Section 14

Guidelines for Traffic Control Plans and Details

14.1 Introduction

This Section along with the Traffic Control Details presented in the Standard Roadway Construction / Traffic Control / Bridge Construction Details and the Traffic Control Plans and Traffic Control and Staging Plans presented in the Sample Plans were prepared to provide designers with general guidelines and examples of minimum desirable applications for typical situations requiring lane closures and/or lane shifts. This information may be used along with the current Manual on Uniform Traffic Control Devices (MUTCD) Part VI to prepare more detailed and site specific Traffic Control Plans that will enable the contractor to construct the project with adequate consideration of safety to motorists, pedestrians and construction workers.

Designers should not refer to or use the Traffic Control Details without proper evaluation of the specific site constraints and construction procedures required to construct the project. Traffic Control Plans should be prepared in accordance with the current Sample Plans. The Traffic Control and Staging methods established for each project should be consistent with the general provisions of this Section and should be based on good safety practices, engineering judgment, the speed and volume of traffic, the duration of the operation, the exposure to potential hazards, sight distance constraints and the physical features of the roadway including horizontal alignment, vertical alignment and the presence of intersections and driveways.

14.2 General

The first two sheets of the Traffic Control Plans should be Standard Traffic Control Detail sheets TCD-1 and TCD-2 as appropriately modified for individual project needs. These sheets contain a standard legend of typical traffic control devices, general traffic control notes, an escape ramp detail, a typical section for placement of construction barrier, a table showing recommended spacing of the channeling devices and a table showing recommended sight distances to the beginning of channelizing tapers. The legend and general traffic control notes should be reviewed and modified to include other project specific symbols and notes as necessary for each project. The standard sheets can also be modified to include other project specific information necessary to adequately address traffic control needs. Where required for clarification, sectional views showing the placement of traffic control devices adjacent to the traveled way and the work site should be provided.

Additional Traffic Control Plans should follow standard sheets TCD-1 and TCD-2. These additional plans should be included to show plan views of project specific work sites when those locations need to be represented or where design features of traffic control devices (such as the type of precast construction barrier) or temporary pavement markings need to be indicated. The scale of the Traffic Control Plans should be selected so that the optimum amount of information is shown on a minimum number of plan sheets. The Traffic Control Plans should include a tabulation of the channelization devices needed for the project.

As a minimum, Traffic Control Plans should include the following items:

- Required lane widths for each staging plan
- Grading for temporary roadways and crossovers

- Detours with respective detour signing
- Pay items for temporary work
- Temporary drainage associated with traffic staging
- Temporary staging for drainage and other utilities
- Temporary traffic signals and associated signal phasing design
- Signing for each staging plan
- Traffic control and safety devices that are necessary for each stage of construction
- Township and county
- Graphic scale and north arrow
- Allowable working hours
- Accommodation for Pedestrian traffic (i.e. locations of temporary sidewalks)
- Appropriate use of temporary / permanent barriers and end treatments
- Appropriate plans and specifications to address safety concerns

14.3 Traffic Control and Staging Plans

Traffic Control and Staging Plans should be utilized when a staging or sequence of construction needs to be specified. Notes pertaining to the various stages of construction should be included on these plans. The notes should thoroughly describe each phase of construction in the sequence to be performed.

The Legend on standard sheets TCD-1 and TCD-2 should be modified to show symbols for the work to be performed during each stage of construction and for work completed while construction is being performed during subsequent stages. When temporary pavement areas are required, a typical section should be provided.

During all phases of paving, staging should provide for a minimum exposure to drop-offs and uneven pavement adjacent to and between travel lanes.

To improve the riding quality of new bituminous concrete pavements, wherever practical, the top layer of the bituminous concrete surface course should be paved as a single stage of construction for the full width of the traveled way, shoulder and auxiliary lanes. Therefore, development of the Traffic Control and Staging Plans for projects involving paving operations should specify a Construction Sequence in which work progresses up to the bottom of the top layer of the surface course. The top layer should be shown as the final paving stage.

Designers should, upon completion of Traffic Control Plans, review the use of Unbound Paving Materials in those portions of roadway under improvement which will incur extensive traffic as a result of stage construction. In these situations, the designer should substitute Bituminous Stabilized Base Course for the Unbound Material. This substitution may be made without a Supplemental Pavement Recommendation. If this situation occurs during construction, the Resident Engineer should make this change.

14.4 Traffic Impact Report

As part of the development of the Traffic Control Plans, designers should conduct an analysis of construction related impacts. Findings should be presented in a detailed Traffic Impact Report that addresses the following items:

1. The existing traffic volumes and capacity data on the roads likely to be substantially impacted.
2. The projected traffic data at the start of construction including nearby highway construction projects as well as private construction projects.
3. The potential impacts of the construction on traffic through the project and along any detours.
4. Recommendations for traffic impact mitigation, e.g., nighttime work, restricted hours of operation, number of lanes available for traffic, width of lanes, requirement for alternating traffic, staging requirements, public information program, and transportation demand management strategies such as park and rides, shuttle buses, flextime, etc.

The Bureau of Transportation and Corridor Analysis should be consulted during the development and approval of the data in items 1, 2 and 3. The Regional Traffic Operations Unit should be consulted during the development and approval of the recommendations contained in item 4.

14.5 Development of Traffic Control Plan Design Parameters

The Department recognizes the need to effectively and efficiently manage traffic through construction projects in order to reduce congestion, maintain high levels of safety for workers, pedestrians and motorists, and minimize impacts to the local community both business and residential.

To this end, the scoping, design, scheduling and construction of projects should be accomplished in a manner that will provide a high level of safety for workers and the traveling public, minimize congestion and community impacts by maintaining levels of service close to preconstruction levels and provide the contractor with adequate access to the roadway to complete the work efficiently, while meeting the quality requirements of the contract.

In order to achieve these objectives, designers can utilize the NJDOT Road User Cost Manual to evaluate potential alternatives, in terms of cost to the traveling public. Project should be designed to minimize road user costs impacts. This may be accomplished through a variety of means including, but not limited to, reduced daytime hours, nighttime operations, detours, diversionary roads, crossovers, use of shoulders as travel lanes, temporary roads and bridges, and alternating traffic patterns. The incorporation of design elements to ease traffic impacts during future construction should also be considered. These could include wider lanes, shoulders or right of way, full depth shoulders, removable sidewalks on bridges, and other alternatives.

The basic safety principles governing the design of permanent roadways and roadsides should also govern the design of construction, maintenance and utility work sites. The goal should be to safely route traffic through these areas with geometrics and traffic control devices, as nearly as possible, comparable to those for normal highway situations. The following items should be considered in determining the overall approach to project specific traffic control:

1. Regarding hours of operation or lane restrictions, consideration should be given to the location of the project and calendar of events. Unless there are valid reasons to the contrary, travel lanes should not be reduced in number or width, nor work be permitted to interfere with traffic, on weekends, holidays (including the PM peak the day before and the AM peak the day after) and days of special events of major traffic generators near the project site, such as the Meadowlands Complex and shore areas during the summer.

2. Using site visit and traffic count information, determine the number of lanes which can be closed during the day, during the night, or on weekends. Incorporate seasonal variations into the analysis. Contact the agency which has jurisdiction and ask what lane or road closings they will allow and discuss independent findings with them. With concurrence from the responsible agency, define the allowable lane closings (see Section 14.4).
3. Provide minimum lane widths of 11 feet for all lane shifts and diversionary roads, except where existing lane widths are 10 feet or as required in the Traffic Control Standard Details.
4. Determine if detour routes are available. If potential detour routes exist, determine if their use would enhance the constructability of the project.
5. Determine if shoulders or temporary pavements can be used by traffic. Shoulders may require reconstruction prior to placing traffic on them. Short temporary roads may provide access to other existing roads making a detour possible.
6. Determine if guide rail has to be removed or relocated. If removal of guide rail reveals a blunt end then temporary impact attenuators should be provided.
7. Determine if temporary signals are required.
8. Determine if there are any reasons why the construction project should be substantially accelerated when under construction. If there are reasons for an accelerated construction process, discuss proposed methods of implementation with the Department's Project Manager and the QMS Construction Scheduling and Assessment Section to determine the details of the acceleration (i.e. number of crews required, hours of work).
9. Using Preliminary Roadway Plans, determine the duration of the various construction operations required to build the project. Using this information, determine if lane closings can be set up and broken down over one work shift (8 hours±), over the weekend (Friday night to Monday morning), or must lane closings be maintained for longer continuous durations. All of the above may apply.
10. Determine whether or not Movable Construction Barrier should be used. Refer to Section 14.9.
11. Review the guidelines for nighttime construction described in Section 14.10.
12. Review the time allowed for the staging of paving operations. Determine that an appropriate amount of time is provided for sufficient curing, deck patching and/or cooling asphalt pavement.

