatigued or distracted, or who are not expecting to encounter a signal at a particular location.

**B.** The following information from Chapter 4C of the OMUTCD regarding *Traffic Control Signal Needs Studies* is hereby adopted into this Standard Operating Procedure.

## **TRAFFIC CONTROL SIGNAL NEEDS STUDIES**

### **Section 4C.01 Studies and Factors for Justifying Traffic Control Signals**

**Standard:**

**An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.**

**The investigation of the need for a traffic control signal shall include an analysis of the applicable factors contained in the following traffic signal warrants and other factors related to existing operation and safety at the study location:**

**Warrant 1, Eight-Hour Vehicular Volume.**

**Warrant 2, Four-Hour Vehicular Volume.**

**Warrant 3, Peak Hour.**

**Warrant 4, Pedestrian Volume.**

**Warrant 5, School Crossing.**

**Warrant 6, Coordinated Signal System.**

**Warrant 7, Crash Experience.**

**Warrant 8, Roadway Network.**

**The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.**

Support:

Sections 8D.07 and 10D.05 contain information regarding the use of traffic control signals instead of gates and/or flashing light signals at highway-railroad grade crossings and highway-light rail transit grade crossings, respectively.

## Guidance:

A traffic control signal should not be installed unless one or more of the factors described in this Chapter are met.

A traffic control signal should not be installed unless an *engineering study* indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection.

A traffic control signal should not be installed if it will seriously disrupt progressive traffic flow.

The study should consider the effects of the right-turn vehicles from the minor-street approaches.

Engineering judgment should be used to determine what, if any, portion of the right-turn traffic is subtracted from the minor-street traffic count when evaluating the count against the above signal warrants.

Engineering judgment should also be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics dictate whether an approach should be considered as one lane or two lanes. For example, for an approach with one lane for through and right-turning traffic plus a left-turn lane, engineering judgment could indicate that it should be considered a one-lane approach if the traffic using the left-turn lane is minor. In such a case, the total traffic volume approaching the intersection should be applied against the signal warrants as a one lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles.

Similar engineering judgment and rationale should be applied to a street approach with one lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.

At a location that is under development or construction and where it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated as part of an engineering study for comparison with traffic signal warrants. Except for locations where the engineering study uses the satisfaction of Warrant 8 to justify a signal, a traffic control signal installed under projected conditions should have an engineering study done within 1 year of putting the signal into stop-and-go operation to determine if the signal is justified. If not justified, the signal should be taken out of stop-and-go operation or removed.

For signal warrant analysis, a location with a wide median, even if the median width is greater than 9m (30 ft), should be considered as one intersection.

Option:

At an intersection with a high volume of left-turn traffic from the major street, the signal warrant analysis may be performed in a manner that considers the higher of the major-street left-turn volumes as the "minor-street" volume and the corresponding single direction of opposing traffic on the major street as the "major-street" volume.

For signal warrant analysis, bicyclists may be counted as either vehicles or pedestrians.

Support:

When performing a signal warrant analysis, bicyclists riding in the street with other vehicular traffic are usually counted as vehicles and bicyclists who are clearly using pedestrian facilities are usually counted as pedestrians.

Option:

Engineering study data may include the following:

- A.** The number of vehicles entering the intersection in each hour from each approach during 12 hours of an average day. It is desirable that the hours selected contain the greatest percentage of the 24-hour traffic volume.
- B.** Vehicular volumes for each traffic movement from each approach, classified by vehicle type (heavy trucks, passenger cars and light trucks, public-transit vehicles, and, in some locations, bicycles), during each 15-minute period of the 2 hours in the morning and 2 hours in the afternoon during which total traffic entering the intersection is greatest.
- C.** Pedestrian volume counts on each crosswalk during the same periods as the vehicular counts in Item B above and during hours of highest pedestrian volume. Where young, elderly, and/or persons with physical or visual disabilities need special consideration, the pedestrians and their crossing times may be classified by general observation.
- D.** Information about nearby facilities and activity centers that serve the young, elderly, and/or persons with disabilities, including requests from persons with disabilities for accessible crossing improvements at the location under study. These persons might not be adequately reflected in the pedestrian volume count if the absence of a signal restrains their mobility.
- E.** The posted or statutory speed limit or the 85th-percentile speed on the uncontrolled approaches to the location.

