

HARRIS COUNTY PUBLIC  
INFRASTRUCTURE DEPARTMENT

**TRAFFIC CONTROL  
GUIDELINES**

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**HARRIS COUNTY PUBLIC INFRASTRUCTURE DEPARTMENT  
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## GENERAL

The Harris County Public Infrastructure Department has developed “Traffic Control Guidelines” for use by Engineers in designing a Traffic Control Plan (TCP) for all construction activities within Harris County right-of-way. As part of the “Traffic Control Guidelines”, a set of guideline drawings will be provided to the Engineer for their use in designing a “Traffic Control Plan” for each project that Harris County undertakes. The Engineer who is to use these guideline drawings shall familiarize himself with them, their proper usage and what is expected in the Traffic Control Plan.

Construction Sequencing and Traffic Control Plan shall be in accordance with general traffic engineering principles and practices governing traffic control during construction as prescribed by the guidelines of the “Texas Manual on Uniform Traffic Control Devices” (Texas MUTCD), and Harris County requirements.

Upon completion of the detailed Traffic Control Plan described herein, technical specifications and a detailed TCP cost estimate shall be completed. Quantities and cost estimates for each traffic control bid item shall be provided by the Engineer and approved by Harris County.

## CONSTRUCTION SEQUENCING

**Construction Sequencing** is a critical part of the Traffic control Plan. The conceptual sequencing of any project will be addressed in the preliminary engineering report. To accomplish this, information must be obtained that delineates the existing topographic features, potential conflicts such as underground utilities and access to adjacent properties. This information combined with the proposed design elements of the project may then be prioritized to establish a construction sequencing plan.

The construction of the project should be scheduled or sequenced **to minimize the down time for the contractor and to maximize the utilization of space for the travelways**. This Sequencing is accomplished by partitioning the project into construction phases. The construction phases may be further fractionated into steps. The description of the phase and step components of a construction sequencing plan is as follows.

A “**phase**” is a major portion of the construction, scheduled in a logical progression toward project completion. For example, a typical construction phasing sequence might include the following: Phase I, construct temporary widening to the east of the existing pavement and transfer traffic to it. Phase

II, construct the west half of the proposed roadway. Phase III, relocate traffic to new pavement and construct the east half of the proposed roadway.

A “**step**” is a minor portion of the construction, subordinate to a particular phase. For example, Phase II, Step I – Construct west roadway with driveway leave-outs for local access; Phase II – Step II complete driveway leave-outs using high early strength concrete.

A sample phasing overview drawing (TCP-2) is provided in the TCP Guideline Drawings.

The construction sequencing should be developed to confine the construction activities to a single lane at a time, whenever possible. Disruption of more than one lane of traffic, especially in the same direction, should be avoided. If, for any reason, construction has to take place in more than one lane at a time, consideration should be given to scheduling the work during periods of low traffic volumes, such as during weekends or off peak nighttime hours. Detouring traffic (routing the traffic off the normal existing travel surface) if utilized as part of the TCP, must be investigated, documented and approved by Harris County Public Infrastructure Department, Traffic and Transportation Group.

The drawings of the construction sequence should have a **plan view** of the project. the plan view should clearly distinguish areas of construction with areas of traffic for each phase. This may be accomplished by some form of shading, hatching or coloring. The work zone is to be distinguished from the actual construction limits (i.e. actual paving being constructed). Likewise, when phasing consists of multiple steps, the different steps should be clearly defined by contrasting patterns or coloring.

In conjunction with plan view sequencing of the project, **typical sections** should be developed at representative locations along the project. These sections should show: the existing and proposed construction elements, traffic lanes, work zone, construction pavement markings, barriers and buffer zones, anticipated drop-off’s and/or key elevational differences in the construction of the project. The typical sections should be drawn to an appropriate scale and be clearly dimensioned and annotated. These sections should be included with the plan view construction sequencing in the preliminary engineering report for approval by Harris County Public Infrastructure Department, Traffic and Transportation Group.