14.6 Temporary Traffic Stripes and Traffic Markings

Department Policy on Traffic Stripes and Traffic Markings is as follows:

1. Placement of permanent stripes (TRAFFIC STRIPES) and permanent markings (TRAFFIC MARKINGS) may be delayed for up to 14 days after paving. Temporary pavement markers shall be used to delineate center lines and lane lines on newly paved sections of roadways that need to be opened to traffic prior to the placement of TRAFFIC STRIPES.
2. TEMPORARY TRAFFIC STRIPES and TEMPORARY TRAFFIC MARKINGS shall be used when traffic stripes or traffic markings are required on intermediate pavement layers that need to be opened to traffic due to stage construction and shall not be in place for more than 14 days. The traffic stripes shall be calculated in linear feet for each 4-inch width of actual stripe (gaps are not counted) under the item TEMPORARY TRAFFIC STRIPES. Chevrons, crosswalks, and stop lines shall be calculated in linear feet for each 4 inch width of actual stripe under the item TEMPORARY TRAFFIC STRIPES. Words, arrows and other pavement symbols shall be calculated in square feet under the item TEMPORARY TRAFFIC MARKINGS.

   TEMPORARY PAVEMENT MARKING TAPE and TEMPORARY PAVEMENT MARKERS shall be specified when lane shifts are necessary on existing pavements not being repaved. The placement of temporary pavement markers shall be in accordance with the Construction Details. However, the designer shall specify TRAFFIC STRIPES and TRAFFIC MARKINGS rather than TEMPORARY PAVEMENT MARKING TAPE and TEMPORARY PAVEMENT MARKERS when the usage of the placed material would extend beyond December 21st.

   When traffic stripes and markings are removed to accommodate stage construction, the removal process invariably mars the final surface. Marring is allowable on intermediate layers, however, the final surface course must not be marred. Designers are to design the project in such a way as to ensure the final surface course does not require temporary traffic stripes or markings to be removed, or develop additional quantities for milling and paving of the final surface course marred by the removal of traffic stripes or markings.
3. TRAFFIC STRIPES or TRAFFIC MARKINGS are to be considered for stage construction, detours, and diversionary roads on those occasions when it can be justified based on cost considerations, site conditions, or length of time when the stripes or markings will be in place. It is important to estimate the length of striping based on all of the above factors of a project.

14.7 Lane and Roadway Closures

14.7.1 Lane Closures

Designers should modify standard sheet TCD-1 to provide a table showing specific restrictions placed on travel lanes, durations of closures and hours when work may be performed, including holidays and weekends. The closures and lane restrictions shall be evaluated in the Traffic Impact Report (see Section 14.4) and approved by the Regional Traffic Operations and Local Authorities. The following table is provided as an example of the form of presentation of this information:

Roadway Route Designation and Direction	Type of Closure	Monday thru Thursday	Friday	Saturday	Sunday
	No Closure				
	One Lane Closure				
	Two Lane Closures				
	Full Closures(indi-cate duration and type of operation)				

14.7.2 Total Roadway Closures

Total roadway closures (i.e. all lanes, single direction or two directions) required for the erection of overhead sign structures, cantilevered sign structures or bridge steel shall be performed in accordance with the following:

- The use of total roadway closures shall be specifically addressed in the Traffic Impact Report (see Section 14.4) and shall be considered only after detours have been determined to be unavailable or infeasible.
- Closures shall be approved by the Regional Traffic Operations and Local Authorities.
- Closures shall be performed during non-peak hours and with prior approval of the Engineer concerning the timing and method of operation.
- The application of nighttime operation of the closure shall be considered (see Section 14.10).
- The erection of overhead and cantilever sign support structures shall be done when the overhead electric lines have been de-energized.
- Closures shall be initiated with a slow down of traffic 1/2 mile in advance of the work area. The slow down shall be accomplished with the assistance of Traffic Direction, Police.
- Closures, whether single direction or two directions, shall be limited to 15 minute intervals. At the end of each 15 minute interval the work must stop, the span must be secured and traffic allowed to pass. After traffic has cleared, the roadway may again be closed for another maximum 15 minute interval (following the procedures in this section) and work may resume. Continue this procedure until all work over the roadway is complete.

14.7.3 Center/Interior Lane Closures

Existing roadway facilities with three or more lanes in each direction often require the closure of interior lanes to perform construction activities. The Standard Traffic Control Details TCD-16, "6 Lanes, Divided, Two Lane Closing" and TCD-17, "6 Lanes, Divided, Center Lane Closure, Maintain Two Through Lanes" provide two methods for maintaining traffic during construction in an interior lane. The

functional difference between these two details is the number of through lanes that remain open after the closure is setup and that TCD-17 is to be used only when workers are not present. In general, TCD-16 is the preferred method for closing an interior lane when the open lane has the capacity to carry the traffic. In addition to this general guideline, specific project/site conditions should be evaluated when determining the appropriate use of these details.

The decision to use TCD-17 should consider capacity and safety along with the following:

1. Determine if the lane closing is for the short term (one day) or long term.
    - The lane closure layout shown on TCD-17 is intended for short term use and only when workers are not present.
    - A buffer space should be used at the upstream end of the closed interior lane. For long term operations a barrier should be used to shield the operation in the closed interior lane.
    - If barriers are used, sufficient room must be provided for the placement of end treatments.
    - If barriers are not used, a TMA/arrowboard equipped vehicle should be used at the beginning of the interior buffer. If the work operation moves more than 150 feet from the buffer zone, a TMA equipped shadow vehicle should follow the work operation.
    - For long term operations, solid white lines should be used in the two lane section. DO NOT PASS signs may also be used.
2. Determine the type of activity, size of construction equipment and worker proximity to travel lane. If barriers are not used, work should not be conducted within 1 ½ feet of a live travel lane.
3. Determine if there is adequate distance to establish the lane closures. Consider volume, speed and road alignment.
4. Determine if there is an exit within the work zone area.
    - Establish whether the closure should be from the right or left lane and determine the type and location of signing (i.e. a right lane exit should use a left lane closure, in this way the right lane will be continuous and the signing will direct exiting traffic to keep right).
    - When TCD-17 is used and an interchange is located either within the limits of the closure or within ½ mile of the end of the closure, temporary guide signs indicating "All Exiting Traffic Keep Right (Left) must be placed on both sides of the roadway as follows: 1300 feet before sign W20-1D, "Road Work ½ Mile" and 500 feet before sign W20-5A, "Right (Left) Lane Closed 1500 Feet".
    - TCD-17 should not be used when multiple interchanges occur within the limits of the closure.
5. Determine if shoulders can be used in conjunction with TCD-16 to increase capacity in lieu of TCD-17.

Applications

The use of Standard Detail TCD-17 should be limited to projects and roadway conditions where a greater benefit can be attained than if TCD-16 were used. Listed below are examples where the use of TCD-17 should be considered:

1. Bridge rehabilitation projects.

2. TCD-17 can be used as a valve to provide increased capacity by intermittently controlling the use of one or two through lanes.
3. Sign structure and sign repair projects (i.e. changing the existing sign on an overhead sign structure where working on the catwalk is not feasible).

14.7.4 Alternate Traffic Routes

1. General

   Alternate traffic routes located where high approach speeds are anticipated should be of a high-type design. Transition lengths, curve radii, superelevation and other design features should be consistent with the speed of traffic that will be entering the alternate traffic route.

