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PART 4
HIGHWAY TRAFFIC SIGNALS

STATE OF CALIFORNIA
BUSINESS, TRANSPORTATION AND HOUSING AGENCY
DEPARTMENT OF TRANSPORTATION

PART 4. HIGHWAY TRAFFIC SIGNALS

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CHAPTER 4A. GENERAL

Support:

No Comments.

This MUTCD Chapter is adopted as is for California.

CHAPTER 4B. TRAFFIC CONTROL SIGNALS – GENERAL

Section 4B.02 Basis of Installation or Removal of Traffic Control Signals

The following is added to this section:

Standard:

Once a traffic signal at an intersection or pedestrian crossing has been energized, it shall not be turned off unless arrangements have been made for temporary control by traffic officers, temporary stop signs or an approved portable signal.

Section 4B.05 Adequate Roadway Capacity

The following is added to this section:

Support:

When the vehicular volume on a two-lane State highway is large enough to warrant traffic signals, usually there will be considerable congestion after the signals are installed unless the State highway is widened to four lanes at the intersection. Sometimes, it is also necessary to widen the intersecting road.

Guidance:

Where possible, the highway approaches and local road approaches should be widened to two lanes for through traffic, for a minimum of 60 m (200 ft) for traffic approaching the intersection and for a minimum of 100 m (330 ft) for traffic leaving the intersection. Additional widening for tapered sections should be provided at the ends of the added lanes. It may be necessary to prohibit parking in these areas and/or to provide left turn lanes. See Section 4B.104 for financing.

Section 4B.101 Traffic Signal Development Procedures –Introduction

Support:

General requirements for the development of traffic signal, lighting and electrical systems projects are noted in the Department of Transportation's Project Development Procedures Manual. See Section 1A.11 for information regarding this publication. The cost of traffic signals on Federal Aid highway projects is eligible for federal participation under certain conditions.

Option:

The preparation of a Project Study Report may be required for major traffic signal lighting and/or electrical system projects for scoping and programming purposes.

Guidance:

The Department of Transportation's Project Development Procedures Manual and the appropriate Program Advisor should be consulted to determine specific reporting requirements.

Section 4B.102 Project Report

Standard:

The Department of Transportation's District shall prepare a project report of the investigation of conditions at locations where a new traffic signal is to be installed, an existing traffic signal is to be modified or an existing traffic signal is to be removed. The Department of Transportation's District Directors are authorized to approve project reports in accordance with the current departmental policies contained in the Project Development Procedures Manual. Three copies of the District-approved project report shall be forwarded to the Department of Transportation's Chief, State and Local Project Development. A project report shall be prepared whether the work is performed by the State or by others.

Guidance:

General requirements for project reports are noted in the Department of Transportation's Project Development Procedures Manual. A project report for the installation, modification (except for upgrading

projects involving specific equipment) or removal of a traffic signal should include the following specific information:

1. Traffic Counts.

   Both pedestrian and vehicular traffic counts should include the periods of the average day when the signals would appear to be needed most. The counts should be at least eight hours in duration, not necessarily consecutive, but including a.m. and p.m. peak hours.

   Traffic counts for a new signal shall be shown on appropriate Traffic Signal Warrant Sheets and a Directional Traffic Count Sheet. See Figures 4C-101, 4C-102 and Table 4C-101.

   Where pedestrian volumes are significant, show the volume on each crosswalk for the same periods as the vehicle count.

   When estimated traffic volumes are used in establishing traffic signal warrants, they should be prepared on Form TS-10D. See Table 4C-101.
2. Collision Diagram.

   A collision diagram for the intersection covering the recent accident experience history. The diagram should cover a 3-year interval.
3. Condition Diagram.

   A condition diagram showing existing roadway conditions. Any railroad grade crossing within 60 m (200 ft) of the intersection should be shown.
4. Improvement Diagram.

   A diagram showing existing and proposed signals, phasing, channelization and other proposed improvements. This may be combined with 1, 2 and/or 3 on a single plan.
5. Estimate.

   An estimate of the cost of the project (including State furnished materials) and the proposed method of financing.
6. Other Specialized Data When Appropriate:
   a. Classification of Vehicles. The classification is required when it is a significant factor in affecting intersection capacity.
   b. Critical Speed (85th percentile) of Approaching Vehicles. This is the speed at a point unaffected by existing controls.
   c. Time-Space Diagram. When the project involves a coordinated traffic signal system.