In developing the representative sections, **a minimum travel lane width of ten (10) feet** shall be maintained. If space is not available within the existing facility, temporary widening of the pavement section may be necessary to provide a minimum ten (10) foot travel lane. The sections should coincide with the plan view in terms of clearly defining areas of traffic, the work zone and the construction limits by matching the shading or hatching of the plan view.

The Engineer shall **meet** with Harris County Public Infrastructure Department, Traffic and Transportation Group during the following three (3) stages of the design process, as a minimum:

1. Prior to submittal of the preliminary engineering report to determine the critical objectives of the plan: whether sequencing can be accomplished with minimal lane closings, what level-of-service is adequate, etc.
2. Upon completion of preliminary engineering report and prior to start of detailed design, the Construction Sequencing Plan comments should be discussed and refined prior to proceeding with detailed design of the Traffic Control Plan.
3. Upon completion of a detailed Traffic Control Plan to review the drawings, specifications and quantity estimates for completeness.

#### **TRAFFIC CONTROL PLAN – GENERAL REQUIREMENTS**

Once the Construction Sequencing is established and approved by Harris County, the Traffic Control Plan (TCP) can be designed. The primary purpose of the TCP is to **protect the traveling public and provide a safe area for construction**. The TCP should follow expeditious steps toward completion of the project within the federal, state and Harris County standards and guidelines. To accomplish this, TCP drawings should provide sufficient details, complete with all necessary placement of barricades, signing, pavement markings, delineation, detours, temporary traffic signals and their adjustments and any other devices necessary to safely control traffic through the construction zones.

Wherever possible, the Traffic Control Plan should utilize the current phase placement of control devices to implement the next phase. By proper coordination of the construction sequencing, the traffic control plans can be simplified by utilizing portions of the current arrangement and devices already in place, for the next phase.

The Traffic Control Plan should contain the following four (4) basic elements:

1. Project approach signing.
2. Phasing overview.
3. Detailed plans for each phase of construction (including steps if any).
4. Necessary TCP details (this includes all applicable Harris County TCP Details).

1. Project approach signing.

The project approach signing drawings may be completed in linear fashion (stick drawing) or to an appropriate scale and will indicate the overall project limits and all necessary approach signing to be set up prior to the beginning of construction. All signing will be properly annotated and dimensioned. Engineering notes, which apply to the overall Traffic Control Plan, may also be placed on this sheet.

2. Phasing overview.

The phasing overview drawing, depending upon the complexity of the TCP, is intended to convey the overall phasing of the project on a single drawing. If the project is complex and/or the phasing cannot be shown clearly on a single drawing, multiple drawings (one (1) phase per drawing) should be utilized. This drawing should also contain a brief description, on a step by step basis, as to the construction activities anticipated, and in what order, for the shown phase and where typical sections are cut. If sufficient space is available, typical sections may be included on this drawing for completeness.

3. Detailed plans for each phase of construction (including steps if any).

Following each phasing overview drawing is the set of detailed traffic control plans needed for each phase. The detailed plan has itself a set of requirements indicating completeness, which must be met by the Engineer.

- Travel lane widths shall not be less than 10 feet.
- The TCP's should be designed to maintain the existing posted speed during the construction. If speed reductions are necessary, every attempt should be made to limit the reduction to no greater than 10 mph below the existing posted speed. If reductions beyond this are unavoidable, these speed reductions should be done in incremental steps with Harris County Public Infrastructure Department, Traffic Engineering Section approval.
- The TCP's must emphasize maintaining the existing number of travel lanes during implementation, except for construction phase changes and then only during prescribed hours of low traffic as determined from a current traffic analysis.
- TCP's should be prepared at a scale not smaller than 1"=50' for full size drawings (24" x 36") or 1"=100' for half size (11" x 17") drawings.