2. Diversionary Roads

   If a temporary roadway is to be constructed on State right-of-way or easement as part of the contract to carry traffic around a construction site it should be referred to as a "diversionary road" and not an official detour. It is desirable that diversionary roads used for construction zone traffic control have the same design speed and cross section as the existing roadway. The minimum design speed of the diversionary road shall be 20 mph less than the design speed of the existing roadway.

3. Detours

   An official detour exists whenever, as a result of State Highway construction, existing roadways are to be closed temporarily and it becomes necessary to reroute State Highway, Municipal or County Road traffic over other existing streets or roads to maintain the normal flow of pedestrian and vehicular traffic.

   Even though the Department is not legally required to obtain County or Municipal permission to close down roads or streets because of State Highway construction and designate other roads and streets for detours, it is the Department's policy to meet with the proper authorities and to try to obtain their permission and cooperation beforehand.

   The roads or streets to be used for the detour should be examined to make sure they are acceptable from the standpoint of condition, safety, necessary signing, lighting and repair. A detour map, together with recommendations for signing, repair, limitations, if any, should be prepared and submitted as part of the project design. Approval of the project makes the detour "legal" and also sets up funds for the improvement, maintenance and repair that are required. The Department is required by Statute to obtain prior permission to improve Municipal streets.

   The Department is responsible for all of these arrangements. Should situations of this type exist which are not being handled as described, the Department's project manager should immediately be contacted so that proper action can be taken.

4. Haul Roads

   The local roads which the Contractor uses to transport materials for the construction project. Haul roads are not considered detours. Municipalities may not levy charges against the haul vehicles because they are licensed to travel on any road in the State.

14.7.5 Temporary Emergency Pull-Off

Emergency pull-offs serve as areas of refuge for disabled vehicles. Typically, they should be utilized on Interstate, expressway and freeway projects exceeding one mile in length when construction activities result in the loss of shoulders for durations exceeding three months. A shoulder is considered lost where it is unavailable due to its being utilized as a lane or a work zone.

Locate emergency pull-offs directly adjacent to the right side of the roadway at approximately one-half mile intervals. Their location should allow for the required minimum stopping sight distance to be met, including stopping sight distance on vertical and horizontal curves. Where feasible, select emergency pull-off locations to avoid adverse impacts to environmentally sensitive areas, utilities, beam guide rail, grading, etc. Modify existing or provide temporary beam guide rail adjacent to emergency pull-offs if warranted (refer to Section 8). Supply a list of the proposed emergency pull-off locations, along with a detail on the Traffic Control Plans and account for the proposed signing, temporary pavement, removal of temporary pavement, and other associated work items. If the roadway geometry does not lend itself to providing minimum standards, engineering judgment should be applied in locating the pull-off areas.

The minimum length of a pull-off area should be 300 feet long plus the taper length. The full width of the emergency pull-off from the edge of travel lane should utilize the same criteria as outside shoulder widths in Section 5.4.2. However, it is desirable that it is 12 feet. For pull-offs less than 11 feet wide, adjacent guide rail should be offset to allow passengers to exit the vehicle. Where a high cut or fill exists, provide a 6 foot vertical curve outside the emergency pull-off. When necessary, construct temporary pavement for the emergency pull-off area (e.g. instances when an existing outside shoulder is utilized for traffic staging). The temporary pavement will need to be removed after the emergency pull-off is no longer necessary. When an existing outside shoulder is taken out of service, sections of that shoulder may temporarily be used to serve as emergency pull-off areas. The typical emergency pull-offs layout is shown in Figure 14-B. To avoid the need for crash cushions, the departure taper may be lengthened.

14.8 Construction Barrier Curb

14.8.1 Introduction

In general, Construction Barrier Curb should be installed only if it is clear that the barrier offers the least hazard potential. Elimination of the warranting obstruction should always be the first alternative considered. Limiting excavations to that which can be backfilled the same work shift or covering minor excavations are practical examples of how obstructions, commonly encountered during construction, can be eliminated. In some cases, a detour may be the most practical solution, especially on projects that would require large quantities of construction barrier.

When construction barrier is not warranted, other traffic control devices such as cones, drums and breakaway barricades are still warranted.

There may be situations where there is not a clear choice as to whether or not a construction barrier is warranted or where site conditions or construction operations will exclude the use of a construction barrier even though one is warranted. The designer should constantly be on the lookout for situations where the site conditions and/or the operational characteristics of the road such as adverse geometrics, high operating speed and high traffic volume, will make the use of construction barrier appropriate even though not specifically required by the

warrants shown in the next subsection. Such cases should be evaluated on an individual basis and, in the final analysis, must usually be resolved by engineering judgment. In such cases, adequate documentation should be included in the job file so that whatever action is taken cannot be misconstrued as being arbitrary.

14.8.2 Warrants

The following guidelines are to be used to establish warrants for using Construction Barrier Curb when developing Traffic Control Plans. Three factors must be considered in determining if an obstruction warrants a construction barrier:

- The physical characteristics of the obstruction.
- The distance from the traveled way to the obstruction.
- How long the obstruction will exist.

For an obstruction to warrant a construction barrier, all three of these criteria must indicate that a barrier is needed.

Physical Characteristics: A warranting obstruction is defined as a nontraversable roadside or a fixed object which is located within the clear zone and whose physical characteristics are such that injuries resulting from an impact with the obstruction would probably be more severe than injuries resulting from an impact with construction barrier.

See Section 8.2.4, "Warrants", for examples of fixed objects and nontraversable hazards whose physical characteristics are such that they may warrant a construction barrier.

Also, other examples of using construction barrier to protect vehicles from warranting obstructions are:

- To protect traffic from entering work areas such as excavations.
- To protect construction such as falsework for bridges and other exposed objects.
- To separate two-lane, two-way traffic on one roadway of a normally divided roadway. Whenever two-way traffic is to be maintained on one side of a normally divided highway, opposing traffic shall be separated as follows and such separation shall be shown on the Traffic Control Plan.

Where the TLTWO is used, the TCP shall include the above provisions for the separation of opposing traffic except:

A. Transition Zones - Positive Barrier (Pre-cast Concrete Construction Barrier or approved alternate).

B. Between Transitions - Positive Barrier, as described in A above or by delineation devices, such as drums, cones or vertical panels, as deemed appropriate by the Design Unit and with the concurrence of the Bureau of Traffic Signal and Safety Engineering.

C. Striping and complimentary signing shall be used in conjunction with A and B above.

Distance from the Traveled Way: An obstruction within the clear zone may warrant a construction barrier. The clear zone is the area, starting at the edge of the traveled way, available for safe use by errant vehicles. See Section 8.2.3, "Clear Zone", on directions on how to determine if an obstruction is within the clear zone.

Duration of Existence: A construction barrier may be warranted if an obstruction will remain within the clear zone for more than one work shift.

14.8.3 Applications

Construction Barrier Curb, is shown on Construction Detail Sheets CD-159-3, CD-159-4 and CD-159-5. Alternate A can be pinned to the roadway, and Alternate B has pockets to receive 1 inch diameter anchor bolts as well as pin holes.

There are three types of connections. Connection Type A should only be used at those locations where an allowable movement of the barrier, when hit, of 41 inches is acceptable. When the maximum allowable movement is 28 inches, connection Type B should be used. When the maximum allowable movement is 11 inches, connection Type C should be used. The connection type to be used at specific locations should be indicated on the Traffic Control and Staging Plans.

Connection Type B uses a box beam bolted onto the construction side of the barrier to help reduce deflections. Refer to Construction Detail sheet CD-159-3. The box beam side cannot be placed adjacent to traffic due to the potential snag hazard. Construction Barrier Curb stiffened with box beams shall be installed at least 50 feet prior to, be continuous through, and extend at least 50 feet beyond the area requiring limited deflection. Show limits on Traffic Control Plans.

