

# DIVISION 11 WORK ZONE TRAFFIC CONTROL

## SECTION 1101 WORK ZONE TRAFFIC CONTROL GENERAL REQUIREMENTS

### 1101-5 TRAFFIC CONTROL PLAN (TCP).

#### (A) General:

Maintain traffic through work zones in accordance with these specifications, the Traffic Control Plan, the Manual on Uniform Traffic Control Devices, and Roadway Standard Drawings.

The Traffic Control Plan normally includes Traffic Control Phasing, Project Notes, Drawings and Roadway Standard Drawings, specifying maintenance of traffic during the process of the work.

If a conflict arises, Phasing and Drawings govern over project notes, and project local notes govern over project general notes.

#### (B) Phasing:

Complete the requirements of each Phase before proceeding to the next Phase and the requirements of each Step before proceeding to the next Step.

If a Traffic Control Plan Phasing is broken into "AREAS", work may be performed in more than one AREA simultaneously as described in the plan. For example, if PROJECT is divided into AREA 1 and AREA 2, work can be performed in both AREAS simultaneously, but must progress through in each AREA through the Phases and Steps requirements.

Perform all work described in the Traffic Control Plan in accordance with Section 104-1, unless it is specifically stated that certain items of the work will be performed by others.

#### (C) Project Notes:

Two types of PROJECT NOTES may be included in the Traffic Control Plan;

- (i) General Notes are not individually referred to within the phasing or plan sheets and apply at all times during the project.
- (ii) Local Notes apply only for the specific times and locations that they are referred to in the phasing and/or detail sheets.

#### (D) Drawings:

The Traffic Control Plan may include Drawings to supplement the Phasing as necessary.

#### (E) Alternate to Traffic Control Plan:

If desired, submit for consideration an alternate method for traffic control other than as shown on the plans. Submit the alternate plan a minimum of 30 days in advance of the anticipated implementation to allow for adequate review time. Do not implement alternate plans for traffic control until they are approved in writing and properly sealed. No adjustment in compensation or extension of the completion date(s) will be allowed due to the review time of the alternate, whether approved or rejected.

#### (F) Traffic Control Plan not fully covered in the Contract:

When the Traffic Control Plan does not cover a particular work function, notify the Engineer to allow for the development or modification of a sealed set of the Traffic

Control Plans.

**1101-10 BLASTING ZONES.**

When blasting operations are within 1000 feet (304.8 m) of a travelway, provide the appropriate traffic control as shown in the plans and/or the Roadway Standard Drawings.

**1101-15 CONSTRUCTION VEHICLE CROSSINGS.**

Do not cross a median, ramps, or loops with vehicles and equipment unless a specific location for crossing is approved and required traffic control devices are used as shown in the Roadway Standard Drawings.

**1101-20 ON-ROAD CONSTRUCTION VEHICLES.**

When operating outside of a closed lane or haul road crossing in a work zone, on road-construction vehicles are subjects to the North Carolina Division Of Motor Vehicle weight and safety regulations as commercial vehicles.

**1101-25 EXCAVATIONS WITHIN TRAVELWAY.**

During the process of excavating in a travelway where traffic is to be later maintained, make provisions to backfill and repair any excavated or damaged pavement before allowing traffic to proceed over the affected lanes. In low speed areas (35 MPH or less) metal plates may be used to cover excavated areas, as shown in plans.

**1101-30 HAULING OPERATIONS.**

Comply with the Multiple and Single Vehicle Hauling restrictions as shown in the plans when performing hauling of equipment or materials to or from the project.

Multiple vehicle hauling is defined as the hauling of equipment or materials to or from the project with delivery at intervals of less than five minutes and/or results in more than one vehicle at particular work site at one time.

Single vehicle hauling is defined as the hauling of equipment or materials to or from the project with delivery at intervals of more than five minutes and results in no more than one vehicle at a particular work site at one time.

**1101-35 MAINTENANCE OF THE TRAVELWAY.**

Refer to Section 107.

The Department will be responsible for the removal of ice and snow from all portions of the project open to traffic.

**1101-40 MATERIAL AND EQUIPMENT STORAGE AND PARKING.**

When work is not in progress, keep all personnel, equipment, machinery, tools, construction debris and supplies at least 40 feet (12.2 m) away from active travel lanes. When vehicles, equipment, and materials are protected by concrete barrier or guardrail they should be offset a minimum of 5 feet (1.5 m) from the barrier or guardrail put along rear side.

**1101-45 PARKING OF PERSONAL VEHICLES.**

Do not park personal vehicles within the right-of-way.

**1101-55 PROTECTION OF HAZARDS.**

During the progress of the work mark all hazards with well maintained signs, barricades, drums, or other warning, or channelizing devices.

At each location where work is started which creates a safety hazard, continue the work until completed to the extent that the safety hazard is eliminated. If the work is not pursued in a continuous manner the Engineer will not allow any other work on the project to be performed until the existing safety hazard is eliminated.

**1101-65 TEMPORARY LANE CLOSURES.****(A) General:**

Operate all equipment and personnel within the designated work area during lane closures. Do not impede, or stop traffic for the purpose of performing construction related work on the traffic side of the lane closure, except when called for in the Traffic Control Plan.

Install lane closures with the traffic flow, beginning with devices on the upstream side of traffic. Remove lane closures against the traffic flow, beginning with devices on the downstream side of traffic, unless otherwise directed by the traffic control plan.

**(B) Intersections:**

When construction proceeds through an intersection, provide flagger(s) and all other necessary Traffic Control as required by the plans to direct the traffic through the intersection. When an intersection is signalized, have authorized personnel place the signal in flash mode, prior to beginning work in the intersection.

**1101-70 TEMPORARY ROAD CLOSURES.****(A) Traffic Pattern Alterations:**

When a traffic pattern is altered from the usual or expected flow, such as during road closures or while stopping traffic, notify the Engineer 21 calendar days or as specified in the plans prior to altering the traffic pattern.

Pre-plan all traffic pattern alterations. Hold a meeting with the Engineer before altering traffic to discuss the necessary details of implementation. The Engineer, as necessary, will then notify the proper authorities, such as police, emergency personnel, business owners, residents, or any other parties that will be affected by traffic being redirected from its normal flow.