**F.** A condition diagram showing details of the physical layout, including such features as intersection geometrics, channelization, grades, sight-distance restrictions, transit stops and routes, parking conditions, pavement markings, roadway lighting, driveways, nearby railroad crossings, distance to nearest traffic control signals, utility poles and fixtures, and adjacent land use.

**G.** A collision diagram showing crash experience by type, location, direction of movement, severity, weather, time of day, date, and day of week for at least 1 year.

The following data, which are desirable for a more precise understanding of the operation of the intersection, may be obtained during the periods specified in Item B of the preceding paragraph:

**A.** Vehicle-hours of stopped time delay determined separately for each approach.

**B.** The number and distribution of acceptable gaps in vehicular traffic on the major street for entrance from the minor street.

**C.** The posted or statutory speed limit or the 85th-percentile speed on controlled approaches at a point near to the intersection but unaffected by the control.

**D.** Pedestrian delay time for at least two 30-minute peak pedestrian delay periods of an average weekday or like periods of a Saturday or Sunday.

**E.** Queue length on stop-controlled approaches.

### **Section 4C.02 Warrant 1. Eight-Hour Vehicular Volume**

See the current edition, latest revision for the actual wording of the warrant.

#### **Additional City of Columbus Guidance for Warrant 1**

- A Stop Sign Delay Study will be conducted. Capacity analyses under Stop Sign control and signalized control will also be performed. The results of these investigations will be considered during development of the recommendation from the Planning Section to the Planning & Operations Division Administrator. Compliance with a specific delay threshold will not be required.
- The City's preference is that the traffic volumes utilized in the warrant analyses should be based on actual traffic volumes. For locations under development or where a traffic count cannot be obtained that would represent future traffic conditions, the City may allow the use of projected volumes. In such cases an engineering study will be performed within one year of stop-and-go operation to determine if the signal is justified. A Stop Sign Delay Study will not be conducted when projected volumes are used for the analysis.

### **Section 4C.03 Warrant 2. Four-Hour Vehicular Volume**

See the current edition, latest revision for the actual wording of the warrant.

### **Additional City of Columbus Guidance for Warrant 2**

- A Stop Sign Delay Study will be conducted. Capacity analyses under Stop Sign control and signalized control will also be performed. The results of these investigations will be considered during development of the recommendation from the Planning Section to the Planning & Operations Division Administrator. Compliance with a specific delay threshold will not be required.
- The City's preference is that the traffic volumes utilized in the warrant analyses should be based on actual traffic volumes. For locations under development or where a traffic count cannot be obtained that would represent future traffic conditions, the City may allow the use of projected volumes. In such cases an engineering study will be performed within one year of stop-and-go operation to determine if the signal is justified. A Stop Sign Delay Study will not be conducted when projected volumes are used for the analysis.

### **Section 4C.04 Warrant 3. Peak Hour**

See the current edition, latest revision for the actual wording of the warrant.

### **Additional City of Columbus Guidance for Warrant 3**

- The City's preference is that the traffic volumes utilized in the warrant analyses should be based on actual traffic volumes. For locations under development or where a traffic count cannot be obtained that would represent future traffic conditions, the City may allow the use of projected volumes. In such cases an engineering study will be performed within one year of stop-and-go operation to determine if the signal is justified. A Stop Sign Delay Study will not be conducted when projected volumes are used for the analysis.
- Warrant 3 shall be applied with engineering judgment and rationale, and other less restrictive countermeasures shall first be investigated.

### **Section 4C.05 Warrant 4. Pedestrian Volume**

See the current edition, latest revision for the actual wording of the warrant.

### **Additional City of Columbus Guidance for Warrant 4**

- City of Columbus has no additional guidance for Warrant 4.

### **Section 4C.06 Warrant 5. School Crossing**

See the current edition, latest revision for the actual wording of the warrant.

### **Additional City of Columbus Guidance for Warrant 5**

- City of Columbus has no additional guidance for Warrant 5.

### **Section 4C.07 Warrant 6. Coordinated Signal System**

See the current edition, latest revision for the actual wording of the warrant.

### **Additional City of Columbus Guidance for Warrant 6**

- A Stop Sign Delay Study will be conducted. Capacity analyses under Stop Sign control and signalized control will also be performed. The results of these investigations will be considered during development of the recommendation from the Planning Section to the Planning & Operations Division Administrator. Compliance with a specific delay threshold will not be required.

### **Section 4C.08 Warrant 7. Crash Experience**

See the current edition, latest revision for the actual wording of the warrant.