Section 4B.103 <u>Submittals</u>

Support:

General requirements for the submittal of plans, specifications and estimates are noted in the Department of Transportation's Project Development Procedures Manual and the PS&E Guide. See Section 1A.11 for information regarding these publications.

Standard:

All electrical plans shall bear the following: "Note: This plan accurate for electrical work only."

Section 4B.104 <u>Financing</u>

Guidance:

Unless previously budgeted, the financing of a project should be considered only after receipt of the PS&E Report and cooperative agreements.

Support:

Normally, the costs of a new traffic signal or the modification of a signal or signal system are to be shared with a local agency.

Option:

In situations where a new traffic signal or a modification to an existing traffic signal or traffic signal system is urgently needed to improve safety or traffic flow on the State highway and the local agencies are

unable to finance their prorated share of the cost, the State may accept a lesser participation, or even no participation, by the local authorities.

Standard:

The definition of "urgently needed" shall be made by the Department of Transportation's District Director.

The cost of small projects such as modifications to existing traffic signals (detectors, signal heads, mast arms, etc.) where the prorated share of the local agency is $3,000 or less, shall be at 100% State expense.

Section 4B.105 Design Cost

Standard:

The following criteria shall apply in determining the amount of participation in the design cost by the State and a local agency:

a Where the State prepares plans for the installation or modification of a traffic signal or a traffic signal system on a State highway, the design costs should be shared with the local agency. Where the local agency is to prepare the plans, the State may participate in the design costs. Participation should be the same as construction cost participation and be covered by a cooperative agreement.

Guidance:

b Estimated design costs should be determined on the basis of an agreed fixed percentage of the total project costs. The fixed percentage should be based on historical design costs for projects in the price range concerned.

Standard:

c Where the State is requested by a local agency to prepare plans and specifications for a traffic signal project that does not involve State participation in the construction costs, the design costs shall be borne entirely by the local agency or others. The State may, however, assume the design engineering costs and the construction engineering costs, where the local agency agrees to pay all of the construction costs for a warranted project and where all of the costs would normally be shared on a prorated basis.

Section 4B.106 Construction Costs - Conventional Highways

Standard:

The following criteria shall apply in determining the amount of the construction costs by the State and local agency for a traffic signal, safety lighting, and channelization or widening project on conventional State highways.

Channelization and/or Widening Costs. On cooperatively financed projects, the channelization and/or widening costs shall be shared as follows:

1. **Channelization on and/or widening of the State highway shall be at 100% State expense.**
2. **Channelization on and/or widening of the local street shall be at 100% local agency expense.**
3. **Where the local agency's portion of the channelization or widening is a minor part of the channelization or widening being constructed by the State and the local agency's share of the work amounts to $3,000, or less, the State may assume the entire cost of the channelization or widening.**

Channelization and/or widening required, as a part of the conditions of a permit by a private party shall be at 100% expense of the private party.

In Cases A, B, and D listed below, the costs of constructing the electrical facilities are to be shared by the State and local agencies. The costs shall be shared on a prorated basis in the same ratio as the number of legs in the intersection under each agency's jurisdiction bears to the total number of legs.

Case A. **Installation or Modification of a Traffic Signal and/or Safety Lighting at an Existing Intersection. When a traffic signal and/or safety lighting is to be installed or modified at the intersection of a State highway and a local road, local agency participation in the installation or modification costs shall be sought.**

Guidance:

Case B. Existing Driveways at Existing Signalized Intersections. A private driveway that constitutes a leg at an existing signalized intersection should be treated as follows:

1. If the driveway does not generate appreciable traffic, no control is required.
2. If the driveway serves an area that generates sufficient traffic to constitute a problem, it should be controlled. One example of control is the use of a red flashing beacon and/or a RIGHT TURN ONLY (CA Code R41) sign to control egress from the private driveway. Another would be to provide signal indications for the private driveway.