**(B) Detour:**

Ensure that all required detour signing and delineation, including work done by others, are in place prior to placing traffic onto a detour.

**(C) Traffic Stoppage:**

Limit stopping traffic to times specified in the plans. Provide enough time between consecutive stoppages to allow traffic to return to normal flow.

**1101-75 TRAFFIC CONTROL SUPERVISION.**

Designate a Traffic Control Supervisor for the project who is knowledgeable of Traffic Control Plan design, devices and application, and has full authority to insure traffic is maintained in accordance with the contract. Coordinate with Department's project traffic control representative on all details concerning the Contractor's traffic control program.

Provide a Traffic Control Supervisor or designated representative to be on call at all times to make any necessary changes in the traffic control operations in a timely manner. Coordinate with and cooperate with traffic control supervisors of adjacent or overlapping construction projects to insure safe and adequate traffic control is maintained throughout the projects at all times including periods of construction inactivity.

**1101-80 VEHICULAR ACCESS.**

Maintain continuous and safe vehicular access, including but not limited to all residences, businesses, schools, police and fire stations, hydrants, other emergency services, hospitals and mailboxes. Conduct operations in such a manner as to limit the inconvenience to property owners.

## SECTION 1105 WORK ZONE TRAFFIC CONTROL DEVICES

### 1105-1 DESCRIPTION.

Furnish, install, maintain, relocate, and remove traffic control devices in accordance with the plans and specifications. All traffic control devices furnished by the Contractor will remain the property of the Contractor, unless otherwise specified in the contract.

### 1105-2 MATERIALS.

Refer to Division 10.

Supply certifications, which meets the requirements of Article 106-3, at least 72 hours prior to use for all used traffic control devices.

Provide traffic control devices which are listed on the North Carolina Department Of Transportation's approved product list or accepted as traffic qualified by the Traffic Control Section. For more information on the Traffic-Qualification process, contact the Traffic Control Section at Century Center Building B, 1020 Birch Ridge Drive, Raleigh, NC 27610; (919) 250-4159, or see the approved product list on the NCDOT web site at: "[www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm](http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm)"

### 1105-3 CONSTRUCTION METHODS.

Have all traffic control devices inspected and approved prior to using them on the project.

Install traffic control devices at the inception of construction operations in the proper phase of construction and properly maintain and relocate as necessary during the time they are in use. Keep these devices in place as long as they are needed and immediately remove thereafter. When operations are performed in stages, install only those devices that apply to the present conditions.

Once a particular work activity is completed, remove the traffic control devices as necessary and remain available for reuse as required by the plans.

### 1105-4 MAINTENANCE.

Provide continuous and expeditious maintenance of all traffic control devices as specified in sections 1101 and 1105 and/or as recommended by the manufacturer throughout the life of the contract.

Prior to construction, submit for approval, a proposed maintenance schedule and maintenance checklist for all traffic control devices.

Perform the maintenance and scheduled inspections of traffic control devices. Continuously review and maintain all traffic handling measures to assure that adequate provisions are in place for the safety of the public and workers.

Include in maintenance activities repair or replacement of traffic control devices which are damaged (torn, crushed, discolored), displaced by traffic or other means, or deteriorated beyond effectiveness.

Specific maintenance responsibilities include but are not be limited to: replacement due to loss of retroreflectivity, repair of defaced sheeting and legend, replacement of broken supports, repositioning of leaning signs, cleaning of dirty devices, replacement of stolen or vandalized devices, replacement of displaced devices including portable concrete barrier.

The name and telephone number of the agency, contractor or supplier may be shown on the non-retroreflective surface of all channelizing devices. Use letters and numbers that are a non-reflective color and not over 2 inches (50.8 mm) in height.

**1105-5 FAILURE TO MAINTAIN TRAFFIC CONTROL.**

Failure to maintain traffic control measures and traffic control devices in accordance with this section may result in formal notification of noncompliance. Implement remedial action immediately for imminent danger situations as directed. Implement remedial action within 48 hours after notification of a safety issue that is not an imminent danger situation. (See Articles 107-22 and 108-7)

Failure to comply may result in having the work performed with available forces and equipment. The Contractor is held responsible for this work, and the actual cost of performing said work will be deducted from the moneys due the Contractor on the contract. In cases of willful disregard for the safety of the public, the Engineer may proceed immediately to implement the measures necessary to provide the appropriate level of traffic control to ensure that the safety of all concerned parties is maintained. (See Article 109-3)

**1105-6 CONSTRUCTION ZONE TRAFFIC CONTROL DEVICE SURVEILLANCE**

Provide continuous surveillance operations only during periods of construction activity. Conduct periodic surveillance, each calendar day, during periods of construction inactivity for the following traffic control situations:

- (a) When a change in the travel lane alignment or pattern has been made.
- (b) When a roadway has been closed to traffic and an off-site detour is provided.
- (c) When temporary concrete barrier, drums or other traffic control devices have been placed on or adjacent to a travelway or a shoulder.

**1105-7 COMPENSATION.**

Payment at the contract unit prices for the various items in the contract will be full compensation for all work covered by this section.

**SECTION 1110  
WORK ZONE SIGNS**

**1110-1 DESCRIPTION.**

Furnish, install, maintain, temporarily cover and uncover signs, relocate, and remove work zone signs (stationary) and work zone signs (barricade mounted) in accordance with the plans and specifications.

Furnish, install, maintain, relocate, and/or reinstall after periods longer than 30 minutes and remove work zone signs and portable work zone sign stands in accordance with the plans and specifications.

Use work zone signs (portable) only with portable work zone sign stands specifically designed for one another. Portable work zone signs may be roll up, aluminum, or approved composite.