There is an optional Connection Type B treatment at vertical drop off (edge of bridge, edge of vertical cut, etc.) shown in Standard Traffic Control Detail TCD-2. It allows for the barrier to extend over the edge of a vertical drop off after it is hit. For Connection Type B, according to the crash test, the center of gravity (centroid) of the barrier sections was deflected beyond the edge of the vertical drop off. However, its connection to the other sections prevented it from falling off. Therefore, barrier with Connection Type B may be placed a minimum 12 inches from the edge of the vertical drop off, provided there is at least 28” of clear space beyond the barrier. For example, if the outside edge of the barrier was placed 12 inches from the edge of the bridge drop off, the bridge area behind the barrier (12 inches) plus an additional 16 inches (28” – 12”) past the drop off must be clear of all obstructions (utility poles, scaffolding, equipment, materials, etc.) or people. The optional Connection Type B treatment at vertical drop off will be used where there is not enough room to allow all of the maximum allowable movement in front of the vertical drop off and detours are not feasible. Reduce lane widths and shoulder widths to the minimum allowed during the construction stage in question, prior to considering the optional connection treatment.

The following chart summarizes the respective connections:

Connection Type	**Use**	**Connections**
A	Maximum allowable deflection of 41 inches	Connection Key, and barrier end sections fully pinned*
B	Maximum allowable deflection of 28 inches (Cannot be used with traffic on both sides of the barrier.)	Connection Key, 6” by 6” box beam, and barrier end sections fully pinned*
C	Maximum allowable deflection of 11 inches	Connection Key, construction side of all sections pinned, and barrier end sections fully pinned*

* Fully Pinned: pins in every anchor recess on both sides. End Sections: The first and last barrier piece of the entire run regardless of connection type.

Pinning barriers to a new bridge deck is undesirable. Pinning barrier to a bridge deck that has an existing LMC overlay undermines the effectiveness of the LMC. In addition, the extra costs associated with placement of LMC make it especially undesirable to lessen its effectiveness by drilling holes through it. Designers are advised to investigate alternatives in order to eliminate the need for pinned barrier on bridge decks where possible so as not to compromise the benefits of the LMC overlay. As an example, if sufficient additional lateral room can be gained, this will eliminate the need for a pinned Construction Barrier Curb.

Construction Barrier Curb shall not be installed on side slopes steeper than 10H:1V. The approach end shall either be flared at 8:1 beyond the clear distance or, when terminated within the clear zone, the approach end of the barrier shall be shielded. See Section 9 for design of inertial barriers or temporary compressive crash cushions.

The minimum functional length of Construction Barrier is 100 feet. Construction Barrier Curb comes in units of 20 feet length, however, other lengths may be used to meet field conditions, see nominal lengths in the Standard Construction Details. The approach length of need (L.O.N.) is the minimum length of construction barrier required in front of the warranting obstruction to shield the hazard effectively. See Figure 14-A for instructions on how to determine the L.O.N. of a Construction Barrier Curb.

LENGTH OF NEED OF CONSTRUCTION BARRIER CURB

FIGURE 14–A

BDC13MR–08

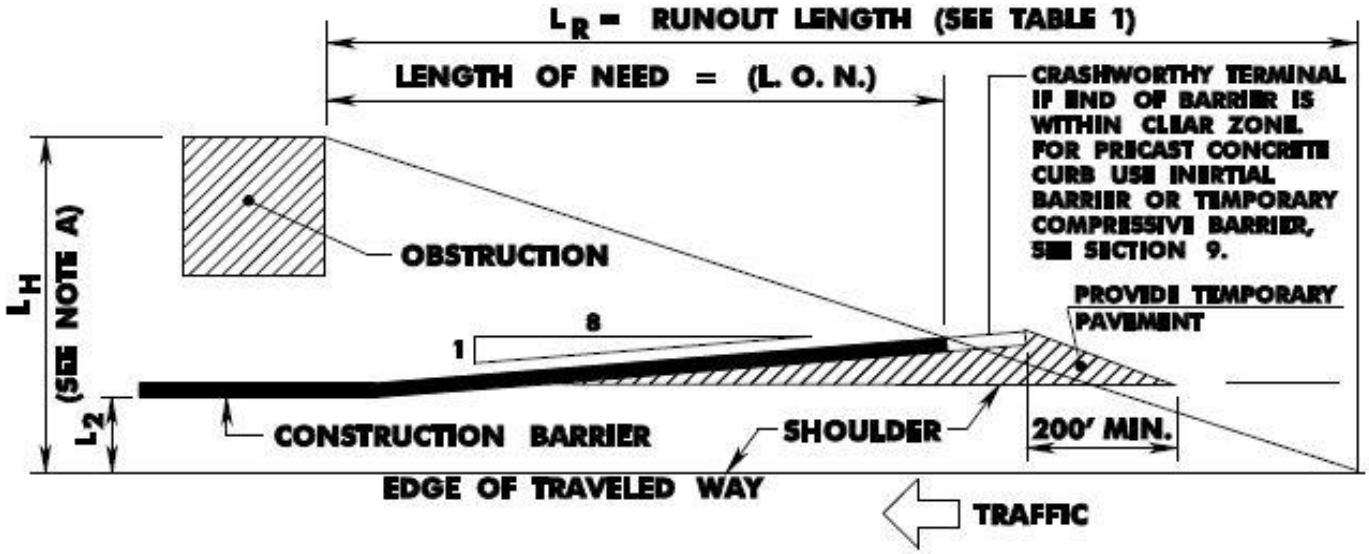


TABLE – 1

	TRAFFIC VOLUME (A.D.T.)			
	OVER 10,000	5,000–10,000	1,000–5,000	UNDER 1,000
DESIGN SPEED (M.P.H.)	L_R	L_R	L_R	L_R
70	360	330	290	250
60	300	250	210	200
55	265	220	185	175
50	230	190	160	150
45	195	160	135	125
40	160	130	110	100
30	110	90	80	70

NOTE A: If obstruction extends beyond Clear Zone, make L_H equal to Clear Zone, except if obstruction is a Critical Slope, see Figure 8–H.

NOTE B: If Roadway is curved, draw layout to scale and obtain L.O.N. directly by scaling from drawing.

NOTE C: If barrier end is parallel to Roadway (no flare), then change "1/8" in formula to "0".

NOTE D: When using Connection Type B, the LON is the greater of 50′ long or the calculated taper length.