Stndard:

3. **Costs shall be as in Case D.**

Case C. **A New Road or Driveway at an Existing Signalized Intersection. Where a new road or driveway is to be constructed to enter an existing "T" intersection, the cost of necessary right-of-way, traffic signal and/or safety lighting shall be at 100% local agency or permittee expense. The cost shall include the signal faces and detectors for the new approach and signal faces and detectors for left turns into the new approach and channelization, if necessary.**

Case D. **Installation of a Traffic Signal and/or Safety Lighting at an existing intersection with a Driveway. Where a traffic signal and/or safety lighting is to be installed at an existing intersection serving an area which generates sufficient traffic to constitute a problem that includes a private driveway as the fourth approach, the cost of signal and lighting equipment for the driveway approach shall be included in the cost of the entire installation. Where one or more legs of the intersection are under the jurisdiction of a local agency, the construction costs shall be shared with the local agency. The cost of the driveway leg shall be included with the local agency's share. It shall be the responsibility of the local agency to obtain the right-of-way, right-of-entry or easement necessary to install and maintain the signal equipment to be located on private property.**

Case E. **Reconstruction of a Conventional State Highway. When it is necessary to widen or reconstruct a State highway, the reconstruction and relocation of traffic control devices and safety lighting systems, shall be at 100% State expense. Local participation for purposes of expediting a project should be accepted. Additional traffic control devices installed in connection with reconstruction of a conventional highway are to be treated as in Case A.**

Case F. **Relocation of a Conventional State Highway. When an existing State highway is relocated, the State will install warranted traffic control devices and safety lighting at State expense. Local participation will not be required. If, however, a local authority wishes to participate in a project in order to expedite it, local participation should be accepted.**

Case G. **Installation of a Traffic Signal and/or Safety Lighting at a Private Driveway or Privately Owned Street. The cost of a new traffic signal and/or safety lighting installed at a private driveway or privately owned street (i.e., not under the jurisdiction of a city or county) shall be entirely at the expense of the property owner or developer.**

The permittee shall grant the State access rights to the private property at any time for the purpose of maintaining or timing the signal and lighting.

Upon installation, all rights, title and interest in the traffic signal equipment shall be granted to the State by the permittee. In the event that the State finds it advisable for the signals to be removed, the State will remove and salvage the equipment.

Case H. Reconstruction of Existing Facilities. When affected by State highway construction, existing street lighting, police and fire alarm systems, and similar systems owned by a city, county or publicly owned service district shall be relocated at the sole expense of the owner, unless prior rights can be established.

Case I. School Traffic Signals and Flashing Beacons. Where traffic signals and/or flashing beacons are justified only by the School Area Traffic Signal Warrant on a State highway, the installation shall be at 100% State expense. When any other warrant is met also, the cost is shared in the usual manner.

Section 4B.107 <u>Construction Costs – Freeways</u>

Standard:

The installation of electrical work and channelization at an intersection of a freeway ramp and a local road shall be at 100% State expense if such improvements are warranted at the time the freeway is to be opened to traffic, or if they are estimated to be warranted within five years after the date the freeway is opened to traffic.

Support:

It can be difficult to accurately predict the traffic pattern at interchanges at the time of the freeway design. Therefore, the need for signals at the ramp connections to local roads cannot always be anticipated.

Standard:

If within five years after the date of completion of the freeway, the interchange does not operate in the manner intended, and signal warrants are met, it shall be the policy to provide signals, lighting, channelization or roadway widening as necessary to facilitate the flow of traffic through the interchange. This work shall be done entirely at State expense in the same manner as it would have been done had it been planned in the original freeway project. This shall include widening of roadway approaches to proposed signalized ramp intersections in accordance with present design practice entirely at State expense.

After the five-year period, the cost of installation shall be financed in the same manner as for existing intersections.

Guidance:

Approval by local agencies should be obtained for changes to roads under their jurisdiction.

Option:

In lieu of treating each ramp intersection individually and sharing the costs on the basis of the number of legs under each jurisdiction, the concept of the overall facility as described in the Department of Transportation's Maintenance Manual may be used. See Section 1A.11 for information regarding this publication.

Standard:

Frontage roads or portions of frontage roads, which serve as connections between ramps to or from the freeway and existing public roads and which are retained under State jurisdiction, shall be considered as freeway ramps and electrical work at the intersections shall be financed as described above.

Any time the interchange is revised by adding or relocating ramps, it is considered a new interchange and the cost of signals at the ramp terminals and/or the connection to the local road shall be at 100% State expense.