**1110-2 MATERIALS.**

**(A) General:**

Refer to Division 10:

Work Zone Signs.....	Article 1089-1
Work Zone Sign Supports.....	Article 1089-2

**(B) Material qualifications:**

Provide portable work zone sign stands and portable signs which are listed on the North Carolina Department Of Transportation’s approved product list or accepted as traffic

qualified by the Traffic Control Section. For more information on the Traffic-Qualification process, contact the Traffic Control Section at Century Center Building B, 1020 Birch Ridge Drive, Raleigh, NC 27610; (919) 250-4159, or see the approved product list on the NCDOT web site at:

["www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm"](http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm)

Provide portable work zone signs and stands which are crash tested by the manufacturer. The portable work zone sign and the portable work zone sign stand must be crash tested together as a system.

**(C) Historical Performance:**

Historical performance of the portable work zone sign and the portable work zone sign stand will be used in determining future use of the material by the NCDOT, even if the portable work zone sign or portable work zone sign stand has been traffic-qualified. Poor past or poor current performance of portable work zone signs and/or portable work zone sign stands at any site, whether or not related to a specific contract may be grounds for non-acceptance of a product on any project under contract.

**1110-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

**(A) Work Zone Signs (stationary):**

Install work zone signs (stationary) to stand plumb within 2° in all directions, under all conditions. Erect signs per Roadway Standard Drawings No. 1110.01 sheet 1 of 1..

Splicing of work zone sign (stationary) posts is acceptable. Splice work zone sign (stationary) posts according to Roadway Standard Drawing No. 1110.01 sheet 1 of 1. Remove entire post when removing signs with spliced posts. Do not back brace work zone sign (stationary) supports.

Cover any work zone signs with an opaque material that prevents reading of the sign at night by a driver using high beam headlights. Use material, which does not damage the sign sheeting.

Any damage incurred from the covering to non-work zone signs will be determined using Division 9. Replace or repair any damaged signs due to the covering at no expense to the department.

**(B) Work Zone Signs (Barricade Mounted):**

Mount work zone sign centered above the top rail of the barricade. See Roadway Standard Drawings.

**(C) Work Zone Signs (Portable):**

**1. General:**

Install the portable work zone sign and sign stand to stand plumb within 10° left and right, within 20° front and back and capable of standing erect in windy conditions.

When not in use for periods longer than 30 minutes, lay the portable work zone sign flat on the ground and collapse the sign stand and lay it flat on the ground.

Clean the sign face prior to erection if laid face down when not in use.

**2. Work Zone Sign (Portable):**

If the distance from the ground to the lowest point of the portable work zone sign is between 1 foot (0.3 m) and 2 feet (0.6 m), install portable work zone sign stand to carry only roll up portable work zone signs.

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If the distance from the ground to the lowest point of the portable work zone sign is 5 feet (1.5 m) or more, install portable work zone sign stands to carry roll up, aluminum, or composite material work zone signs.

**1110-4 MAINTENANCE.**

Perform all maintenance in accordance with the requirements of Article 1105-4.

**1110-5 METHOD OF MEASUREMENT.**

Nominal dimensions will be used to compute the sign panel areas

**(A) Work Zone Signs (Stationary):**

The quantity of work zone signs (stationary) to be paid for will be the actual number of square feet (square meters) of sign panels which have been satisfactorily installed at each required location and accepted. Where a particular sign is used at more than one location, measurement will be made at each location.

**(B) Work Zone Signs (Barricade Mounted):**

The quantity of work zone signs (barricade mounted) to be paid for will be the maximum number of square feet (square meters) of sign panels which have been satisfactorily installed on barricades and accepted. Payment will be made for the initial installation only. Relocation of signs will be considered incidental to the measurement of the quantity of signs.

**(C) Work Zone Signs (Portable):**

The quantity of work zone signs (portable) to be paid for will be the maximum number of square feet (square meters) of the sign panels which have been satisfactorily installed and accepted. Payment will be made for the initial installation only. Relocation of signs will be considered incidental to the measurement of the quantity of signs.

**1110-6 BASIS OF PAYMENT.**

The quantity of work zone signs (stationary) and work zone signs (barricade mounted), and work zone signs (portable) measured as provided in Article 1110-5, will be paid for at the contract unit price per square foot (square meter) for "Work Zone Signs (Type)".

No direct payment will be made for stationary work zone sign supports or portable work zone sign stands. All stationary work zone sign supports or portable work zone sign stands are considered incidental to the work of providing work zone signs.

Payment will be made under:

Work Zone Signs (Stationary) .....	Square Foot (Square Meter)
Work Zone Signs (Barricade Mounted).....	Square Foot (Square Meter)
Work Zone Signs(Portable).....	Square Foot (Square Meter)

**SECTION 1115  
FLASHING ARROW PANELS, TYPE C**

**1115-1 DESCRIPTION.**

Furnish, install, place, operate, maintain, relocate, and remove flashing arrow panels in accordance with the plans and specifications.

**1115-2 MATERIALS.**

**(A) General:**

Refer to Division 10:

Flashing Arrow Panels .....	Article 1089-6
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**(B) Material Qualifications:**

Use Flashing Arrow Panels, which have been evaluated by NTPEP.

Use Flashing Arrow Panels, which are on the North Carolina Department of Transportation's Approved Products List or are Traffic-qualified by the Traffic Control Section. For more information on the Traffic-qualification process, contact the Traffic Control Section at Century Center Building B, 1020 Birch Ridge Dr., Raleigh, NC, 27610, (919)-250-4151, or see the approved product list on the NCDOT web site at:

["www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm"](http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm)

**(C) Historical Performance:**

Historical performance of the Flashing Arrow Panels will be used in determining future use of the material by the NCDOT, even if the Flashing Arrow Panel has been traffic-qualified. Poor past or poor current performance of Flashing Arrow Panels at any site, whether or not related to a specific contract may be grounds for non-acceptance of a product on any project under contract.

**1115-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

Use arrow panels which have the capability to display mode selections as shown in the plans.

Do not use straight line caution displays.

Mount flashing arrow panels on trucks, trailers, or other mobile units.

**1115-4 MAINTENANCE.**

Perform all maintenance in accordance with the requirements of Article 1105-4.

**1115-5 METHOD OF MEASUREMENT.**

The quantity of flashing arrow panels to be paid for will be the maximum number of panels acceptably placed and in use at any one time during the life of the project as required by the contract.