- Typical cross sections showing the existing and proposed construction complete with traffic lanes, construction pavement markings, delineators, barriers, buffer zones by barrels or CTB's, pavement drop-offs and construction details as applicable, shall be shown for all representative situations adjacent to their location in the plan view. The typical sections should be drawn to an appropriate scale and be clearly dimensioned and annotated.
  - All construction signing shall be represented pictorially and designated with the appropriate identification numbers as shown in the Texas MUTCD.
  - All other traffic control devices shall be shown pictorially and properly labeled on both the plan and cross section views.
  - TCP's shall be complete, noting all barricades, signing, pavement markings, delineation, detours, etc., necessary to control traffic during the construction process.
4. Necessary TCP details (this includes all Harris County Barricade & Construction Details).

Following the detail TCP drawings, sufficient details at an appropriate scale should be provided for the implementation of these plans for unique situations. These details may consist of but not be limited to: specific traffic handling at major intersections, traffic signal movements, handling of public and private driveways, special utility construction, detour layouts and pavement sections, etc. Inclusion of Harris County's barricades and construction devices as appropriate.

### **Speed Limits on Construction Projects:**

The Engineer should determine and recommend a construction zone design speed for the project. **Advisory** speed signs (orange and black) are mainly suggested for use on projects with spot or short speed reduction needs and projects where the advisory speed is no more than 10 mph below the posted speed or the observed 85<sup>th</sup> percentile speed. Speed limits for the entire length of a longer project where the advisory speed is more than 10 mph below the posted speed limit or the observed 85<sup>th</sup> percentile speed can be established below the posted speed utilizing **regulatory** (black and white) speed zone signs. The recommended speed should be **reasonable and safe** for the traveling public under the conditions found. Any such recommendation should be documented in the traffic engineering study and approved by Harris County Public Infrastructure Department, Traffic and Transportation Group.

### **Advisory Speed Plate:**

If the construction zone design speed is lower than the existing posted speed, the maximum recommended speed through the construction area may be indicated by orange and black **advisory speed limit plate** (for use with orange construction and maintenance signs, as per the T.M.U.T.C.D.). Please note that advisory speeds are “recommended” speeds for the benefit and assistance of the vehicle operator, not mandated and enforced by law.

### **Regulatory Speed Zones:**

Reduction of the existing posted regulatory speed limit (or alteration of the prima facie speed limits) using black and white **regulatory** signs, must be made based on a comprehensive engineering or traffic investigation, and authorized by the County Commissioners Court or the governing body of an incorporated city, town or village in which the project resides. If it is found to be necessary to alter the existing speed limit, and it has been studied and authorized, the new speed limit is **enforceable**. All existing regulatory speed limit signs must then be covered or removed and replaced with the temporary construction zone regulatory speed signs.

## **APPLICATIONS OF GUIDELINE DRAWINGS**

A set of guideline drawings has been prepared to assist the Engineer in designing a Traffic Control Plan for a given project. The guideline drawings represent an arrangement of traffic control devices for a given situation. These guideline drawings show a deployment of a number of devices that represent a minimum requirement. Therefore, if in the judgement of the Engineer, additional signing is needed for a particular situation, it is advisable to add whatever is in the best interest of the safety of the public and the project.

In general, these guideline drawings should be used as a template or an example of how, where and how many devices to deploy in any particular situation.

After review of the typical construction and maintenance projects undertaken by Harris County, a set of guideline drawings have been developed (see Table No. 1) to address the typically encountered construction activities. These activities are broad enough to cover several kinds of construction operations. Therefore, in order to apply any one of the guideline drawings, **the Engineer must have defined his particular construction operations in terms of the items of construction, space requirements and time of completion**. These considerations apply to whether the entire project is being considered or only one construction phase at a time.