Section 4B.108 Roadway Improvements by Local Agencies

Standard:

Any new connection of a local street to a State highway, including any electrical work, widening and/or channelization required within the State highway right of way, shall be at 100% local agency expense.

At existing intersections any relocation or improvement of electrical facilities due to widening and/or channelization of the local street shall be at 100% local agency expense.

Section 4B.109 Cooperative Agreements

Support:

When a local agency participates in the various project costs, a cooperative agreement is required.

Standard:

Each agreement shall include a statement of ownership, maintenance and operation.

Support:

Preapproved agreement forms and procedure details are available.

Section 4B.110 Engineering Services for Local Agencies

Standard:

Contracts with local agencies for the State to provide traffic signal control system engineering services shall include a clause relating to "Legal Relationships and Responsibilities".

Support:

Preapproved wording is available.

Section 4B.111 Salvaged Electrical Equipment

Support:

A construction project sometimes includes the removal of traffic signal, lighting or other electrical equipment that is not to be reused on the particular project.

Guidance:

The determination as to whether particular electrical equipment is salvable should be made at the Department of Transportation's District level. The determination as to whether or not to salvage existing equipment should be made on the basis of the economic benefit to the State and on the conservation of energy and/or materials that would result from salvaging and/or reinstallation. Equipment should be salvaged if it falls within one of the following categories:

1. It is an item for which there is a foreseeable use.
2. It is part of an electrical installation owned jointly with another agency and the other agency has requested the salvaged equipment.
3. It is usable in some other Department of Transportation's District.
4. It can be immediately disposed of by other means.

Standard:

All electrical equipment removed and determined not to be salvable shall become the property of the contractor.

Equipment determined to be salvable shall be disposed of as follows:

1. **If the electrical installation is jointly owned by the State and one or more local agencies, each of the owners shall share in the salvage value. The local agencies shall be given first choice in obtaining the salvaged equipment. The agency obtaining the salvaged equipment shall reimburse the other agency in accordance with the proportionate ownership.**
2. **Where the State or local agency is replacing existing electrical equipment without the other agency participating in the cost of the new equipment, the salvaged equipment shall belong to**

the party or parties who bore the cost of the new equipment unless otherwise specified in an agreement or encroachment permit.

The salvage value shall be determined at the Department of Transportation's District level during preparation of the preliminary report.

Guidance:

The salvage value should be such that if the equipment were taken into State storage it could be used economically for maintenance or as State-furnished material on contracts. The estimated salvage value should make the equipment more attractive to local agencies than the money representing the other partner's share of the salvage value. Wire and wiring supplies such as conduit, junction boxes, and connectors, and other materials should be considered as a lot at no value, or in any case, not more than the nominal sum of $1.

Support:

Often, salvaged electrical equipment is available for use on new installations; in many cases this will result in considerable savings.

Section 4B.112 Encroachment Permits

Standard:

Encroachment permits are required for a local agency or a private party to install or modify traffic signals and street lighting on a State highway.

Guidance:

Plans and Specifications prepared by Permittees should conform to State Standard Specifications, Standard Plans and be submitted to the Department of Transportation's District for review and approval.

Standard:

In each case, a statement of ownership, maintenance and operation shall be included in the permit.

Support:

A Permit Engineering Evaluation Report (PEER) may be prepared in lieu of a project report for all projects estimated to cost $1,000,000 or less, as part of the encroachment permit review process. Instructions for PEER's are found in the Department of Transportation's Project Development Procedures Manual and the Encroachment Permits Manual. See Section 1A.11 for information regarding these publications.

Standard:

All projects financed, in whole or in part, from retail transactions and use taxes and projects costing more than $1,000,000 requires a cooperative agreement.

Section 4B.113 Modifications of Existing Signals

Guidance:

Where existing signals are to be modified, construction plans should include a separate plan of the existing system as well as a plan showing the modifications.

Option:

It may also be necessary to include a tabulation on the plan showing such appurtenances as backplates and special signal faces that may be difficult to discern on a complicated plan.

Guidance:

The design of any signal modification project should include adequate consideration for keeping the existing signals in operation while the modification work is being done.

Section 4B.114 Signals on Poles Owned by Others

Option:

Traffic signal equipment may be attached to poles owned by utility companies or other agencies when it is desired to keep the number of poles at an intersection to a minimum.