### **Additional City of Columbus Guidance for Warrant 7**

- City of Columbus has no additional guidance for Warrant 7; however, the latest 3 years of crash data should be analyzed in order to detect any trends in crash types and to verify if there has been an increase or decrease in the frequency of correctable crashes. This may help to identify other crash types as well for further investigation. The latest 3 years is defined as that period for which a complete record of crash reports is available at the time the study is performed.

### **Section 4C.09 Warrant 8. Roadway Network**

See the current edition, latest revision for the actual wording of the warrant.

### **Additional City of Columbus Guidance for Warrant 8**

- One of the major routes of the intersection must appear on the City of Columbus Thoroughfare Plan.

#### **IV. Additional Guidance which Supplements the OMUTCD Traffic Signal Control Warrants**

In 1997 Ordinance 150-97 (otherwise known as the **Traffic Standards Code**) was passed by City Council. This Ordinance adopted the goal for the City of Columbus to operate its roadways at Level-of-Service D or higher. Level-of-Service D for an intersection refers to the Average Stopped Delay per Vehicle being no more than 55.0 seconds for signalized control. This goal will be considered during the review process.

#### **V. Traffic Signal Removal Study**

When a request is made for a traffic signal removal, volume and crash data are collected to determine if a removal study is appropriate. If a warrant is not met, approval is needed from the Administrator to place the signal on flash for a period of time to perform the removal study. The time frame is dependent on the signal location. (School Area, Commercial, etc) If the engineering study during flashing operation shows the traffic signal is no longer warranted or justified then the signal will be removed.

1. Remove any sight-distance obstructions.
2. Determine the appropriate traffic control to be used while the study is underway. The signal normally should flash under 2-Way "Stop" control.
3. Inform the public of the removal study by installing "Signal Under Study for Removal" (W3-H12) sign at the signalized intersection on all approaches.
4. Flash or cover the signal heads for a minimum of 90 days, and install the appropriate stop control or other traffic control devices. The City may place a signal on flash for 1 year or more if special conditions exist such as: Public input, political input, accidents increase, Project removes, Pending development, etc.

If the engineering data collected during the study period confirms that the signal is no longer needed, remove the signal heads, pedestrian heads, push buttons and any signal related signage. The poles and cables may remain in place after removal of the signal heads for continued analysis.

#### **VI. SUPPLEMENTAL**

- A.** The Director of the Department of Public Service reserves the right to promulgate, adopt and enforce additional steps or studies, and repeal or amend existing ones.
- B.** This Standard Procedure herein is not intended to conflict with City Ordinances or resolutions or laws or the Constitution of Ohio or laws of the Constitution of the United States. Any conflicts therewith shall be null, void and of no consequence.



# Traffic Signal Study Checklist

Initial and date each task when it has been completed.

## Location \_\_\_\_\_

### A. Service Request:

- \_\_\_\_\_ 1. The Traffic Signal Study process usually begins with a request from the 311 Call Center. Respond to the on-line 311 request. This will serve as an acknowledgement to the 311 Call Center that the request has been received. Update 311 as the signal study progresses.
  
- \_\_\_\_\_ 2. Collect previous Traffic Signal Studies. Check the files for any previous Traffic Signal Study that was conducted at the Intersection in question. Generally, we will not conduct a full study if an Intersection has been studied for signalization within the previous two years. A new study can be initiated in less than two years if major changes in development have occurred since the last Traffic Signal Study was conducted.
  
- \_\_\_\_\_ 3. Compose a pre-reply letter. This letter should inform the citizen of the status of the Traffic Signal Study. Place a copy of the signed letter in the file. You may also respond with this information through 311 or a phone conversation, this must be documented in the file stating this action was done.

### B. Data Collection:

- \_\_\_\_\_ 1. Create a file and file folder for the traffic signal study files.
  
- \_\_\_\_\_ 2. Request the crash history for the location. This request will be for a 3-year period prior to the date at which the accident history request is being made.
  
- \_\_\_\_\_ 3. Request a 24-hour machine count. Projected volumes may be used for the minor approach if the site/location is under development. Projected volumes must be for 8-12 hours and not for just the 8<sup>th</sup> highest hour. (Projected volumes are generally not used to warrant a traffic signal, but are used to assist in determining how much signal infrastructure should be installed at a given time.)
  