The guideline drawings show deployment of traffic control devices in a schematically straight section of roadway. This deployment does not show actual dimensions for device spacing. They do show, however, “X”s and dimensioning arrows for the places where dimensions are to be calculated by the Engineer. The required distances are dependent on **work zone speed** within the construction area and are determined from Table No. 2, taken from MUTCD. ***The Engineer must show, as a minimum, all the devices shown on the guideline drawing, placed at actual location on the TCP drawings, with exact distances, and also taking into account the proposed roadway alignment.***

## **USE OF GUIDELINE DRAWINGS**

The guideline drawings are meant to be schematic. The key information they contain is the type and location of the traffic control devices required for a given situation. Traffic control devices are standardized by the Texas Department of Transportation, in the Texas MUTCD. The guideline drawings present the selection of the appropriate devices for each particular condition. These ***guideline drawings depict minimum requirements*** for a particular condition and should be modified for actual conditions.

A key point in selecting the appropriate guideline drawings for preparing of the Traffic Control Plan is to choose only the drawings that apply to the project. The selection is based upon the development of the construction sequencing with each phase and step clearly defined. Selection of the guideline drawings may be accomplished to the extent that the description of the activity fits the general description of work in the guideline drawing selection tables (see Tables No. 3 & 4).

Once the applicable guideline drawings are selected, the next step is to apply them to the project. To do this, engineer must survey the construction area to determine the posted speed limit or determine safe construction zone speed limit. Refer to the section “Traffic Control Plan – General Requirements”, Item 3 for proper selection of the construction zone speed.

With the speed selected, the distances of placement of the various devices can be obtained from the Speed/Distance Table (see Table No. 2). On the actual TCP drawing for each phase of the project, the Engineer must superimpose all the devices from the guideline drawing, at the required distances taken from the Table No. 2. These distances can be modified if necessary by project space constrictions, such as when a sign placement occurs at a driveway or intersection. In the case when the distance available between intersections is not sufficient to allow proper advanced warning, a lower construction zone speed, which is ***safe and reasonable***, may be considered in order to obtain a comprehensive sign spacing. In cases of obstructions,

the distance can be changed to clear the obstruction with the understanding that distances shown on Table No. 2 are minimum requirements.

In summary, to use the guideline set of traffic control drawings, the Engineer should complete the following drawing selection process steps:

1. Develop a comprehensive construction sequence plan for the project and obtain Harris County Public Infrastructure Department, Traffic and Transportation Group approval.
2. Create a phasing overview drawing showing each phase of construction and steps of the major construction activities (Ref: Phasing Overview Dwg. TCP-2).
3. Create the project approach sign layout drawing for the current construction project (Ref: Project Approach Signing TCP-1).
4. Locate in Table 4 (Harris County – Traffic Control Operations) under the “Construction Operations” column, the construction operation that best describes the project. Locate, in Table 4, under the “Construction Area Required” column, the lane closure conditions required by the project’s construction operation.
5. With the information developed on the steps above, find the applicable guideline drawings. This is done by referring to Table 5 (Harris County Traffic Control Guideline Drawing Chart) and looking at the operation area required, i.e.: one lane closure, in relation to the roadway section, i.e.: 4 lane road, to find the applicable guideline drawings. The list of guideline drawings can be found in Table 1 (Harris County Traffic Control Guideline Drawing List).
6. Conduct appropriate traffic study and determine the construction zone speed, preferably the existing posted speed, and calculate the appropriate device spacing. This step is accomplished by following the directions in Tables 2 and 3 (Speed/Device Spacing).
7. If the appropriate work zone design speed is determined to be 15 mph less than the posted speed limit, it may be necessary to temporarily change the posted speed limit and/or post additional signs to inform the public that traffic fines may be doubled in the work zone. Any changes to the posted speed limit must be approved by HCPID and Harris County Commissioners’ Court.
8. Complete the TCP drawings and necessary details.
9. Prepare the required specifications and cost estimate.