EXAMPLE

$$L.O.N. = \frac{L_H - L_2}{\frac{1}{8} + \frac{L_H}{L_R}}$$

L_2 = 15′

L_H = 25′

L_R = 360′

DESIGN SPEED = 70 mph

ADT = 26,000

$$L.O.N. = \frac{25 - 15}{\frac{1}{8} + \frac{25}{360}}$$

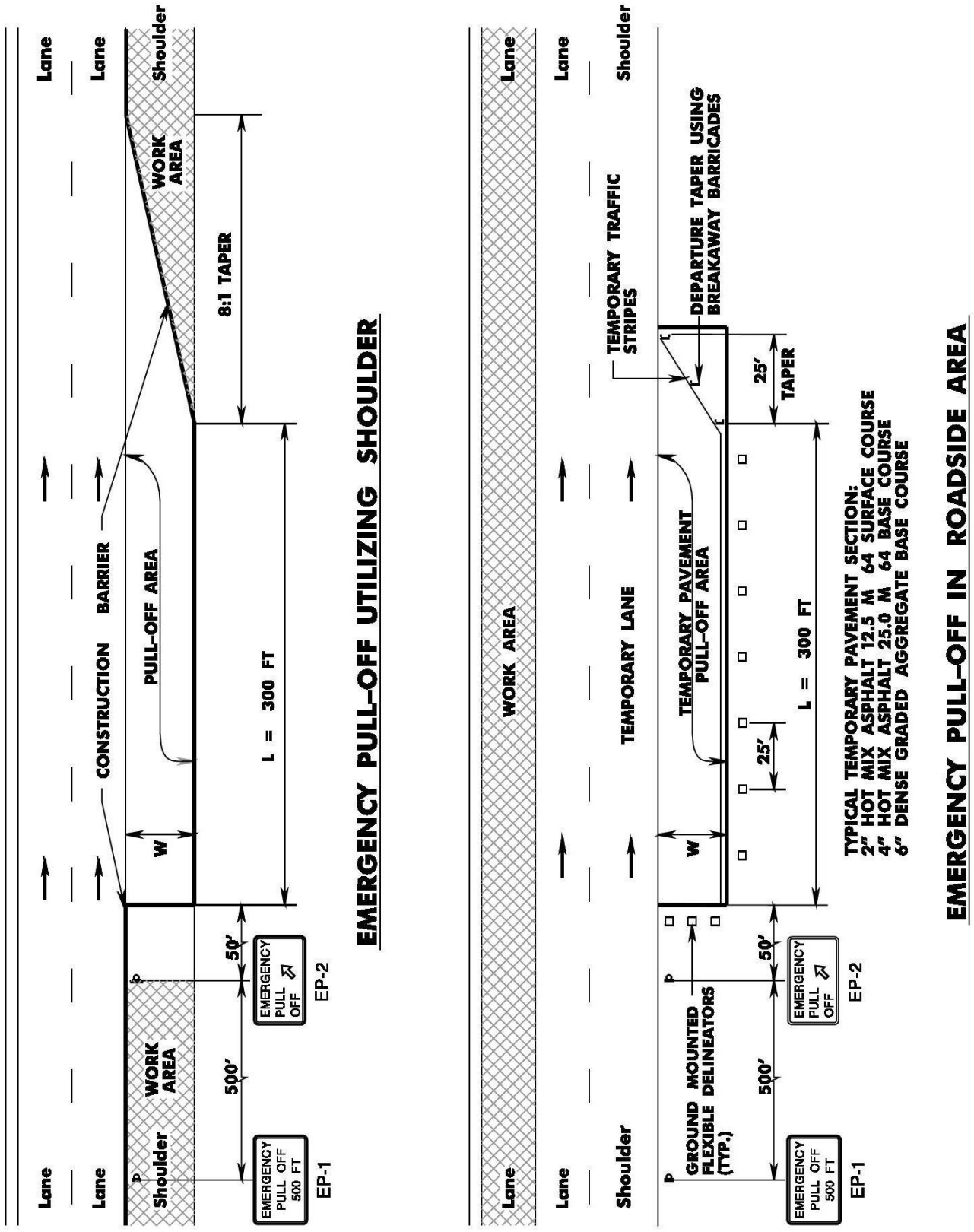
L.O.N. = 51.4′, increase to nearest multiple of 20′, therefore L.O.N. = 60′

SOURCE: AASHTO "ROADSIDE DESIGN GUIDE", 4TH EDITION 2011

TEMPORARY EMERGENCY PULL–OFF

FIGURE 14–B

BDC13MR–08



14.9 Movable Construction Barrier

14.9.1 Warrants

The following guidelines are to be used to establish the warrants for using Construction Barrier Curb and Moveable (CBM) to achieve an efficient and effective Traffic Control Plan. CBM will provide additional traffic capacity lanes for accommodation of both AM and PM peak traffic, a safe and expeditious means of expanding the Contractor's work area (all work is done using positive separation), or the opportunity to stage projects in a more efficient method.

CBM's should be a type that can be quickly moved laterally from 4 feet to 18 feet in one continuous operation and at speeds of about 5 mph. The decision to use a CBM system should be made by the designer with capacity, safety and economics as the guidelines and should include the following considerations:

1. Additional traffic lane capacity can be gained during peak hour traffic periods.
2. Additional contractor working area can be gained during off peak hours and s
3. Construction time can be shortened either through staging or increased productivity by the contractor.
4. Timing required to set up staging can be kept to a minimum.
5. Construction sites with limited work zones in urban or restricted areas where frequent day or nighttime lane closures will be required.
6. Their use will provide a greater degree of safety for motorists.
7. Projects which are located in non-attainment areas and Clean Air Issues require a reduction in emissions.

Input for justification should be obtained from the Bureau of Traffic Engineering and Regional Construction.

14.9.2 Applications

When developing the Traffic Control Plan, the use of these CBM systems should be limited to projects where a greater benefit can be attained than if standard methods and equipment were used. Listed below are types of projects where it would be a viable option for use.

1. Widening or reconstruction projects on highways or expressways with high peak hour traffic volumes (i.e. 50,000 AADT and greater for four lane facilities and 90,000 AADT and greater for 6 lane facilities).
2. Projects where a reversible traffic lane would be beneficial during peak traffic durations and which would allow for better staging.
3. Median and shoulder reconstruction projects. Examples include shoulder/median improvements or widenings, such as a new permanent concrete barrier being installed. The CBM is especially beneficial when the size of the work zone is either very restricted or if repeated lane closures are anticipated.
4. Resurfacing projects. By closing one side of a divided highway and creating opposing traffic lanes on the open side of the road, a contractor can resurface one side of the roadway at night without interference from traffic.
5. Reconstruction of parallel structures. Design of a reversible lane to increase the capacity of one structure while closing down the other.
6. Alternate routes do not have excess capacity for suitable detour.
7. Alternate routes do not exist.

14.9.3 Safety and Cost Considerations

In construction projects, the CBM generally is used to open traffic lanes during peak traffic periods and close the lanes during off peak periods to allow improved access to the work zone. In this application the CBM has the unique ability to provide continuous positive protection before, during and after the opening and closing of traffic lanes. Once these barriers are on the road, it takes significantly less time to perform a lane closure with this barrier than it does using traditional methods. A determination should be made by the designer that this feature and resulting increased worker safety makes the use of the CBM system a viable alternative to conventional traffic control devices. Its use should be clearly described in the Traffic Control Plan.

When considering this product the designer should also prepare a cost comparison of the CBM and the next best alternative. The following items should be considered:

1. Cost of the CBM. The designer should work with the supplier to determine operational costs and a lease price to contractors.
2. The next best alternative and its cost.
3. If possible, the accident cost savings associated with the use of the CBM and the next best alternative. It is assumed that there is no difference in accident costs when CBM is compared to construction barrier curb of other types.
4. The savings in time for the projects schedule should also be considered with the overall savings.
5. Consideration for congestion and clean air issues where a reduction in emissions is required.

Use of CBM on land service roads should take into consideration access to properties and businesses. Access must be maintained during construction.

When using CBM, consideration for additional wide load signing in the Traffic Control Plans may be appropriate. If the barrier is used to reverse traffic flow and there is a single lane in one direction, it shall not be less than 11 feet.

CBM should only be used on tangent sections and flat curves where an angle of impact of not more than seven degrees exists and where an allowable movement of the barrier, when hit, of 1 ½ feet is acceptable. The CBM can be used on the following sharp curves where an allowable movement of the barrier, when hit, of 5 feet is acceptable:

Number of Lanes	5 ft. Deflection where Radius is less than
1	500 feet
2	900 feet
3	1300 feet

Approved safety end treatments for Inertial Barriers and temporary compressive barriers see Section 9. Where possible, the barriers may be tucked behind conventional concrete barrier curb. See Section 9 for construction detail requirements for Inertial Barriers and temporary compressive crash cushions.

14.10 Nighttime Construction

In keeping with the Department's mission of delivering a safe, reliable and affordable transportation system and to alleviate traffic congestion and improve air quality, it is proposed that any activity that requires the temporary closing of traffic lanes which results in a sufficient degradation of the highway level of service, should be performed at night provided that certain conditions outlined below are met. Excluded will be emergency operations such as: locations where safety conditions preclude nighttime work; locations where existing municipal ordinances have been enacted that prohibit nighttime work; or locations where the traffic volumes are such that the work activity can be accomplished during the day without significant negative impacts.

It is the intent of the Department to perform construction activities at night that would otherwise cause unacceptable negative impact on traffic flow. It is recognized that there are certain influencing factors that must be reviewed when considering whether or not to perform nighttime work.

The decision to perform nighttime work will be determined during the scoping process but the final approval for nighttime construction should be made by the Department's Project Manager. The following guidelines are to be used for establishing the warrants for nighttime work.