**1115-6 BASIS OF PAYMENT.**

The quantity of flashing arrow panels, measured as provided in Article 1115-5, will be paid for at the contract unit price each for "Flashing Arrow Panels, Type C".

Payment will be made under:

Flashing Arrow Panels, Type C .....Each

**SECTION 1120  
CHANGEABLE MESSAGE SIGNS**

**1120-1 DESCRIPTION.**

Furnish, install, maintain, relocate and remove changeable message signs in accordance with the plans and specifications.

**1120-2 MATERIALS.**

**(A) General:**

Refer to Division 10:

Changeable Message Signs ..... Article 1089-7

**(B) Material Qualifications:**

Use Changeable Message Signs that have been evaluated by NTPEP.

Use Changeable Message Signs, which are on the North Carolina Department of Transportation's Approved Products List or are Traffic-qualified by the Traffic Control Section. For more information on the Traffic-qualification process, contact the Traffic Control Section at Century Center Building B, 1020 Birch Ridge Dr., Raleigh, NC, 27610, (919)-250-4151, or see the approved product list on NCDOT web site at: ["www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm"](http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm)

**(C) Historical Performance:**

Historical performance of the Changeable Message Signs will be used in determining future use of the material by the NCDOT, even if the Changeable Message Sign has been traffic-qualified. Poor past or poor current performance of Changeable Message Signs at any site, whether or not related to a specific contract may be grounds for non-acceptance of a product on any project under contract.

**1120-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

Mount all changeable message signs on a trailer designed to adequately support the message board in a level position. Align and site the changeable message sign to provide optimal driver visibility. Sign operator will adjust flash rate so that a minimum of two complete sign panels can be displayed and legible to a driver while approaching the sign at the posted speed.

Relocate the units for the various stages of construction as shown in the plans or as needed to adequately inform the motorists.

Provide an experienced operator for the changeable message sign during periods of operation to ensure that the messages displayed on the sign panel are in accordance with the plans and in accordance with message content guidelines. Ensure that the message sign is illuminated properly to meet the existing light conditions, and that all adjustments for operation of the sign are made as required by the plans or as needed to properly guide motorists.

Expedite repairs due to failure, malfunction, or damage to a changeable message sign, in operation for any reason. During the process of repairing the sign, furnish another changeable message sign (approved by the Engineer and at no additional cost). Repair changeable message sign within 24 hours; otherwise, suspend all construction activities requiring the use of the sign until the sign is restored to operation.

**1120-4 MAINTENANCE.**

Perform all maintenance operations recommended by the manufacturer of the sign. Include the periodic cleaning of the sign face and associated solar panels in maintenance operations. Meet the requirements of Article 1105-4 for all maintenance operations.

**1120-5 METHOD OF MEASUREMENT.**

The quantity of changeable message signs to be paid for will be the maximum number of changeable message signs acceptably placed and in operation, at any one time during the life of the project.

**1120-6 BASIS OF PAYMENT.**

The quantity of changeable message signs, measured as provided in Article 1120-5, will be paid for at the contract unit price each for "Changeable Message Signs" on the following schedule:

- 70% of the unit bid price upon placing the unit in service.
- 20% of the unit bid price when the project is 50% complete.
- 10% of the unit bid price when the project is 100% complete.

Payment will be made under:

Changeable Message Signs ..... Each

**SECTION 1125  
WARNING FLAG SETS**

**1125-1 DESCRIPTION.**

Furnish, install, maintain, relocate, and remove warning flag sets used to supplement other traffic control device in accordance with the plans and specifications.

A warning flag set consists of three flags of the fabric type

**1125-2 MATERIALS.**

Refer to Division 10:

Warning Flags ..... Article 1089-10

**1125-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

Use warning flag sets to supplement other traffic control devices by mounting the flags on the top portion of the device that they are supplementing.

Use appropriate fastening methods to mount the flags to signs or other traffic control devices.

**1125-4 MAINTENANCE.**

Meet the requirements of Article 1105-4 for all maintenance operations.

Inspect warning flag sets periodically and replace any worn, faded, or damaged flags. When replaced, warning flag sets will be paid for under article 1125-6.

**1125-5 METHOD OF MEASUREMENT.**

The quantity of warning flag sets to be paid for will be the maximum number of warning flag sets used to supplement other traffic control devices acceptably installed at any one time during the project. Relocation of warning flag sets used to supplement other traffic control devices will be considered incidental, and will not be paid for separately.

**1125-6 BASIS OF PAYMENT.**

The quantity of warning flag sets used to supplement other traffic control devices measured as provided in Article 1125-5, will be paid for at the contract unit price each for "Warning Flag Sets".

Payment will be made under:

Warning Flag Sets .....Each

**SECTION 1130  
DRUMS**

**1130-1 DESCRIPTION.**

Furnish, install, maintain, relocate, and remove drums with ballast in accordance with the plans and specifications.

**1130-2 MATERIALS.**

Refer to Division 10:

Drums .....Article 1089-5

**1130-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

Utilize the same type of reflective sheeting on all drums installed at any one time during the life of the project.

Use ballasting method in accordance with manufacturer's specification. When using tire ballasting method, place the tires flush with the ground.

**1130-4 MAINTENANCE.**

Meet the requirements of Article 1105-4 for all maintenance operations.

**1130-5 METHOD OF MEASUREMENT.**

The quantity of drums to be paid for will be the maximum number of drums acceptably placed and in use at any one time during the life of the project.

**1130-6 BASIS OF PAYMENT.**

The quantity of drums, measured as provided in Article 1130-5, will be paid for at the contract unit price each for "Drums".

Payment will be made under:

Drums.....Each

**SECTION 1135  
CONES**

**1135-1 DESCRIPTION.**

Furnish, install, relocate, maintain, and remove cones and reflective cone collars in accordance with the plans and specifications.

**1135-2 MATERIALS.**

Refer to Division 10:

Cones.....Article 1089-4

**1135-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

Have reflective collars on all cones used between dusk and dawn as shown in the plans. Utilize the same type of reflective sheeting on all cone collars installed at any one time during the life of the project.