Guidance:

In such cases, the Agency should enter into an agreement with the owner of the pole. The agreement should be written to hold the owner of the pole free of liability relative to operation of the traffic signal or damage to the pole and to make the State or Local Transportation Agency responsible for moving the equipment in the event the pole is removed or relocated.

CHAPTER 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES

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

The following is added to this section:

Standard:

Delay, congestion, approach conditions, driver confusion, future land use or other evidence of the need for right of way assignment beyond that which could be provided by stop sign shall be demonstrated.

Support:

Figure 4C–101 and Table 4C-101 are examples of warrant sheets.

Guidance:

Table 4C-101 should be used only for new intersections or other locations where it is not reasonable to count actual traffic volumes.

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

In the first Option, the text "70 km/h or exceeds 40 mph" is deleted and replaced by "64 km/h or exceeds 40 mph".

Delete the last Option that begins "If the posted or…" The 56% column in Table 4C-1 shall not apply in California.

Table 4C-1 Warrant 1, Eight-Hour Vehicular Volume

Delete the 56% column and related note(d).

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

In the Option the text "70 km/h or exceeds 40 mph" is deleted and replaced by "64 km/h or exceeds 40 mph".

Section 4C.04 Warrant 3, Peak Hour

In the Option the text "70 km/h or exceeds 40 mph" is deleted and replaced by "64 km/h or exceeds 40 mph".

Section 4C.06 Warrant 5, School Crossing

The following is added to this section:

Option:

Flashing beacons at school crosswalks may be installed on State highways in accordance with CVC Sections 21372 and 21373.

The following alternative criterion may be used for determining if a school crossing traffic signal is justified under this warrant:

1. When other warrants in this Chapter are met AND
2. No other controlled crossing is located within 180 m (600 ft) AND;
3. Urban Areas - 500 vehicles and 100 school pedestrians for each of any two hours (not necessarily consecutive) daily while students are crossing to or from school; or 500 vehicles for each of any two hours daily while students are crossing to or from school and a total of 500 school pedestrians during the entire day. OR
4. Rural Areas - 350 vehicles and 70 school pedestrians for each of any two hours (not necessarily consecutive) daily while students are crossing to or from school; or 350 vehicles for each of any two hours (not necessarily consecutive) daily while students are crossing to or from school and minimum total of 350 school pedestrians during the entire day.

Guidance:

When the critical (85th percentile) approach speed exceeds 55 km/h (35 mph) or the sight distance to the intersection is less than the required stopping sight distance, rural criteria should be applied.

Section 4C.101 Function of School Crossing Traffic Signals

Support:

A traffic signal assigns intersection right-of-way and promotes the orderly movement of pedestrians and vehicles. However, improper signal controls sometimes lead to intentional violations, unnecessary delays and traffic diversion to less desirable routes.

Section 4C.102 Criterion for School Crossing Traffic Signals

Standard:

1. **The signal shall be designed for full-time operation.**
2. **Pedestrian signal faces of the International Symbol type shall be installed at all marked crosswalks at signalized intersections along the "Suggested Route to School."**
3. **If an intersection is signalized under this guideline for school pedestrians, the entire intersection shall be signalized.**
4. **School area traffic signals shall be traffic actuated type with push buttons or other detectors for pedestrians.**

Option:

Non-intersection school pedestrian crosswalk locations may be signalized when justified.

Section 4C.103 Bicycle Signal Warrant

Guidance:

A bicycle signal should be considered for use only when the volume and collision or volume and geometric warrants have been met:

1. *Volume*, When W = B x V and W $\geq$ 50,000 and B $\geq$ *50.*
   Where: W is the volume warrant. B is the number of bicycles at the peak hour entering the intersection. V is the number of vehicles at the peak hour entering the intersection. B and V shall use the same peak hour.
2. *Collision*, When 2 or more bicycle/vehicle collisions of types susceptible to correction by a bicycle signal have occurred over a 12-month period and the responsible public works official determines that a bicycle signal will reduce the number of collisions.
3. *Geometric*, (a) Where a separate bicycle/ multi use path intersects a roadway. (b) At other locations to facilitate a bicycle movement that is not permitted for a motor vehicle.