1. The conditions listed below must be met before nighttime work can be performed:
    - Compliance with local noise restriction ordinances.
    - Office of Community Relations has obtained local government approval for nighttime work within the project limits. (Inform local government of what type of work will be taking place.)
    - Work zone safety must not be compromised by nighttime construction activities.
    - The quality of construction work must not be compromised by nighttime work.
2. Some factors that may eliminate the need for nighttime work:
    - A shoulder which may be used in place of the lane to be closed.
    - A viable detour is available.
    - Traffic Operations staff and the Traffic Impact Report indicate that a lane closure during the day would not cause a significant impact.
3. Projects which may require both day and nighttime construction operations are as follows:
    - Projects where the location has specific seasonal requirements (such as shore routes during the summer, major shopping centers at the Holiday Season).
    - Projects where the work required has specific temperature or environmental constraints.
    - Projects with accelerated construction schedules.

14.11 Construction Details

Construction details should be provided for any traffic control device not adequately covered by the Standard Roadway Construction Details.

14.11.1 Crash Cushions

Crash cushions in construction zones shall not be placed on side slopes steeper than 5%, or on islands, curbs, platforms, etc. greater than 4 inches in height. Designers should refer to Section 9 - Guidelines for the Selection and Design of Crash Cushions for information on the design of the temporary compressive barrier crash cushions and Inertial Barrier systems. The designer must provide design specific information such as the required number of bays or modules for each location. For Inertial Barrier systems, a layout of the modules including the weight of each module shall be included as a construction detail in the contract plans.

14.11.2 Signs

1. General

   - Any construction sign not depicted on the Standard Roadway Construction Details should be shown in detail.
   - "Trail blazers" should be sized relative to the posted speed limit (i.e. use 4 by 3 feet for posted speeds greater than 40 mph).
   - Determine if specific site conditions require special supplemental signing. The use of variable message boards should be considered and approved by Regional Traffic Operations.

2. W99-2 Signs

   All projects should include provisions for construction signs with the legend "GIVE US A BRAKE - SLOW DOWN". These signs should be designated as W99-2 and should be 4 by 4 feet. The following guidelines should be used for determination of location and quantity of W99-2 signs:

   - Signs will be located 200 feet in advance of the project, one sign for each direction of traffic flow.
   - Signs will be installed on existing highways within the scope of the project.
   - Signs are to be installed in accordance with the Standard Detail for Construction Signs.

   The W99-2 signs are now eligible for Federal-aid funding participation.

3. Construction Identification Signs

   Construction Identification Signs should be included in all projects. The following guidelines should be used to determine the location and quantity of Construction Identification Signs:

   - Signs are to be located in advance of the project, one sign for each direction of traffic flow.
   - Signs are to be installed on major existing intersecting highways within the limits of the project.

4. Tables for Construction Signs

   In order to estimate the required quantity of signs in square feet, designers should prepare a summary of signs for the project. This summary of construction signs should be shown on a table, and included on the first sheet of the Traffic Control Plans. An example of a completed table listing the sign designation, quantity and area in square feet is shown on TC-1 of the Sample Plans.

14.11.3 Guide Rail

Guide rail in construction zones shall not be installed on side slopes steeper than 10H:1V. Otherwise, guide rail shall be used in construction zones in accordance with Section 8, "Guidelines for Guide Rail Design and Median Barriers".

14.12 Utilities

Utility relocations that affect staging or traffic control should be clearly identified on the staging and traffic control plans. This information should include both temporary and permanent relocation work. Notes pertinent to the relocations should be provided on the applicable staging plan(s) and/or traffic control plan(s). In addition, the designer should review the need for general utility notes to be added or modified on TCD-1.

14.13 Quantities

Quantities should be estimated based upon actual usage/requirements shown on the plans.

For quantity purposes, the If and Where Directed number of units or linear feet of traffic control devices and signs should be the maximum quantity required to be in use at any one time. Construction signs should be tabulated by sign designation, quantity and area in square feet (see Section 14.11.2). Signs indicating speed limits or speed reductions should be included.

Temporary pavement to be used for traffic control should be shown as plan sheet quantities. Quantities for the removal of temporary pavement must also be considered. Standard Item Numbers with construct quantities and a TO BE CONSTRUCTED box should be shown on the Traffic Control and Staging Plans where temporary pavement is to be constructed or removed.

14.14 Installation and Removal Sequence for Work Zone Traffic Control

The manner in which traffic control schemes are installed and removed may affect safety and traffic flow. The following is a suggested guideline describing the proper installation and removal sequence for work zone traffic control schemes:

1. Required advance warning signs should be installed first so that protection is provided when channelizing devices are installed near the work area. If work zone signing is necessary for both directions of travel, sign installation should begin with the advance warning sign located furthermost in advance of the work area and on the side of the roadway opposite the work area. Sign installation should proceed down the roadway toward the work area. After the necessary signs are erected on the side of the roadway opposite the work area, sign installation may begin for the other direction of travel, beginning with the sign furthermost form the work area. In the process of installing the work zone signing, existing signs with conflicting messages shall be completely covered, removed or modified.
2. If the work area is such that flagging operations are necessary, the flaggers may begin flagging operations after the advance warning signs are in place. Otherwise, the installation of channelizing devices at the work area can begin after the placement of the advance warning signs. These devices should also be installed in the direction of travel starting with the device furthermost in advance of the work area.
3. A shadow vehicle with a TMA should be placed between approaching traffic and the workers who are installing channelizing devices around the work area. After the channelizing devices are installed, the vehicle may be removed or moved inside the work area and the work may begin.

4. After work is completed, the work zone traffic control scheme may be dismantled. The removal of the traffic control scheme should be carried out in reverse order from the installation procedure. The channelizing devices which surround the work site should be removed first, followed by flaggers which may have been used. The work area signing may then be removed and normal traffic patterns restored.

14.15 Traffic Control Plan Submission Requirements

14.15.1 Initial Submission: Investigate project site specific conditions and Prepare Preliminary Staging Plans:

1. Visit project site and note locations of the following:
   - Horizontal and vertical sight distance restrictions due to existing roadway conditions (i.e. roadside vegetation, adjacent property usage, overpass bridge structures, sign structures, barrier curb, guide rail and/or horizontal and vertical geometry).
   - Expected pedestrian activity, crosswalks, parks, schools, bus routes, school bus routes, bus stops, emergency vehicle access routes, churches, stadiums, and/or shopping and industrial areas. When a park is located within the project limits, obtain a calendar of events and the name, address and phone number of the individual to contact for coordination of construction staging. Also obtain University calendar events where applicable.
   - Existing emergency facilities for fire, rescue and/or police; where traffic signals exist, note if they are equipped with an optically controlled emergency vehicle detection system or a pre-empted system to provide for clearance of adjacent railroad crossings.
   - Look for alternate routes which can be used as detour routes.
2. Review of Existing Information
   - Review as-built plans and/or collect field data necessary to determine the horizontal and vertical sight distances of the existing roadway throughout the project limits including 1,000 feet beyond each terminus.
   - Obtain existing peak hour traffic counts with vehicle classification and 24 hour ATR traffic counts. Use this data to support decisions regarding minimum lanes to be maintained, detour requirements and work hours.
   - Review existing accident information to determine if any specific type of vehicle accidents may affect the proposed staging plans.
   - Determine if the traffic flow within the project area has any seasonal characteristics such as shore route, Christmas shopping route, etc.
   - Determine the agencies which have jurisdiction over the project area and potential detour routes.
3. Prepare Preliminary Roadway plans in accordance with current submission requirements. Note features that will effect traffic control such as number of lanes and lane widths, existing shoulder widths and pavement thickness, lateral clearance restrictions, vertical and horizontal clearances at structures, structural widths (i.e., parapet to parapet, abutment to abutment, stringer spacing, etc.) and the location of major utilities.
4. Prepare Preliminary Staging Plans to show the overall approach to the required stages of construction of the project considering site specific conditions and work to be accomplished. Identify issues, constraints and time frames

associated with the various stages to be studied in greater detail during Final Design.