**1135-4 MAINTENANCE.**

Meet the requirements of Article 1105-4 for all maintenance operations. Immediately replace any cone or reflective collar that becomes torn, crushed, discolored, or otherwise damaged such that it will not perform its intended purpose.

**1135-5 METHOD OF MEASUREMENT.**

The quantity of cones to be paid for will be the maximum number of cones acceptably placed and in use at any one time during the life of the project.

**1135-6 BASIS OF PAYMENT.**

The quantity of cones, measured as provided in Article 1135-5, will be paid for at the contract unit price each for "Cones".

Payment will be made under:

Cones..... Each

**SECTION 1145  
BARRICADES**

**1145-1 DESCRIPTION.**

Furnish, erect, maintain, relocate, ballast, and remove barricades in accordance with the plans and specifications. Provide barricades which meet or exceed the requirements of NCHRP 350 requirements for category II traffic control devices.

**1145-2 MATERIALS.**

Refer to Division 10:

Barricades..... Article 1089-3

**1145-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

Assure proper closure of the road by the end of the work day where access at a point of road closure is provided for construction equipment through Type III barricades.

Use sandbags or other approved ballasts for ballasting on barricades to prevent overturning of barricades by the wind. Place sandbags on the lower parts of the frame or stays to provide the required ballast but do not place on top of any striped rail. Do not ballast barricades with heavy objects such as rocks or chunks of concrete.

Do not anchor barricades to any pavement surfaces unless such anchoring method has passed the crash test requirement of NCHRP 350 for work zone category II devices.

Provide type III barricades which consist of three rails. Provide type II barricades which consist of two 6 foot (1.8 meter) wide rails.

**1145-4 MAINTENANCE.**

Meet the requirements of Article 1105-4 for all maintenance operations. Periodically inspect barricades and replace any sand bags having any loose sand outside the bag at no cost.

**1145-5 METHOD OF MEASUREMENT.**

The quantity of barricades to be paid for will be the maximum number of linear feet (linear meters) of barricades acceptably placed and in use at any one time during the life of the project. Measurement will be made of the total length of each barricade along one rail.

Relocation of barricades will be considered as incidental to the measurement of the quantity of barricades.

**1145-6 BASIS OF PAYMENT.**

The quantity of barricades, measured as provided in Article 1145-5, will be paid for at the contract unit price per linear foot (linear meter) for "Barricades (Type \_\_\_\_)".

Payment will be made under:

Barricades (Type II) ..... Linear Foot (Linear Meter)  
Barricades (Type III)..... Linear Foot (Linear Meter)

**SECTION 1150  
FLAGGERS**

**1150-1 DESCRIPTION.**

Furnish, relocate, and maintain the flaggers, hats, vests and STOP/SLOW Paddles and any other incidentals necessary to complete the work in accordance with the plans and specifications.

**1150-2 MATERIALS.**

Refer to Division 10:

Flaggers .....Article 1089-12

**1150-3 CONSTRUCTION METHODS**

Refer to Article 1105-3.

Provide the services of competent and properly equipped flagger(s) (see Roadway Standard Drawing No. 1150.01) at locations and times for such periods as necessary for the control and protection of vehicular and pedestrian traffic. Use flagging methods, which comply with the guidelines in the MUTCD.

Flagging operations will not be allowed for the convenience of the contractor's operations. However, if safety issues exist (i.e. sight/stopping site distance), the Engineer may approve the use of flagging operations.

**1150-4 MAINTENANCE.**

Meet the requirements of Article 1105-4 for all maintenance operations.

**1150-5 METHOD OF MEASUREMENT.**

The quantity of flaggers (day) to be paid for will be the actual number of days that each flagger is provided during the life of the project. On any calendar day that more than one flagger is used, the quantity to be paid for on that calendar day will be the maximum number of flaggers used at one time in that calendar day.

The quantity of flaggers (hour) to be paid for will be the actual number of hours that each flagger is provided during the life of the project.

Any flagger (Days) used for less than one hour will be considered as incidental to that operation.

**1150-6 BASIS OF PAYMENT.**

The quantity of flaggers measured as provided in Article 1150-5 will be paid for at the contract unit price per day for "Flaggers".

The quantity of flaggers measured as provided in Article 1150-5 will be paid for at the contract unit price per hour for "Flaggers".

Payment will be made under:

Flaggers .....Day  
Flaggers .....Hour

**SECTION 1155  
WARNING LIGHTS**

**1155-1 DESCRIPTION.**

Furnish, install, operate, maintain, relocate, and remove warning lights in accordance with the plans and specifications. Provide Warning lights, attached to category II traffic control devices, which meets or exceeds the requirement of NCHRP 350 requirements for category II traffic control devices.

**1155-2 MATERIALS.**

Refer to Division 10:

Warning Lights..... Article 1089-11

**1155-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

**Section 1155**

Use Type A and B flashing warning lights to supplement warning signs at the locations shown in the plans.

Do not use Type A and B flashing warning lights for channelization of traffic.

Mount warning lights so that they are a minimum of 30 inches (762 mm) from the bottom of the lens to the ground. Securely fasten the lights to the top of the traffic control device they are supplementing. Mount batteries at locations described in the NCHRP 350 crash test.

Use Type A warning lights between dusk and dawn. Operate Type B warning lights at night or 24 hours per day if required by the plans.

**1155-4 MAINTENANCE.**

Meet the requirements of Article 1105-4 for all maintenance operations.

**1155-5 METHOD OF MEASUREMENT.**

The quantity of warning lights to be paid for, will be the maximum number of warning lights acceptably installed at any one time during the life of the project. Relocation of the warning lights will be considered incidental, and will not be paid for separately.

**1155-6 BASIS OF PAYMENT.**

The quantity of warning lights measured as provided in Article 1155-5, will be paid for at the contract unit price each for "Warning Lights (Type\_\_\_)".

Payment will be made under:

Warning Lights (Type A).....	Each
Warning Lights (Type B).....	Each

**SECTION 1160  
TEMPORARY CRASH CUSHIONS**

**1160-1 DESCRIPTION.**

Furnish, install, maintain, reset, and remove temporary crash cushions in accordance with the plans and specifications.

