

Signal Warrant Analysis for NE 124th Street / 162nd Place NE
Future Conditions With Approved Pipeline

Warrant 1 - Eight Hour Vehicular Volume
Condition A - Minimum Vehicular Volume

Hour Begins	Minor Approach 162nd Place NE Highest NB/SB (2)	Major Approach NE 124th Street Total EB & WB (2)	MUTCD (1) Warrant 1A	
6:00	27	696		
7:00	65	1,097		
8:00	89	1,217		
9:00	98	1,100		
10:00	77	945		
11:00	72	987		
12:00	72	1,012		
13:00	65	1,012		
14:00	65	1,048		
15:00	86	1,164		
16:00	106	1,347		YES
17:00	125	1,395		YES
18:00	84	1,178		
19:00	63	843		
WARRANT MET (3) =				NO

Notes:

- (1) MUTCD - Manual on Uniform Traffic Control Devices, 2009.
- (2) Three-day average of 24-hour volumes conducted on 8/5, 8/6, and 8/7, 2014.
- (3) Signal warrant satisfied when traffic volumes exist for each of any 8 hours of an average day.

MUTCD Warrant Requirements

Warrant 1, Condition A: Minimum Vehicular Volume

Minimum volume of 350 vehicles per hour on 1-lane major street (both approaches)
105 vehicles per hour on 1-lane minor street approach.

Signal Warrant Analysis for NE 124th Street / 162nd Place NE
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Warrant 1 - Eight Hour Vehicular Volume
Condition B - Interruption of Continuous Traffic

Hour Begins	Minor Approach 162nd Place NE Highest NB/SB (2)	Major Approach NE 124th Street Total EB & WB (2)	MUTCD (1) Warrant 1B
6:00	27	696	
7:00	65	1,097	YES
8:00	89	1,217	YES
9:00	98	1,100	YES
10:00	77	945	YES
11:00	72	987	YES
12:00	72	1,012	YES
13:00	65	1,012	YES
14:00	65	1,048	YES
15:00	86	1,164	YES
16:00	106	1,347	YES
17:00	125	1,395	YES
18:00	84	1,178	YES
19:00	63	843	YES
WARRANT MET (3) =			YES

Notes:

- (1) MUTCD - Manual on Uniform Traffic Control Devices, 2009.
- (2) Three-day average of 24-hour volumes conducted on 8/5, 8/6, and 8/7, 2014.
- (3) Signal warrant satisfied when traffic volumes exist for each of any 8 hours of an average day.

MUTCD Warrant Requirements

Warrant 1, Condition B: Interruption of Continuous Traffic

Minimum volume of 525 vehicles per hour on 1-lane major street (both approaches) and 53 vehicles per hour on 1-lane minor street approach.

Signal Warrant Analysis for NE 124th Street / 162nd Place NE
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**Warrant 1 - Eight Hour Vehicular Volume
Combination of Condition A and Condition B**

Hour Begins	Minor Approach 162nd Place NE Highest NB/SB (2)	Major Approach NE 124th Street Total EB & WB (2)	MUTCD (1)		
			Warrant 1 A/B	56% Condition A	56% Condition B
6:00	27	696			
7:00	65	1,097			YES
8:00	89	1,217	YES	YES	YES
9:00	98	1,100	YES	YES	YES
10:00	77	945			YES
11:00	72	987			YES
12:00	72	1,012			YES
13:00	65	1,012			YES
14:00	65	1,048			YES
15:00	86	1,164	YES	YES	YES
16:00	106	1,347	YES	YES	YES
17:00	125	1,395	YES	YES	YES
18:00	84	1,178			YES
19:00	63	843			YES

WARRANT MET (3) = NO

Notes:

- (1) MUTCD - Manual on Uniform Traffic Control Devices, 2009.
- (2) Three-day average of 24-hour volumes conducted on 8/5, 8/6, and 8/7, 2014.
- (3) Signal warrant satisfied when traffic volumes exist for each of any 8 hours of an average day.