Figure 4C-2 Warrant 2 – Four Hour Vehicular Volume (70% Factor)

Under the Figure title, the text "70 km/h OR ABOVE 40 mph" is replaced by "64 km/h OR ABOVE 40 mph."

Figure 4C-4 Warrant 3 – Peak hour (70% Factor)

Under the Figure title, the text "70 km/h OR ABOVE 40 mph" is deleted and replaced by "64 km/h OR ABOVE 40 mph."

Figure 4C-101. Traffic Signal Warrants Worksheet (Sheet 1 of 4)

DIST ____ CO ____ RTE ____ KPM ____

CALC _____ DATE _____
CHK _____ DATE _____

Major St: _____ Critical Approach Speed _____ km/h
Minor St: _____ Critical Approach Speed _____ km/h

Critical speed of major street traffic > 64 km/h (40 mph)..... ☐ or
In built up area of isolated community of < 10,000 population..... ☐
} **RURAL (R)**

☐ **URBAN (U)**

WARRANT 1 - Eight Hour Vehicular Volume

Condition A - Minimum Vehicle Volume

100% SATISFIED YES ☐ NO ☐
80% SATISFIED YES ☐ NO ☐

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS												
	U	R	U	R									
APPROACH LANES	1		2 or More										Hour
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)									
Highest Approaches Minor Street	150 (120)	105 (84)	200 (160)	140 (112)									

Condition B - Interruption of Continuous Traffic

100% SATISFIED YES ☐ NO ☐
80% SATISFIED YES ☐ NO ☐

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS												
	U	R	U	R									
APPROACH LANES	1		2 or More										Hour
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)									
Highest Approaches Minor Street	75 (60)	53 (42)	100 (80)	70 (56)									

Combination of Conditions A & B

SATISFIED YES ☐ NO ☐

REQUIREMENT	WARRANT	✓	FULFILLED
TWO WARRANTS SATISFIED 80%	1. MINIMUM VEHICULAR VOLUME		Yes ☐ No ☐
	2. INTERRUPTION OF CONTINUOUS TRAFFIC		

Figure 4C-101. Traffic Signal Warrants Worksheet (Sheet 2 of 4)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for four hours.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Highest Approaches - Minor Street						

*All plotted points fall above the curves in MUTCD Figure 4C-1 or 4C-2. Yes ☐ No ☐

WARRANT 3 - Peak Hour **PART A or PART B SATISFIED YES ☐ NO ☐**

PART A **SATISFIED YES ☐ NO ☐**

(All parts 1, 2, and 3 below must be satisfied)

1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceedds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach; AND Yes ☐ No ☐
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND Yes ☐ No ☐
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaoches. Yes ☐ No ☐

PART B **SATISFIED YES ☐ NO ☐**

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Highest Approaches - Minor Street						

The plotted points for vehicles per hour on major streets (both approaches) and the corresponding per hour higher volume vehicle minor street approach (one direction only) for one hour (any consecutive 15 minute period) fall above the applicable curves in MUTCD Figure 4C-3 or 4C-4.

Figure 4C-101. Traffic Signal Warrants Worksheet (Sheet 3 of 4)

DIST	CO	RTE	KPM

CALC _____ DATE _____
CHK _____ DATE _____

Major St: _____ Critical Approach Speed _____ km/h
Minor St: _____ Critical Approach Speed _____ km/h

Critical speed of major street > 64 km/h (40 mph)..... ☐ or
In built up area of isolated community of < 10,000 population..... ☐
} **RURAL (R)**

☐ **URBAN (U)**

WARRANT 4 - Pedestrian Volume
(All Parts Must Be Satisfied)

100% SATISFIED YES ☐ NO ☐

Hours - - ->				
Pedestrian Volume				
Adequate Crossing Gaps				

Any hour > 190 Yes ☐ No ☐
OR 4 hours > 100 Yes ☐ No ☐
AND < 60 gap/hr Yes ☐ No ☐

AND, The distance to the nearest traffic signal along the major street is greater than 90m (300 ft) - - - - - - - - - - - Yes ☐ No ☐

AND, The new traffic signal will not seriously disrupt progressive traffic flow in the major street. - - - - - - - - - - - Yes ☐ No ☐

WARRANT 5 - School Crossing
(All Parts Must Be Satisfied)