**1160-2 MATERIALS.**

**(A) General:**

Refer to Division 10:

Temporary Crash Cushions.....	Article 1089-8
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**(B) Material Qualifications:**

Use Temporary Crash Cushions which meet or exceed the requirements of NCHRP 350 Test Level II and III for work zone traffic control devices.

Use Temporary Crash Cushions, which are on the North Carolina Department of Transportation's Approved Products List or are Traffic-qualified by the Traffic Control Section. For more information on the Traffic-qualification process, contact the Traffic Control Section at Century Center Building B, 1020 Birch Ridge Dr., Raleigh, NC, 27610, (919)-250-4151, or see the approved product list on NCDOT web site at: "www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm "

**(C) Historical Performance:**

Historical performance of the Temporary Crash Cushions will be used in determining future use of the material by the NCDOT, even if the Temporary Crash Cushion has been traffic-qualified. Poor past or poor current performance of Temporary Crash Cushions at

any site, whether or not related to a specific contract may be grounds for non-acceptance of a product on any project under contract.

**1160-3 CONSTRUCTION METHODS.**

Refer to Article 1105-3.

Before beginning installation of the temporary crash cushion, furnish to the Engineer detailed brochures, specifications, and other manufacturer's data which completely describe the crash cushion, including performance criteria and installation drawings and instructions.

The Contractor may provide a portable base for installation. When a portable base is used, provide one which is designed and/or approved by the manufacturer of the temporary crash cushion.

Install temporary crash cushions in accordance with the manufacturer's specifications.

Use temporary crash cushions, which have a yellow reflective end treatment to delineate the approach end of the crash cushion to oncoming traffic.

Repair any pavement damaged by the installation or removal of a temporary crash cushion at no cost to the Department.

**1160-4 MAINTENANCE.**

Meet the requirements of Article 1105-4 for all maintenance operations. Repair or replace within 24 hours any temporary crash cushion that becomes crushed or otherwise damaged so that it will not perform its intended purpose. Suspend all construction activities until the temporary crash cushion is repaired or replaced. Provide safe control of traffic until the temporary crash cushion has been repaired or replaced using approved methods.

**1160-5 METHOD OF MEASUREMENT.**

The quantity of temporary crash cushions to be paid for will be the actual number of crash cushions, which have been furnished, installed and accepted by the Engineer.

The quantity of reset temporary crash cushions to be paid for will be the actual number of crash cushion relocations as directed.

**1160-6 BASIS OF PAYMENT.**

The quantity of temporary crash cushions, measured as provided in Article 1160-5, will be paid for at the contract unit price each for "Temporary Crash Cushions".

The quantity of reset temporary crash cushions, measured as provided in Article 1160-5, will be paid for at the contract unit price each for "Reset Temporary Crash Cushions".

Payment will be made under:

Temporary Crash Cushions.....	Each
Reset Temporary Crash Cushions.....	Each

**SECTION 1165  
TRUCK MOUNTED IMPACT ATTENUATORS**

**1165-1 DESCRIPTION.**

Furnish, install, operate, maintain, and relocate truck mounted impact attenuators in accordance with the plans and specifications.

**1165-2 MATERIALS.**

**(A) General:**

Refer to Division 10:

Truck Mounted Impact Attenuators .....Article 1089-9

**(B) Material Qualifications:**

Use Truck Mounted Impact Attenuators, which meet or exceed the requirements of NCHRP 350 Test Level II and III for work zone traffic control devices.

Use Truck Mounted Impact Attenuators, which are on the North Carolina Department of Transportation's Approved Products List or are Traffic-qualified by the Traffic Control Section. For more information on the Traffic-qualification process, contact the Traffic Control Section at Century Center Building B, 1020 Birch Ridge Dr., Raleigh, NC, 27610, (919)-250-4151, or see the approved product list on NCDOT web site at: "www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm "

**(C) Historical Performance:**

Historical performance of the Truck Mounted Impact Attenuators will be used in determining future use of the material by the NCDOT, even if the Truck Mounted Impact Attenuator has been traffic-qualified. Poor past or poor current performance of Truck Mounted Impact Attenuators at any site, whether or not related to a specific contract may be grounds for non-acceptance of a product on any project under contract.

**1165-3 CONSTRUCTION METHODS.**

Apply the provisions of Article 1105-3 to the work covered by this section.

Before beginning using of the Truck Mounted Impact Attenuator, furnish to the Engineer detailed brochures, specifications, and other manufacturer's data which completely describe the Truck Mounted Impact Attenuator, including performance criteria and installation drawings and instructions.

Use only impact attenuators which meet the crash test requirements of Article 1089-9(A).

Do not park truck mounted impact attenuators against rigid objects (i.e. bridge piers or portable concrete barrier) except as a temporary safety measure, in no case longer than 72 hours, until a stationary crash cushion is installed. Install the truck mounted impact attenuator on a truck that is fully operational, in good running order, and in accordance with the manufacturer's specification.

Use the appropriate lighting and delineation on the truck and truck mounted impact attenuators as shown in the plans.

**1165-4 MAINTENANCE.**

Meet the requirements of Article 1105-4 for all maintenance operations. Repair or replace within 24 hours any attenuator that becomes crushed or otherwise damaged so that it will not perform its intended purpose. Suspend all construction activities until the attenuator is repaired or replaced. Provide safe control of traffic until the attenuator has been repaired by using approved methods.

**1165-5 METHOD OF MEASUREMENT.**

The quantity of truck mounted impact attenuators to be paid for will be the maximum number of truck mounted impact attenuators placed and in use at any one time during the life of the project.

**1165-6 BASIS OF PAYMENT.**

The quantity of truck mounted impact attenuators, measured as provided in Article 1165-5, will be paid for at the contract unit price each for "Truck Mounted Impact Attenuators".

Payment will be made under:

Truck Mounted Impact Attenuators ( ) ..... Each

**SECTION 1170  
PORTABLE CONCRETE BARRIER**

**1170-1 DESCRIPTION.**

Furnish, install, secure, maintain, remove and reset portable concrete barrier in accordance with the plans and specifications.