MUTCD Warrant Requirements

Warrant 1: Combination of A and B

The combination of warrants is satisfied where Condition A and Condition B are satisfied to the extent of 56 percent or more of the stated values.

NOTE:

This combination warrant only applies after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

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Warrant 2 - Four Hour Vehicular Volume

Hour Begins	Minor Approach 162nd Place NE Highest NB/SB (2)	Major Approach NE 124th Street Total EB & WB (2)	MUTCD (1)
			Warrant 2
6:00	27	696	NO
7:00	65	1,097	NO
8:00	89	1,217	YES
9:00	98	1,100	YES
10:00	77	945	YES
11:00	72	987	YES
12:00	72	1,012	YES
13:00	65	1,012	YES
14:00	65	1,048	YES
15:00	86	1,164	YES
16:00	106	1,347	YES
17:00	125	1,395	YES
18:00	84	1,178	YES
17:00	63	843	YES
WARRANT MET (3) =			YES

Notes:

- (1) MUTCD - Manual on Uniform Traffic Control Devices, 2009.
- (2) Three-day average of 24-hour volumes conducted on 8/5, 8/6, and 8/7, 2014.
- (3) Signal warrant satisfied when traffic volumes exist for each of any 4 hours of an average day.

MUTCD Warrant Requirements

Warrant 2: Four Hour Vehicular Volume

The plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher volume minor street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes.

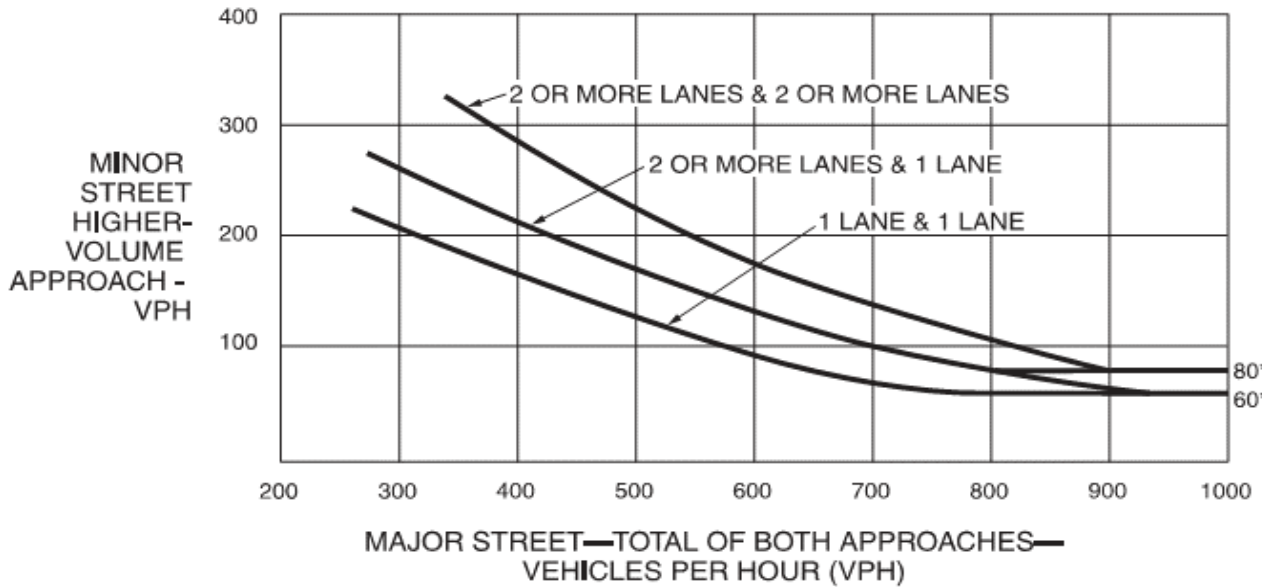
Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-2 may be used in place of Figure 4C-1.