5. Prepare a Traffic Impact Report as discussed in Section 14.4 above.
6. Contact and coordinate with appropriate State Highway Authorities (i.e. New Jersey Turnpike, Garden State Parkway, Atlantic City Expressway, etc.) to obtain the required permits needed to enter upon lands under their jurisdiction. This coordination effort should include, but not be limited to:
   - Permits required and fees.
   - Authorities Traffic Control Plan Standards.
   - Insurance requirements.
   - Materials specifications.
   - Agreements between NJDOT and affected Highway agency to perform certain type of work.

14.15.2 Final Submission: Prepare Final Traffic Control Plans and Staging Plans:

1. Perform field visits and collect additional field data as necessary during the development of the Final Traffic Control Plans and Staging Plans.
2. The first two sheets of the Traffic Control Plans should be Standard Traffic Control Plan sheets TCD-1 and TCD-2 modified to address project site specific conditions. This sheet should contain General Notes, a Standard Legend of typical traffic control devices and a table showing recommended spacing of the channeling devices if project specific traffic control plans have been added to the contract plans.
3. Review the Traffic Control Details, select details applicable to the project and modify to reflect the specific site constraints and construction procedures required to construct the project.
4. Review the Legend and modify to include other project specific symbols as necessary for traffic control.
5. Review the need for travel lane restrictions.
6. Review hours of operations or lane restrictions determined in the Initial Submission, consideration should be given to the location of the project, calendar of events, etc.
7. Review the Traffic Control Detail General Notes and select the notes applicable to the project. Additional project specific notes should be added as necessary. The notes should include but not be limited to:
   - specific restrictions placed on travel lanes,
   - durations of closures,
   - hours when work may be performed (include holidays and weekend hours),
   - number of lanes of unobstructed traffic to be maintained in each direction,
   - staging of traffic signals,
   - temporary drainage,
   - allowable minimum widths of traveled way and if detour routes have to be established for over width vehicles,

- number of lanes to be open to traffic,
- diversionary routes with any restrictions,
- traffic lanes or patterns to be maintained during construction for local roads affected by construction,
- contractor's access and staging areas,
- provisions for maintaining access to driveways,
- signing for temporary access driveways to commercial developments.

8. Standard sheets TCD-1 and TCD-2 can be modified to include other project specific information necessary to adequately address traffic control needs as follows:
   - Where required for clarification, sectional views showing the placement of traffic control devices, such as construction barrier, adjacent to the traveled way and the work site should be provided.
   - When ramps or jughandles are to be reconstructed, consideration should be given to the effect that the work will have on traffic patterns or flow. Traffic Timing Plans for traffic signals may have to be altered.
   - The need for a detour route should be considered if a ramp or jughandle is to be closed for construction. Also, where work is to be performed on a ramp or jughandle whose width is less than 14 feet, that ramp or jughandle should be closed while the work is being done or if the ramp cannot be closed, a temporary ramp widening may be required. When reconstructing a shoulder, consider the use of a temporary traffic shift to provide a buffer.
9. Following standard sheets TCD-1 and TCD-2, prepare additional Traffic Control Plans to show plan views of project specific work sites when these locations need to be represented or where design features of traffic control devices or temporary pavement markings need to be indicated. Issues to address on the plans should include but are not limited to those listed in Item 7 above. These plans should contain notes pertaining to the various stages of construction that thoroughly describe each phase of construction in the sequence to be performed. In addition, utility relocations that affect the staging of construction should be clearly identified within the sequence of work.
10. When temporary pavement areas are required, a typical section should be provided.
11. Prepare and include in the Traffic Control Plans the method of removal of surface water runoff during each stage of construction.
12. Review the construction staging to determine any seasonal constraints due to weather (i.e. snow removal etc).
13. Determine the constructability of the construction staging by reviewing the sequencing of work and methods of construction.
14. When staging the successive passes of resurfacing, consideration should be given to the location of the longitudinal pavement edge. Designers should avoid placement of these edges within the wheel path.
15. Determine if underground work (i.e. new storm drains, pipelines, gas, electric, etc.) is sequenced to coincide with or enhance construction phasing, and that this work will meet traffic control constraints for lanes, etc. (i.e. check limits on applying a back slope in trenches when calculating lateral clearances. Also

check if sheeting or a trench box will be required. Standard segment lengths of pipe should also be considered.)

16. If required, prepare temporary or interim traffic signal plans, details and traffic signal timing plans associated with the staged reconstruction of existing traffic signals
17. Prepare construction details for any traffic control device not adequately covered in the Standard Roadway Construction Details such as the following:
    - Details for all Inertial barriers and temporary compressive crash cushions as per the construction detail requirements in Section 9 to be utilized on the project.
    - Construction signs not depicted in the Standard Roadway Construction Details.
18. Prepare and include in the Traffic Control Plans, a tabulation of the channelization devices needed for the project.
19. Obtain Traffic and Parking restriction ordinances approved by municipalities.
20. Establish a maximum length of lane closure, length of alternating traffic and maximum number of intersections affected.

14.16 Quality Control Checklist for Designers

Designers shall review the following checklist throughout the development of the Traffic Control Plans. Explanations are required for all "No's" checked.

Design / Quality Control	YES	NO
General		
Stage construction is required for the project and the proposed staging is constructible.		
A Traffic Impact Report was prepared.		
Warrants for nighttime construction have been evaluated.		
Nighttime construction is warranted and has been approved by the Department's Project Manager for use on this project.		
All staging designs and diversionary roads meet NJDOT Design and Construction Standards.		
All work zone pavement markings and traffic control devices meet MUTCD and NJDOT Standards.		
Adequate work zones and transitions are provided.		
Traffic Control Plans provide staging that facilitates construction phasing.		
Traffic Control Plans include NJDOT Standard Traffic Control Details that have been modified based on specific site constraints and construction procedures required to construct the project.		
The Legend and General Notes contained within the NJDOT Standard Traffic Control Details were reviewed, modified and/or expanded to address project specific conditions.		
Where required for clarification, sectional views showing the placement of traffic control devices, such as construction barrier, adjacent to the traveled way and the work site have been provided.		
Construction details for any traffic control device not adequately covered by NJDOT Standard Roadway Construction Details have been provided (i.e. temporary crash cushions).		
A tabulation of the channelization devices needed for the project is provided in the Traffic Control Plans.		
Temporary compressive barrier crash cushions are warranted, fill out summary table in CD-159-9		
Inertial barriers are warranted, include layout of modules, including the weight of each module as a construction detail.		
Appropriate designs, specifications and/or notes are provided for safety during work and non-work periods (i.e. storage of equipment, materials and vehicle parking outside clear zone, use of appropriate channelizing devices, etc.).		
Earthwork phasing is compatible with the actual construction and Traffic Control Plan for the project.		
The project makes appropriate use of the item, Traffic Director, Flagger.		
Emergency facilities for fire, rescue and/or police exist within the project limits.		
Special regulations are needed for speed limits, turn prohibitions, parking prohibitions and/or one-way designations.		

The hours of operation for this project (i.e. lane closures) have been established with Traffic Operations and are provided on the Traffic Control Plans.		
Expected pedestrian activity and crosswalks for parks, schools, residential, churches, stadiums, shopping, industrial and other appropriate areas have been identified within the project limits.		
A schedule of construction staging has been established to minimize interference with the timing of local events like shore traffic, county fairs, race tracks, sporting events, high volume traffic generators, etc.		
A park is located within the project limits and a calendar of events and the name, address and phone number of the individual to contact for coordination of construction staging is provided on the Traffic Control Plans.		
All pay items for temporary work are provided.		
Adjacent projects which may pose a conflict with traffic management during construction, including on parallel routes have been reviewed.		
All adjacent projects and/or agreements have been accounted for in the specifications.		
The completion date for this project has been reviewed in relation to area traffic management.		
The proper liquidated damages clauses are included for traffic management.		
Appropriate State Highway Authorities (i.e. New Jersey Turnpike, Garden State Parkway, Atlantic City Expressway, etc.) have been contacted and the required permits have been obtained in accordance with Section 14.15.1, 6.		
Detours / Diversionary Roads		
The project will require a detour.		
Resolution(s) of concurrence from the agency(ies) having jurisdiction over the detour route have been received and are on file with the designer and the Bureau of Traffic Signal and Safety Engineering.		
The appropriate Detour Plans are complete and presented correctly.		
Detour routes meet the minimum requirements to carry the volume and type of traffic detoured.		
The Traffic Control Plans and Specifications providing the required maintenance of traffic and/or work zones are completed and presented correctly.		
The temporary traffic signal timing and sequence is appropriate for the volumes projected to use the detour.		
Diversionary roads are required for the proposed stage construction and the design meets the minimum standards.		
The project specifications include provisions for videotaping the detour road before and after construction.		
Planned detour / diversionary road grades and existing ground contours appear to reasonably conform to the existing conditions.		