**1170-2 MATERIALS.**

**(A) General:**

Refer to Division 10:

Portable Concrete Barrier.....Section 1090  
Guardrail and Barrier Delineators..... Article 1088-2

Provide Portable Concrete Barrier, which meets or exceeds the requirements of NCHRP 350 Test Level II for work zones which have a posted speed limit of 45 mph (72 km/h) or less; and/or meet or exceed the requirements of NCHRP 350 Test Level III for work zones which have a posted speed limit of 50 mph (80 km/h) or greater.

**(B) Material Qualifications:**

Use Portable Concrete Barrier, which is on the North Carolina Department of Transportation's Approved Products List or is Traffic-qualified by the Traffic Control Section. For more information on the Traffic-qualification process, contact the Traffic Control Section at Century Center Building B, 1020 Birch Ridge Dr., Raleigh, NC, 27610, (919)-250-4151, or see the approved product list on NCDOT web site at: ["www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm"](http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/products.htm)

**(C) Historical Performance:**

Historical performance of the Portable Concrete Barrier will be used in determining future use of the material by the NCDOT, even if the Portable Concrete Barrier has been traffic-qualified. Poor past or poor current performance of Portable Concrete Barrier at any site, whether or not related to a specific contract may be grounds for non-acceptance of a product on any project under contract.

**1170-3 CONSTRUCTION METHODS.**

**(A) General:**

Refer to Article 1105-3.

Place all types of portable concrete barrier as shown in the plans. When required by the plans, anchor barrier by an approved method as shown in the Roadway Standard Drawings and/or refer to Section 1170-3(B).

Use any approved NCHRP 350 portable concrete barrier. Use one type of portable concrete barrier throughout the entire project.

Use portable concrete barrier (drainage), as shown in the Roadway Standard Drawings; to avoid trapping of water in sags, vertical curves, areas of wedging and paving

where super-elevations have been changed, and other low spots as directed. Provide adequate drainage behind the portable concrete barrier (drainage) installation.

Lift, place and reset portable concrete barrier units using a two-point pick up, or other acceptable method, which does not over stress, damage, or mar the surface of the concrete. Do not use connection points for lifting purposes.

Do not use any barrier units, which are cracked, damaged, chipped, or otherwise nonfunctional.

**(B) Securing Barrier On Concrete and Asphalt Pavement Surfaces:**

**(1) Anchoring:**

Secure barrier to concrete and asphalt pavement surfaces using approved anchoring methods in the following three situations:

- a) On concrete pavement surfaces where the back side of the portable concrete barrier is 4 feet (1.2 m) or closer to the edge of a drop-off that is 3 feet (0.9 m) deep or greater.
- b) On bridge decks after the removal of an existing bridge rail or in places where portable concrete barrier is used and the back side of the portable concrete barrier is 6 feet (1.8 m) or closer to the edge of the bridge deck.
- c) On concrete and asphalt pavement surfaces where portable concrete barrier is used to separate opposite direction of traffic and either side of the portable concrete barrier is 2 feet (0.6 m) or closer to the edge of either opposing travel lane.

**(2) Anchoring Methods:**

**(a) General:**

Use anchoring methods shown in Roadway Standard Drawings.

**(b) Anchor holes:**

Drill anchor holes normal to the surface of installation using a pneumatic drill with a depth indicator, unless another drilling method is allowed. Make sure that the diameter of the hole is in strict conformance with the plans or the manufacturer's recommendations. When directed, use a jig or fixture to ensure that correct positioning of the holes and proper alignment during the drilling process. Adjust hole locations, as necessary, to avoid encountering reinforcing steel. Immediately after drilling, brush the holes with a stiff-bristled brush of a sufficient size to effectively remove dust from the sides of the hole, and blow all holes free of all dust and debris using oil free compressed air. Repeat this procedure until the hole is completely clean.

Inspect each hole immediately prior to placement of the adhesive and anchor. Rework any hole found to deviate from these requirements to ensure that an acceptable hole.

Check each hole with a depth gauge to ensure that proper embedment depth.

Satisfactorily repair all spalled or damaged concrete.

Once the barrier and anchors are removed, fill the holes with an approved non-shrink, non-metallic, grout (see Article 1054-6). These requirements may be waived if the bridge or roadway will no longer be used by traffic.

**(3) Adhesives:**

Mix adhesives in strict conformance with the manufacturer's instructions.

Pour the mixed adhesive into the hole. Agitate or rotate anchors to ensure that wetting and complete encapsulation while inserting the anchors to the specified depth.

Completely fill the anchor hole with adhesive and remove any excess adhesive flush with the pavement. Do not disturb any anchors while the adhesive is hardening.

Coat all anchors used with the adhesive bonding method with a debonding agent so they can be easily removed. Formulate the debonding agent such that it does not reduce the strength of the anchor system.

**(4) Securing Barrier On Asphalt Pavement and soil Surfaces:**

Secure barrier to asphalt pavement and soil surfaces using approved shoring methods (see Section 1175) in the following situation:

On soil and asphalt pavement surfaces, if the back side of the portable concrete barrier is within three (3) feet (0.9 m) of the top of the shoring and drop-off is three (3) foot (0.9 m) behind the shoring; design the temporary shoring to resist the lateral movement of the barrier when struck by a vehicle. This shoring will be paid for separately as “Temporary Shoring - Barrier Supported” (See Section 1175). Portable concrete barrier is paid for under Section 1170-6 as “Portable Concrete Barrier”.

**(C) Resetting Barrier:**

Reset portable concrete barrier as shown in the plans.

**(D) Stockpiling:**

Stockpile the portable concrete barrier when the barrier is not utilized on the project or it becomes necessary to stockpile units between placing two (2) separate installations.

Stockpile the barrier at a location off the project of your choosing, unless otherwise noted in the plans, or to a location within the project limits if provided. Provide the stockpile area at no cost to the Department.

**(E) Barrier Delineators:**

Use any of the several alternate delineator types for barrier (see Roadway Standard Drawings).

Use only one delineator type for barrier at any one time throughout the project.