SATISFIED YES ☐ NO ☐

Part A
Gap/Minutes and # of Children

Each of Two Hours - - ->			
Gaps vs Minutes	Minutes Children Using Crossing		
	Number of Adequate Gaps		
School Age Pedestrians Crossing Street			

Gaps < Minutes SATISFIED YES ☐ NO ☐
Children > 20/hr SATISFIED YES ☐ NO ☐

Part B
Distance to Nearest Controlled Crossing

Is Nearest Controlled Crossing More Than 180 m (600 ft) away? SATISFIED YES ☐ NO ☐

Figure 4C-101. Traffic Signal Warrants Worksheet (Sheet 4 of 4)

WARRANT 6 - Coordinated Signal System **SATISFIED YES ☐ NO ☐**
(All Parts Must Be Satisfied)

MINIMUM REQUIREMENTS	DISTANCE TO NEAREST SIGNAL	FULFILLED
> 300 m (1000 ft)	N _____ m, S _____ m, E _____ m, W _____ m	Yes ☐ No ☐
On one way isolated streets or streets with one way traffic significance and adjacent signals are so far apart that necessary platooning and speed control would be lost.		
On 2-way streets where adjacent signals do not provide necessary platooning and speed control proposed signals could constitute a progressive signal system.		☐ ☐

WARRANT 7 - Crash Warrant **SATISFIED YES ☐ NO ☐**
(All Parts Must Be Satisfied)

REQUIREMENTS	WARRANT	✓	FULFILLED
One Warrant Satisfied 80%	Warrant 1 - Minimum Vehicular Volume		
	OR Warrant 2 - Interruption of Continuous Traffic		Yes ☐ No ☐
Signal Will Not Seriously Disrupt Progressive Traffic Flow			☐ ☐
Adequate Trial of Less Restrictive Remedies Has Failed to Reduce Accident Frequency			☐ ☐
Acc. Within a 12 Month Period Susceptible for Corr. & Involving Injury or ≥ $500 Damage			
MINIMUM REQUIREMENTS	NUMBER OF ACCIDENTS		
5 or More			☐ ☐

WARRANT 8 - Roadway Network **SATISFIED YES ☐ NO ☐**
(All Parts Must Be Satisfied)

MINIMUM VOLUME REQUIREMENTS	ENTERING VOLUMES - ALL APPROACHES		✓	FULFILLED
1000 Veh/Hr	During Typical Weekday Peak Hour _____ Veh/Hr			
	OR During Each of Any 5 Hrs. of a Sat. and/or Sun _____ Veh/Hr			Yes ☐ No ☐
CHARACTERISTICS OF MAJOR ROUTES	MAJOR ST.	MINOR ST.		
Hwy. System Serving as Principal Network for Through Traffic				
Rural or Suburban Highway Outside Of, Entering, or Traversing a City				
Appears as Major Route on an Official Plan				
Any Major Route Characteristics Met, Both Streets				☐ ☐

The satisfaction of a warrant is not necessarily justification for a signal. Delay, congestion, confusion or other evidence of the need for right-of-way assignment must be shown.