Signal Warrant Analysis for NE 124th Street / 162nd Place NE
 Future Conditions With Approved Pipeline

Warrant 2 - Four Hour Vehicular Volume

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
 (COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

WARRANT MET (2) =

Notes:

- (1) The four highest hourly minor/major approach volumes as shown in the data for Warrant 1.
- (2) The signal warrant is satisfied when the conditions given below exist for each of any 4 hours of an average day.

MUTCD Warrant Requirements

Warrant 2: Four Hour Vehicular Volume

The plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher volume minor street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Signal Warrant Analysis for NE 124th Street / 162nd Place NE
Future Conditions With Approved Pipeline

Warrant 3 - Peak Hour (AM Peak Hour)

Condition A

This warrant is met if all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:

1. The total stopped delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach

NE 124th St / 162nd Pl NE, NB approach (1 lane)			
		NB Approach	
Control Delay (sec/veh) =	103.2	sec/veh	**Based on results from HCM 2010 analysis
Stopped Delay (sec/veh) =	79.4	sec/veh	
Total Volume (veh/hr) =	89	veh/hour	
Vehicle-Hours =	1.96	veh-hours	
CONDITION 1 MET =	NO		

2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes.

NE 124th St / 162nd Pl NE, NB approach (1 lane) =	89
CONDITION 2 MET =	NO

3. The total entering volume serviced during the hour equals or exceeds 650 vehicle per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

NE 124th St / 162nd Pl NE, NB approach (1 lane) =	1,284
CONDITION 3 MET =	YES

WARRANT MET =	NO
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NOTE:

This signal warrant shall only be applied in unusual cases. Such cases include, but are not limited to, office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

Signal Warrant Analysis for NE 124th Street / 162nd Place NE
Future Conditions With Approved Pipeline

Warrant 3 - Peak Hour (PM Peak Hour)

Condition A

This warrant is met if all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:

1. The total stopped delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach

NE 124th St / 162nd Pl NE, NB approach (1 lane)			
		NB Approach	
Control Delay (sec/veh) =	651.2	sec/veh	**Based on results from HCM 2010 analysis
Stopped Delay (sec/veh) =	500.9	sec/veh	
Total Volume (veh/hr) =	125	veh/hour	
Vehicle-Hours =	17.39	veh-hours	
CONDITION 1 MET =	YES		

2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes.

NE 124th St / 162nd Pl NE, NB approach (1 lane) =	125
CONDITION 2 MET =	YES

3. The total entering volume serviced during the hour equals or exceeds 650 vehicle per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

NE 124th St / 162nd Pl NE, NB approach (1 lane) =	1,438
CONDITION 3 MET =	YES

WARRANT MET =	YES
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NOTE:

This signal warrant shall only be applied in unusual cases. Such cases include, but are not limited to, office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

Signal Warrant Analysis for NE 124th Street / 162nd Place NE
Future Conditions With Approved Pipeline

**Warrant 3 - Peak Hour
Condition B**

Hour Begins	Minor Approach 162nd Place NE Highest NB/SB (2)	Major Approach NE 124th Street Total EB & WB (2)	MUTCD (1)
			Warrant 3
6:00	27	696	NO
7:00	65	1,097	NO
8:00	89	1,217	YES
9:00	98	1,100	YES
10:00	77	945	YES
11:00	72	987	NO
12:00	72	1,012	NO
13:00	65	1,012	NO
14:00	65	1,048	NO
15:00	86	1,164	YES
16:00	106	1,347	YES
17:00	125	1,395	YES
18:00	84	1,178	YES
19:00	63	843	NO
WARRANT MET (3) =			YES

Notes:

- (1) MUTCD - Manual on Uniform Traffic Control Devices, 2009.
- (2) Three-day average of 24-hour volumes conducted on 8/5, 8/6, and 8/7, 2014.
- (3) Signal warrant satisfied when traffic volumes exist for one hour of an average day.