**TABLE NO. 1**

**HARRIS COUNTY TRAFFIC CONTROL  
GUIDELINE DRAWING LIST**

<u>DWG NO.</u>	<u>DESCRIPTION</u>
TCP-1	PROJECT APPROACH SIGNING
TCP-2	PHASING OVERVIEW
TCP-3	ONE LANE CLOSURE-3 & 4 LANE ROAD
TCP-4	ONE LANE CLOSURE-4 & 5 LANE ROAD
TCP-5	ONE LANE CLOSURE-6 LANE ROAD
TCP-6	TWO LANE CLOSURE-4 LANE ROAD
TCP-7	TWO LANE CLOSURE-5 & 6 LANE ROAD
TCP-8	TWO LANE CLOSURE-6 LANE BLVD.
TCP-9	SHOULDER WORK
TCP-10	MEDIAN WORK
TCP-11	INSIDE LANE CLOSURE-4 LANE ROAD
TCP-12	INSIDE LANE CLOSURE-6 LANE ROAD
TCP-13	BOULEVARD CLOSURES
TCP-14	DETOURS-1 AND 2 LANE
TCP-15	TASK FORCE OPERATIONS
TCP-16	1 LANE CLOSURE-FLAGGING OPERATION
TCP-17	FLAGGING/MOVING OPERATION
TCP-18	INTERSECTION SEQUENCING
TCP-19	CONSTRUCTION CROSSING EXISTING FACILITIES

**TABLE 2**

**TYPICAL TRANSITION LENGTHS AND  
SUGGESTED MAXIMUM SPACING OF DEVICES**

Posted Speed*	Formula	Minimum Desirable Taper Lengths**			Suggested Maximum Spacing of Device	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60' - 75'
35		205'	225'	245'	35'	70' - 90'
40		265'	295'	320'	40'	80' - 100'
45	L = WS	450'	495'	540'	45'	90' - 110'
50		500'	550'	600'	50'	100' - 125'
55		550'	605'	660'	55'	110' - 140'
60		600'	660'	720'	60'	120' - 150'
65		650'	715'	780'	65'	130' - 175'

\*85<sup>th</sup> Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit.

\*\*Taper lengths have been rounded off.

L= Length of Taper (FT.)

W= Width of Offset (FT.)

S= Posted Speed (MPH)

**TABLE 3**

**CONSTRUCTION WARNING  
SIGN SPACING**

Posted Speed or 85% Speed (MPH)	X Min. Distance (FT.)
30 or less	120
35	160
40	240
45	320
50	400
55	500
65	750

**TABLE 4**

<b>HARRIS COUNTY - TRAFFIC CONTROL OPERATIONS</b>						
<b>CONSTRUCTION OPERATIONS</b>		<b>CONSTRUCTION AREA REQUIRED</b>				
<b>GENERAL DESCRIPTION</b>		<b>LANE CLOSURE</b>				
<b>#</b>		<b>ONE</b>	<b>TWO</b>	<b>THREE</b>	<b>NONE</b>	<b>ALL</b>
1	Bridge Construction	STD-OP	STD-OP	STD-OP	N/A	DETOUR
2	Bridge Repairs	STD-OP	STD-OP	STD-OP	N/A	DETOUR
3	Bridge Replacement	STD-OP	STD-OP	N/A	N/A	N/A
4	Bridge Widening	STD-OP	STD-OP	N/A	N/A	DETOUR
5	Culvert Installation	STD-OP	STD-OP	N/A	N/A	DETOUR
6	Culvert Replacement	STD-OP	N/A	N/A	N/A	N/A
7	Ditch Maintenance	STD-OP	N/A	N/A	MISC-OP	N/A
8	Driveways Work	STD-OP	N/A	N/A	MISC-OP	N/A
9	Elect. Power Work	STD-OP	N/A	N/A	MISC-OP	N/A
10	Gas Lines Work	STD-OP	N/A	N/A	MISC-OP	N/A
11	Guard Rail Installation	STD-OP	N/A	N/A	N/A	N/A
12	Guard Rail Repair	STD-OP	N/A	N/A	N/A	N/A
13	Landscaping Inside	STD-OP	STD-OP	N/A	N/A	N/A
14	Landscaping Outside	STD-OP	N/A	N/A	MISC-OP	N/A
15	Lighting Installation	STD-OP	N/A	N/A	MISC-OP	N/A
16	Lighting Repair	STD-OP	N/A	N/A	MISC-OP	N/A
17	Loop Detectors	STD-OP	STD-OP	N/A	N/A	N/A
18	Pavement Replacement	STD-OP	STD-OP	STD-OP	N/A	DETOUR
19	Road Repair	STD-OP	N/A	N/A	N/A	DETOUR
20	Road Resurfacing	MISC-OP	N/A	N/A	N/A	N/A
21	Road Striping	MISC-OP	N/A	N/A	N/A	DETOUR
22	Road Widening	STD-OP	N/A	N/A	N/A	N/A
23	R.O.W. Mowing	MISC-OP	N/A	N/A	MISC-OP	N/A
24	Sanitary Sewers Work	STD-OP	STD-OP	N/A	MISC-OP	DETOUR
25	Shoulder Construction	STD-OP	N/A	N/A	MISC-OP	N/A
26	Signs: Install/Repair	STD-OP	N/A	N/A	MISC-OP	N/A
27	Storm Drainage Work	STD-OP	STD-OP	N/A	MISC-OP	DETOUR
28	Street Repair	STD-OP	N/A	N/A	N/A	DETOUR
29	Street Resurfacing	MISC-OP	N/A	N/A	N/A	N/A
30	Street Striping	MISC-OP	N/A	N/A	N/A	DETOUR
31	Street Widening	STD-OP	N/A	N/A	N/A	N/A
32	Telephone Work	STD-OP	N/A	N/A		N/A
33	Traffic Signals	STD-OP	N/A	N/A		N/A
34	Water Lines Work	STD-OP	STD-OP	N/A		DETOUR