Figure 4C-102. Traffic Count Worksheet

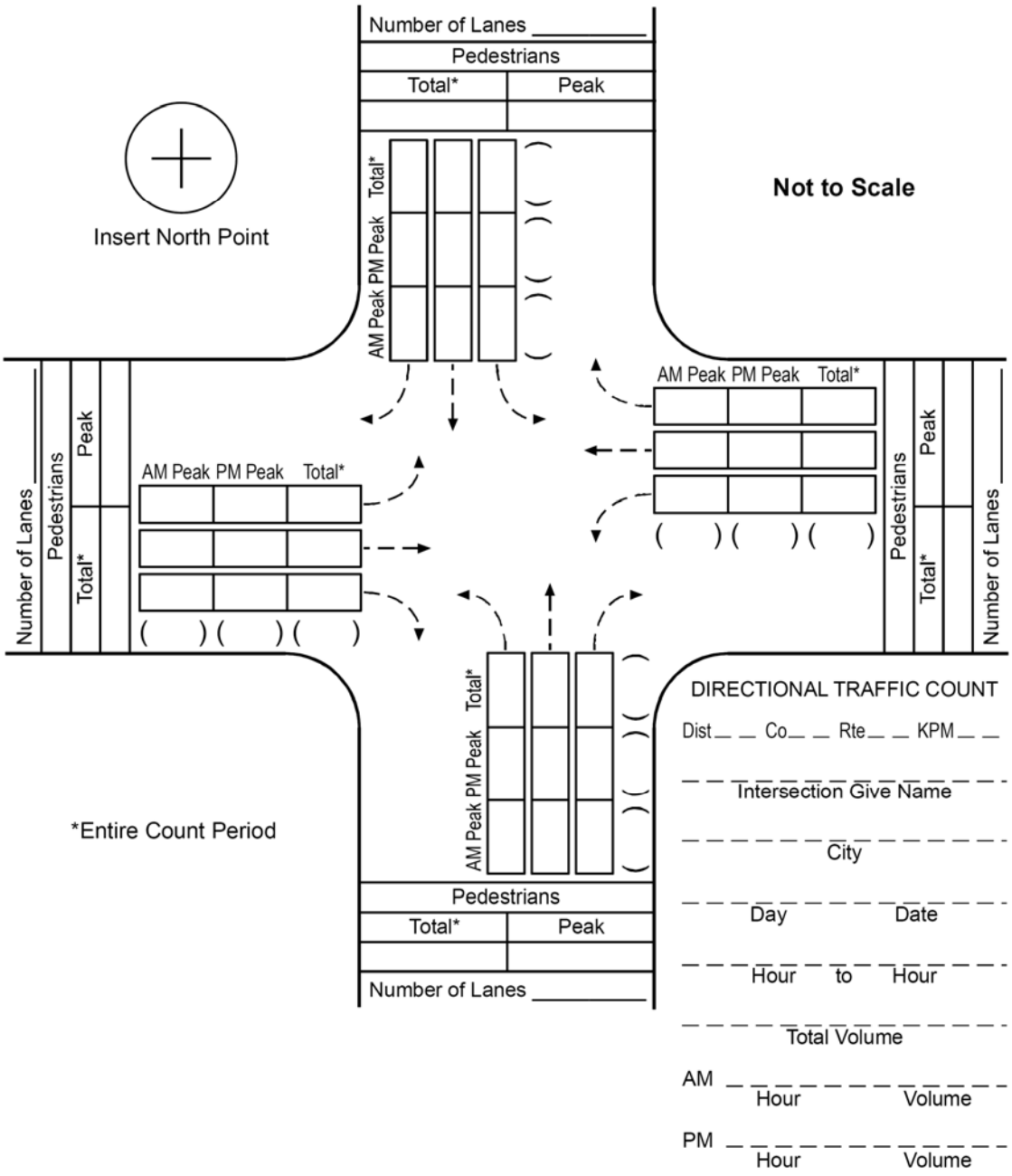

Table 4C-101. Traffic Signal Warrants Worksheet (Average Traffic Estimate Form)

(Based on Estimated Average Daily Traffic - See Note)

URBAN..... RURAL.....	Minimum Requirements EADT			
1A - Minimum Vehicular Traffic Satisfied _____ Not Satisfied _____	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Number of lanes for moving traffic on each approach	Urban	Rural	Urban	Rural
Major Street / Minor Street				
1..... 1.....	8,000	5,600	2,400	1,680
2 or More..... 1.....	9,600	6,720	2,400	1,680
2 or More..... 2 or More.....	9,600	6,720	3,200	2,240
1..... 2 or More.....	8,000	5,600	3,200	2,240
1B - Interruption of Continuos Traffic Satisfied _____ Not Satisfied _____	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Higher-Volume Minor Street Approach (One Direction Only)	
Number of lanes for moving traffic on each approach	Urban	Rural	Urban	Rural
Major Street / Minor Street				
1..... 1.....	12,000	8,400	1,200	850
2 or More..... 1.....	14,400	10,080	1,200	850
2 or More..... 2 or More.....	14,400	10,080	1,600	1,120
1..... 2 or More.....	12,000	8,400	1,600	1,120
1A&B - Combinations Satisfied _____ Not Satisfied _____ No one warrant satisfied, but following warrants fulfilled 80% or more..... _____ (1) _____ (2)	2 Warrants		2 Warrants	

Note: To be used only for NEW INTERSECTIONS or other locations where it is not reasonable to count actual traffic volumes.