The delineators consist of a reflector and base or casing. Attach the delineator to the barrier as shown in the Roadway Standard Drawings. Only one attachment position will be permitted throughout the project length.

Position delineators perpendicular to the centerline of the road. Use yellow delineators in the median and on the left side of one-way ramps, loops, or other one-way facilities. Use crystal delineators on the right side of divided highways, ramps, loops and all other one-way or two-way facilities. In all cases, the color of the delineator must supplement the color of the adjacent edgelines.

**1170-4 MAINTENANCE.**

Refer to Article 1105-4.

**1170-5 METHOD OF MEASUREMENT.**

The quantity of portable concrete barrier to be paid for will be the actual number of linear feet (linear meters) which has been furnished, installed, maintained, removed and accepted. Measurement will be made by counting the number of barrier units used and multiplying by the length of a unit.

The quantity of resetting portable concrete barrier to be paid for will be the number of linear feet (linear meters) of barrier that has been moved from one location on the project to another location on the project. Measurement will be made by counting the number of barrier units moved during any one move and multiplying by the length of a unit. Where barrier units are moved more than once, each move will be measured separately. Whenever the Engineer directs the Contractor to move barrier units from an

**Section 1170**

installed location to a stockpile either on or off the project and then back to another installed location, the complete move from the first installed location to the next installed location will be measured as 2 moves.

There will be no measurement made of barrier delineators as they are considered incidental to the other pay items in this specification.

**1170-6 BASIS OF PAYMENT.**

The quantity of portable concrete barrier, measured as provided in Article 1170-5, will be paid for at the contract unit price per linear foot (linear meter) for "Portable Concrete Barrier".

The quantity of portable concrete barrier (anchored), measured as provided in Article 1170-5, will be paid for at the contract unit price per linear foot (linear meter) for "Portable Concrete Barrier (Anchored)".

The quantity of portable concrete barrier (drainage), measured as provided in Article 1170-5, will be paid for at the contract unit price per linear foot (linear meter) for "Portable Concrete Barrier (Drainage)".

The quantity of resetting portable concrete barrier, measured as provided in Article 1170-5, will be paid for at the contract unit price per linear foot (linear meter) for "Reset Portable Concrete Barrier".

The quantity of resetting portable concrete barrier (anchored), measured as provided above, will be paid for at the contract unit price per linear foot (linear meter) for "Reset Portable Concrete Barrier (Anchored)". Where the plans or the Engineer require the anchored barrier to be removed from one location on the project and reset at another location on the project where the barrier will not require re-anchoring at the new location, payment will be made under "Reset Portable Concrete Barrier" as covered above.

There will be no direct payment made for barrier delineators as they are considered incidental to the other pay items in this specification.

Payment will be made under:

Portable Concrete Barrier.....	Linear Foot (Linear Meter)
Portable Concrete Barrier (Anchored) .....	Linear Foot (Linear Meter)
Portable Concrete Barrier (Drainage) .....	Linear Foot (Linear Meter)
Reset Portable Concrete Barrier.....	Linear Foot (Linear Meter)
Reset Portable Concrete Barrier (Anchored) .....	Linear Foot (Linear Meter)

**SECTION 1175**

**TEMPORARY SHORING FOR THE MAINTENANCE OF TRAFFIC**

**1175-1 DESCRIPTION**

Furnish, install, and remove sheeting, shoring, and bracing necessary to maintain traffic at locations shown on the Traffic Control Plans and other locations determined during construction. Use shoring to maintain traffic when it is necessary to provide lateral support to the side of an excavation or embankment parallel to an open travelway. Provide shoring when a theoretical 2:1 or steeper slope from the bottom of the excavation or embankment intersects the existing ground line closer than 5 feet (1.5 m) from the edge of pavement of the open travelway.

**1175-2 MATERIALS**

Provide hot rolled steel sheet piles when sheet piles are used.

Include all materials proposed for use in temporary shoring in the method of shoring submittal described below.

Provide a Type 7 Contractor’s Certification for all shoring materials used.

**1175-3 CONSTRUCTION METHODS**

Submit method of shoring for review and acceptance prior to beginning construction.

Submit calculations and detail drawings in accordance with section 410-4 of the Standard Specifications.

Design all temporary shoring in accordance with the latest edition of AASHTO’s Standard Specifications for Highway Bridges, Section 3 “Temporary Works”.

When temporary concrete barrier is to be located within three (3) feet (0.9 m) of the top of the shoring, measured to the back face of the barrier, and with a three (3) foot (0.9 m) drop off behind the shoring; design the temporary shoring to resist the lateral movement of the barrier when struck by a vehicle. Extend the shoring out of the ground at least to the top elevation of the temporary concrete barrier. This shoring will be paid for as “Temporary Shoring - Barrier Supported”. Temporary concrete barrier is not included in this pay item. It is paid for separately.

**1175-5 METHOD OF MEASUREMENT**

The quantity of temporary shoring to be paid for will be the actual number of square feet (square meters) of exposed face of the shoring measured from the bottom of the excavation or embankment to the top of the shoring, with the upper limit not to exceed one (1) foot (0.3 m) above the retained ground elevation.

The quantity of temporary shoring - barrier supported to be paid for will be the actual number of square feet (square meters) of exposed face of the shoring measured from the bottom of the excavation or embankment to the top of the shoring, with the upper limit not to exceed one (1) foot (0.3 m) above the retained ground elevation.

**1175-6 BASIS OF PAYMENT**

Payment for temporary shoring will only be made at those locations where it is required in order to maintain traffic. Trench boxes are not considered temporary shoring for the maintenance of traffic and will not be paid for under this specification.

The quantity of shoring necessary for the maintenance of traffic, measured as provided above, will be paid for at the contract unit price per square foot (square meter) of “Temporary Shoring”.

The quantity of shoring with temporary concrete barrier located within 3 feet (0.3 m) of the shoring will be paid for at the contract unit price per square foot (square meter) of “Temporary Shoring - Barrier Supported”.

Payment will be made under:

- Temporary Shoring.....Square Feet (Square Meter)
- Temporary Shoring - Barrier Supported .....Square Feet (Square Meter)

## NOTES