TABLE 5

<b>HARRIS COUNTY TRAFFIC CONTROL GUIDELINE DRAWING CHART</b>							
GENERAL DESCRIPTION	ROADWAY SECTION						
	2 LANE RD.	3 LANE RD.	4 LANE RD.	5 LANE RD.	6 LANE RD.	4 LANE RD. W/MEDIAN	6 LANE RD. W/MEDIAN
<b>STANDARD OPERATIONS</b>							
ONE LANE CLOSURE	TCP-16 TCP-14	TCP-3	TCP-3	TCP-4	TCP-5	TCP-4	TCP-5
TWO LANE CLOSURE	TCP-14	N/A	TCP-6	TCP-7	TCP-7	TCP-13	TCP-8
THREE LANE CLOSURE	N/A	N/A	N/A	N/A	N/A	N/A	TCP-13 TCP-14
INSIDE LANE CLOSURE	N/A	N/A	TCP-11	N/A	TCP-12	TCP-11	TCP-12
TWO INSIDE LANE CLOSURE	N/A	N/A	N/A	N/A	TCP-11 TCP-12	N/A	TCP-10 TCP-11
<b>NON-STANDARD OPERATIONS</b>							
NEW CONSTRUCTION-CROSSING EXISTING FACILITIES	TCP-19	TCP-19	TCP-19	TCP-19	TCP-19	TCP-19	TCP-19
INTERSECTIONS	TCP-18	TCP-18	TCP-18	TCP-18	TCP-18	TCP-18	TCP-18
BOULEVARD SECTIONS	N/A	N/A	N/A	N/A	N/A	TCP-10 TCP-13	TCP-10 TCP-13
<b>MISCELLANEOUS OPERATIONS</b>							
OVERLAY OPERATIONS (MOVING OPERATIONS)	TCP-15	TCP-15	TCP-15	TCP-15	TCP-15	TCP-15	TCP-15
FLAGGING OPERATIONS (POTHOLE PATCHING)	TCP-17	TCP-17	TCP-17	TCP-17	TCP-17	TCP-17	TCP-17
MAINTENANCE WORK (GENERAL)	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9
UTILITY OPERATIONS (GENERAL)	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9
MOWING OPERATIONS (BY SECTOR)	TCP-17	TCP-17	TCP-17	TCP-17	TCP-17	TCP-17	TCP-17
CONSTRUCTION OF DRIVEWAYS (LOCALIZED)	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9	TCP-9