MUTCD Warrant Requirements

Warrant 3: Peak Hour - Condition B

The plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher volume minor street approach (one direction only) for one hour (any four consecutive 15-minute periods) of an average day falls above the curve in Figure 4C-3 for the existing combination of approach lanes.

NOTE:

This signal warrant shall only be applied in unusual cases. Such cases include, but are not limited to, office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

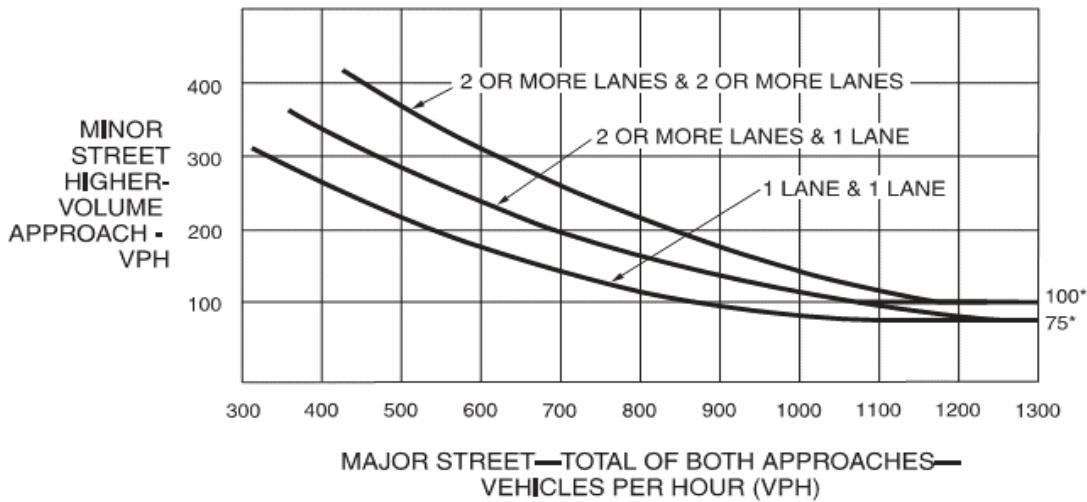
Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-4 may be used in place of Figure 4C-3.

Signal Warrant Analysis for NE 124th Street / 162nd Place NE
Future Conditions With Approved Pipeline

Warrant 3 - Peak Hour
Condition B

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

WARRANT MET (2) = YES

Notes:

- (1) The highest hourly minor/major approach volumes as shown in the data for Warrant 1.
- (2) The signal warrant is satisfied when the conditions given below exist for one hour of an average day.

MUTCD Warrant Requirements

Warrant 3: Peak Hour - Condition B

The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor street approach (one direction only) for 1 hour of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

NOTE:

This signal warrant shall only be applied in unusual cases. Such cases include, but are not limited to, office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

Option:

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-4 may be used in place of Figure 4C-3.