Temporary roadway/pavement design fits field needs.		
Detour / diversionary road grades coincide with crossroads elevations.		
Detour / diversionary road ends meet the existing or proposed alignment.		
Enough area is available inside the detour / diversionary road alignment to perform planned work.		
While the detour / diversionary road is in use, access for affected local business or residents is provided.		
Temporary striping is required.		
The cost of using temporary striping with latex versus long life striping was evaluated.		
Geometry		
The project site was visited and horizontal / vertical sight distance restrictions due to existing roadway conditions were identified (i.e. roadside vegetation, adjacent property usage, overpass bridge structures, sign structures, barrier curb, guide rail and/or horizontal and vertical geometry).		
The limits of construction have been extended based on field conditions (i.e. insufficient sight distance) at the proposed end limits.		
Required lane widths are shown for each staging plan.		
Minimum lane widths of 11 feet have been provided for all lane shifts and diversionary roads, except where existing lane widths are 10 feet or as required in the Standard Details.		
Constructibility of the horizontal and vertical alignment was evaluated (i.e., widening on one side of the roadway may be more cost effective than widening on both sides because of physical restrictions).		
Widths of roadway widenings are compatible with equipment sizes (i.e. most placement/finishing units need widths of 12 feet to operate. Anything less becomes a grading tractor/hand labor activity with high costs).		
Roadway widths for projects which are not compatible with standard equipment sizes were avoided where ever possible (i.e. anything less than 10 feet -12 feet in width for base course becomes a grading tractor/hand labor activity. Asphalt paving machines usually have a standard screed width of 10 feet.		
Work zones have sufficient size for the intended construction operation (i.e. allow 30 to 36 inches for concrete paver tracks for work operations).		
Transition areas meet or exceed the minimum standards set forth in the MUTCD.		
Grading for all temporary roadways and cross-overs is shown.		
A maximum length of lane closure, length of alternating traffic andmaximum number of intersections affected have been established.		
Pavement		
Temporary overlays or patching are needed for staging.		

Temporary pavement areas are required and a typical section has been provided.		
Full depth shoulder reconstruction is needed for staging operations.		
Existing shoulder can be used to carry traffic for staging operations.		
Distressed areas of existing pavement will require joint repair or bituminous patch.		
Sawing and sealing of joints is required.		
Rutting in the existing pavement will require special milling treatments to achieve new cross slope or typical section.		
Conflicting pavement markings and/or plowable pavement reflectors have to be removed and replaced.		
Access		
Provisions were made for workers, equipment and material deliveries to safely enter/exit work zones.		
Provisions were made for emergency vehicle travel through the detour/road closure/lane closure area.		
Provisions were made for bus routes and bus stops within the detour/road closure/lane closure area.		
Access for local business/residents is provided.		
Freeway closure information is clearly shown in plans.		
Required lanes and closure periods for freeways and local streets, are clearly listed in the plans or special provisions.		
Restrictions on access to site or other sensitive environmental issues were evaluated.		
Areas are available for: stockpiling processed material, form lay down and fabrication yards, equipment parking, temporary field offices, personnel parking, and purchased material storage.		
Temporary sidewalks are required.		
Temporary Barriers / Guide Rail		
Where temporary barrier is required, all staged moves are accounted for.		
The transition lengths for temporary barrier curb or guide rail meet or exceed the minimum design standards.		
Temporary barriers are flared to 30 feet outside roadway edge where ever space permits to reduce the use of sand barrel cushions.		
Approved end treatments have been provided for the ends of the barrier curb, guide rail or bridge parapets.		
A warrant evaluation was conducted regarding the use of the quick change movable barrier system as a cost effective method to safely expedite or improve productivity in the construction work zone and shorten the construction duration.		
Input for the justification of use of a quick change movable barrier system was obtained from Traffic Engineering and Regional Construction.		
A quick change movable barrier system will be used on the project.		

Staging requires guide rail to be extended, removed or upgraded along with appropriate approved end treatments and attachments.		
Staging requires existing guide rail to be reset along with appropriate approved end treatments and attachments.		
Temporary Traffic Signals		
Temporary traffic signals are provided for the proposed stage construction and the design has been certified by a New Jersey licensed professional engineer.		
The Traffic Control Plans for the temporary traffic signal(s), including signal phasing design, signs, pavement markings and timing sequence(s) are complete and presented correctly.		
The traffic signal timing has the minimum change, clearance and pedestrian intervals based on the location and approach speed.		
Existing traffic signals are equipped with an optically controlled emergency vehicle detection system.		
Traffic signal timing provides for pre-emption and clearance cycles when adjacent to RR crossings.		
Utilities / Drainage		
All utility conflicts for the stage construction have been resolved.		
Underground work (new storm drains, pipelines, gas, electric, etc.) is sequenced to coincide with or enhance construction phasing.		
Utility relocations that affect the staging of construction are clearly identified within the appropriate sequence of work.		
Underground utilities are located to meet traffic control constraints for lanes, etc. (i.e. check limits on applying a back slope in trenches when calculating lateral clearances. Also check if sheeting or a trench box will be required. Standard segment lengths of pipe should also be considered.)		
Temporary drainage through the project is provided for specific construction phases.		
Consideration was given to obstructions that may pose a hazard to the motoring public during the various stages of construction, i.e. manholes, inlets, sign foundations and footings. (The Designer should not specify full depth precast units for various stage construction with elevation changes.)		
Review the construction staging to determine any seasonal constraints due to weather (i.e. snow removal).		
Consideration was given to the particular stage of construction that will be in place during the winter months, i.e. elevation of manholes and inlets. (This is not only to provide drainage but a smooth pavement and not to interfere with snow plow operations.)		
Detour/diversionary road drains properly to avoid ponding on the pavement.		
Conduit for lighting, ITS and/or signals can be installed during construction sequencing for alignment shown.		
Excavated embankment material is suitable for conduit trench backfilling.		

Power for temporary lighting, signals and utilities is provided.		
Existing inlets and drainage structures need to be cleaned out prior to construction staging.		
Existing inlets and/or manholes need to be reconstructed or have castings replaced prior to construction staging.		
Drainage problems with adjacent properties have been evaluated for the construction staging shown on the Traffic Control Plans.		
Structures		
Work area needs were considered during easement procurement (i.e. space is needed adjacent to a major structure for a form lay down site).		
Sufficient room is provided between new foundations and existing roadways for the excavation, a working area, and a barrier.		
Access to structure locations can be provided which will permit a free flow for transit mixers or trucking and the access is compatible with traffic patterns and safe to merge.		
Pedestrian traffic at structures was addressed and protection provided where required.		
Design of bridges which require falsework construction over traffic conditions allows a 16 feet minimum clearance to the bottom of the falsework.		
Falsework requires illumination for nighttime traffic.		
Traffic flow for phased construction of elevated or depressed structures was considered (i.e. elevation differences that may require the use of sheet piling or some other technique to maintain traffic lanes were evaluated).		
In high volume areas, construction of temporary over/under passes for hauling equipment were considered to avoid traffic conflicts.		
Adequate protection has been provided for the roadway or water course under the structure.		
Traffic stoppage and time limits for stoppage for setting steel over roadway have been indicated.		
Signing		
Signing diagram is clear and understandable.		
Traffic Control signing meets MUTCD standards and the traffic needs in each phase.		
Traffic Control signing is shown for all detours.		
Variable message signs and/or highway advisory radio are needed.		
Special signs are needed for businesses and safety of pedestrians.		
Existing highway signing needs refurbishing or replacement prior to construction staging.		