

Traffic control signals are valuable devices for the control of motor vehicle and pedestrian traffic. Because they assign the right of way to the various traffic movements, traffic signals exert a profound influence on traffic flow.

Traffic control signals, when properly located and operated, usually have one or more of the following advantages:

1. They can provide for the orderly movement of traffic.
2. Where proper physical layouts and control measures are used, they can increase the traffic handling capacity of the intersection.
3. They can reduce the frequency of certain types of crashes, especially the right-angle type.
4. Under favorable conditions, they can be coordinated to provide for continuous or nearly continuous movement of traffic, at a definite speed, along a given route.
5. They can be used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross.

Even though warranted, if not properly placed, operated, or maintained, the following can result:

- Excessive delay may be caused.
- Disobedience of the signal indication is encouraged.
- The use of less adequate routes may be induced in an attempt to avoid the signal.
- Crash frequency (especially the rearBend type) can be significantly increased.

III-12.01 Engineering Study

Because there are disadvantages as well as advantages in the use of traffic signals, it is important to conduct an engineering study of the traffic operations before placing a signal at a particular location. Generally, this is conducted by the Programming Division and the recommendations are contained in the Traffic Operations Report.

III-12.02 Warrants

A careful analysis of traffic operations and other factors at a large number of signalized and unsignalized intersections, coupled with the judgment of experienced engineers, have provided a series of warrants that define the minimum conditions under which signal installations may be justified.

There are 9 warrants and they may be found in Part 4 Chapter C of the Manual on Uniform Traffic Control Devices (MUTCD).

III-12.03 Design Requirements

If the design speed is 30 mph or less, the signal standard should be placed a minimum of 2' from the curb face to the signal standard base.

If the design speed is greater than 30 mph, the signal standard should be placed outside the clear zone. If the signal standard is placed within the clear zone, it should be shielded from traffic. Feed points and traffic signal controller cabinets should be placed outside the clear zone.

The specific lighting and traffic signal foundation size shall be shown in the plans for each foundation installed with the project. Refer to the table below for the specific foundation diameter and depth requirements for various lighting and traffic signals.

LIGHTING & TRAFFIC SIGNAL FOUNDATION TABLE			
(USE FOR SINGLE MAST ARMS ONLY)			
Description	Footing Depth, "D" 24" & 30" Ø (ft)	Footing Depth, "D" 36" & 42" Ø (ft)	
Light Standard			
30'-35' Mounting Height	6	5	
36'-44' Mounting Height	6	5	
45'-50' Mounting Height	8	7	
Type I, II, V, VI, VII Signal Standard			
	4	3	
Type IV Signal Standard			
0'-25' Signal Mast Arm	11,11	11,11	
26'-30' Signal Mast Arm	12,12	12,12	
31'-35' Signal Mast Arm	12,12	12,12	
36'-39' Signal Mast Arm	13,13	13,13	
40'-45' Signal Mast Arm	16,15	15,15	
46'-50' Signal Mast Arm	16,16	15,15	
51'-55' Signal Mast Arm	17,16	16,16	
56'-60' Signal Mast Arm	18,17	17,17	
Combination 30' Mounting Height			
0'-25' Signal Mast Arm	11,11	11,11	
26'-30' Signal Mast Arm	12,12	12,12	
31'-35' Signal Mast Arm	13,13	13,13	
36'-39' Signal Mast Arm	14,14	14,14	
40'-45' Signal Mast Arm	16,16	15,15	
46'-50' Signal Mast Arm	17,16	16,16	
51'-55' Signal Mast Arm	17,17	16,16	
56'-60' Signal Mast Arm	18,18	17,17	

LIGHTING & TRAFFIC SIGNAL FOUNDATION TABLE			
(USE FOR SINGLE MAST ARMS ONLY)			
Description	Footing Depth, "D" 24" & 30" Ø (ft)	Footing Depth, "D" 36" & 42" Ø (ft)	
Combination 40' Mounting Height			
0'-25' Signal Mast Arm	12,12	12,12	
26'-30' Signal Mast Arm	13,13	13,13	
31'-35' Signal Mast Arm	13,13	13,13	
36'-39' Signal Mast Arm	14,14	14,14	
40'-45' Signal Mast Arm	16,16	15,15	
46'-50' Signal Mast Arm	17,16	16,16	
51'-55' Signal Mast Arm	18,17	16,16	
56'-60' Signal Mast Arm	19,18	17,17	
Combination 50' Mounting Height			
0'-25' Signal Mast Arm	12,12	12,12	
26'-30' Signal Mast Arm	13,13	13,13	
31'-35' Signal Mast Arm	14,13	13,13	
36'-39' Signal Mast Arm	15,14	14,14	
40'-45' Signal Mast Arm	17,16	16,16	
46'-50' Signal Mast Arm	17,16	16,16	
51'-55' Signal Mast Arm	18,17	17,17	
56'-60' Signal Mast Arm	19,18	18,17	

III-12.04 Span Wire Signals and Flashing Beacons

The maximum span between support poles is shown in the table below for the number of heads (up to 5 section head) that can be supported. The span calculations are based on ½” – 7 strand steel cables with a 5% sag, Class II wood poles for supports, and soil anchors capable of resisting 12,000 lbs of tension at 30° and 24,500 lbs of tension at 15°.

Number of Traffic Signal Heads			
1	2	3	4
200 FT	185 FT	165 FT	145 FT

Note: Reducing the sag to less than 5% will significantly increase the tension in the wires and may cause failure.

If signing is required on the span wires, each sign would take the place of one head.

III-12.05 Resources and References

- The Traffic Signal Book
- Manual of Traffic Signal Design
- Traffic Control System Handbook
- The Highway Capacity Manual for Timing and Lane Assignments
- Manual on Uniform Traffic Control Devices
- Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals

III-12.06 Standards and Standard Drawings

The Manual on Uniform Traffic Control Devices (MUTCD) Part 4 covers Highway Traffic Signals. There are design features that are used frequently and these have been embodied in the 770 and 772 Standard Drawings which can be found on the web at:

<http://www.dot.nd.gov/dotnet/standarddrawings/std drawings.aspx>