72-Hour Volume Summary - NE 124th Street / 162nd Place NE

Time	Tuesday 8/5/14				Wednesday 8/6/14				Thursday 8/7/14				3-Day Average				Total Entering Volume	Pipeline Growth*				Future Conditions				Total Entering Volume
	EB (NE 124th St)	WB (NE 124th St)	NB (162nd PI NE)	SB (162nd PI NE)	EB (NE 124th St)	WB (NE 124th St)	NB (162nd PI NE)	SB (162nd PI NE)	EB (NE 124th St)	WB (NE 124th St)	NB (162nd PI NE)	SB (162nd PI NE)	EB (NE 124th St)	WB (NE 124th St)	NB (162nd PI NE)	SB (162nd PI NE)		EB (NE 124th St)	WB (NE 124th St)	NB (162nd PI NE)	SB (162nd PI NE)	EB (NE 124th St)	WB (NE 124th St)	NB (162nd PI NE)	SB (162nd PI NE)	
12:00 AM	49	21	2	2	45	21	0	0	54	25	2	1	49	22	1	1	73	3		1		52	22	2	1	73
1:00 AM	30	12	1	0	26	6	0	0	40	11	0	0	32	10	0	0	42	2		0		34	10	0	0	42
2:00 AM	20	16	1	0	18	10	1	1	18	9	2	0	19	12	1	0	32	1		1		20	12	2	0	32
3:00 AM	15	22	0	2	17	34	0	1	20	14	1	1	17	23	0	1	41	1		0		18	23	0	1	41
4:00 AM	30	39	1	4	27	47	2	3	29	36	1	1	29	41	1	3	74	2		1		31	41	2	3	74
5:00 AM	62	176	8	5	57	165	11	7	54	193	10	6	58	178	10	6	252	3		7		61	178	17	6	252
6:00 AM	155	560	19	14	162	535	12	13	153	495	16	11	157	530	16	13	716	9		11		166	530	27	13	716
7:00 AM	213	882	39	30	248	871	43	26	237	800	32	30	233	851	38	29	1,151	13		27		246	851	65	29	1,151
8:00 AM	307	870	46	31	307	870	53	32	347	898	56	34	320	879	52	33	1,284	18		37		338	879	89	33	1,284
9:00 AM	341	747	57	34	368	742	49	31	365	677	65	28	358	722	57	31	1,168	20		41		378	722	98	31	1,168
10:00 AM	378	509	39	32	417	543	50	30	414	504	46	26	403	519	45	29	996	23		32		426	519	77	29	996
11:00 AM	447	484	44	23	527	485	40	20	472	461	42	24	482	477	42	22	1,023	28		30		510	477	72	22	1,023
12:00 PM	492	469	42	24	527	486	44	19	507	466	41	23	509	474	42	22	1,047	29		30		538	474	72	22	1,047
1:00 PM	509	481	32	26	495	492	33	26	516	456	50	21	507	476	38	24	1,045	29		27		536	476	65	24	1,045
2:00 PM	562	466	34	27	559	442	42	15	612	402	39	19	578	437	38	20	1,073	33		27		611	437	65	20	1,073
3:00 PM	717	443	50	20	707	437	40	33	693	373	59	33	706	418	50	29	1,203	40		36		746	418	86	29	1,203
4:00 PM	849	527	60	32	885	395	65	23	877	360	61	27	870	427	62	27	1,386	50		44		920	427	106	27	1,386
5:00 PM	1,040	405	64	23	914	414	77	27	956	291	77	25	970	370	73	25	1,438	55		52		1,025	370	125	25	1,438
6:00 PM	819	364	50	21	815	367	65	16	710	326	33	16	781	352	49	18	1,200	45		35		826	352	84	18	1,200
7:00 PM	555	277	42	16	575	250	33	15	533	245	36	13	554	257	37	15	863	32		26		586	257	63	15	863
8:00 PM	454	227	30	10	488	228	17	10	452	179	23	11	465	211	23	10	709	27		16		492	211	39	10	709
9:00 PM	331	162	22	8	353	189	10	11	350	139	15	6	345	163	16	8	532	20		11		365	163	27	8	532
10:00 PM	175	99	6	7	183	125	6	6	196	104	8	1	185	109	7	5	306	11		5		196	109	12	5	306
11:00 PM	97	43	8	2	117	59	3	1	135	42	4	4	116	48	5	2	171	7		4		123	48	9	2	171
TOTAL	8,647	8,301	697	393	8,837	8,213	696	366	8,740	7,506	719	363	8,743	8,006	703	373	17,825	500		500		9,243	8,006	1,203	373	17,825

* Reflects 205 approved single-family lots in vicinity of 162nd PI NE / NE 124th St intersection