- \_\_\_\_\_ 4. **Generate an area map.**
  
- \_\_\_\_\_ 5. **Speed Study.**  
If engineering judgment indicates that the 85<sup>th</sup> percentile speed is greater than the posted speed and could result in the use of reduced volume threshold, then a speed study should be conducted.

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6. **Conduct manual counts.**

If a request for a traffic signal is based upon pedestrian movement. One should consider conducting a pedestrian manual count in special circumstances such as at an intersection near a park or at an intersection that is part of the WALK SMART MAPS FOR SCHOOLS. A vehicular manual count shall be conducted along with all pedestrian counts. One should consider conducting a vehicular manual count when the accuracy of the machine count is in question.

### **C. Traffic Signal Warrant Analysis**

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1. **Evaluate crashes.**

Record the number of crashes which are of types responsive to correction by traffic signal control and accidents involving pedestrians.

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2. **Conduct warrant analysis.**

### **D. Traffic Signal Delay Analysis (if a warrant is met):**

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1. **Conduct a Stop Sign Delay Study.**

A Stop Sign Delay Study is used to determine the degree of delay a motorist experiences at a "Stop Sign" before entering into the flow of traffic. This is done in the am & pm peak hours that are derived from the 24 hour volume machine counts.

- a. A Stop Sign Delay Study is necessary if any of the warrants are met; except Warrant 4 (Pedestrian Volume), Warrant 5 (School Zone Crossing), and Warrant 7 (Crash Experience).
- b. No Stop Sign Delay Study is necessary if five or more crashes, of types Responsive to correction by a traffic signal control, have occurred within a recent 12-month period and at least 80% of either Warrant 1, 2, or 3 have been met; however, the traffic signal shall not be recommended until an adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency (as long as any alternatives are feasible).
- c. No Stop Sign Delay Study is necessary if five or more crashes, of types Responsive to correction by a traffic signal control, have occurred within a recent 12-month period and Warrant 7 – Crash Experience is **not** met. The intersection data should then be forwarded to the Operations Section where non-signalized measures will be taken to reduce the number of crashes.

\_\_\_\_\_ 2. **Calculate right-turn discount when appropriate.**  
Apply the right-turn discount to a fresh copy of the machine count and re-evaluate the warrant analysis. In this way, one could easily reference the original warrant analysis and traffic volumes prior to the application of the right-turn discount. The results of the Stop Sign Delay Study are used also to determine the right-turn discount to apply to the warrant analysis.

\_\_\_\_\_ 3. **Perform capacity analyses for signalized and unsignalized control.**

\_\_\_\_\_ 4. **Update crash history.**

## **E. Traffic Signal Study Presentation**

\_\_\_\_\_ 1. **Assemble traffic signal study packets.**  
These packets are for a meeting with the Administrator of the Division of Planning and Operations. The packet needs to include the agenda, signal warrant analysis, the area map, pictures taken of the intersection plus other information pertaining specifically to that intersection. If crashes are a concern in a signal warrant analysis then a collision diagram shall be included. This is done for each traffic signal study.

\_\_\_\_\_ 2. **Schedule meeting.**  
Schedule a meeting with The Planning & Operations Division Administrator. Present recommendation and make decision.

## **F. Traffic Signal Study**

\_\_\_\_\_ 1. **Update the Agenda.**  
Update the Agenda when the final decision is made for each of the Traffic signal study. This may include additional comments or further investigative concerns that may need to be done (observe crashes for 6 months, etc). Check the "Approve or Deny" box before electronically sending the agenda to the appropriate group/groups of people that need to be notified of the final decision. (Maintenance, Design & Const, Operations, etc).

\_\_\_\_\_ 2. **Schedule hand-off meeting.**  
Schedule meeting with Design for approved signals to be designed in-house.

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**3. Compose a letter of final reply.**

Place a copy of the signed letter in the file. This letter should inform the citizen of the final decision reached by the Planning and Operations Division Administrator regarding their traffic signal request. As so with the pre reply you may also respond with this information through 311 or a phone conversation, this must be documented in the file stating this action was done.

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**4. Assemble and file.**

Assemble and file the traffic signal study. Also mark the study as “Permanent Do Not Destroy” sign and date this action. A copy of the Signal Warrant Analysis Sheet shall be placed in the appropriate notebook/on-line folder and the traffic signal study packet shall be filed in the traffic signal files.

## **G. Update Files As Needed**

This is done when a study(s) (intersection) needs monitoring for accidents for a period of time, for instance 3-6 months. Or to look at volumes again for growth, etc.