(E) Anchoring
Design a delineator post for a permanent installation to resist overturning, twisting and displacement from wind and impact forces.

(F) Temperature
Design flexible delineators that do not bend, warp or distort and remain straight, when stored or installed at temperatures up to + 120°F. Design all components of the flexible delineator, post and reflective sheeting to remain stable and remain fully functional within a temperature range of -20°F to +120°F.

(G) Impact Resistance, Wind Resistance
Design flexible delineators that meet the impact and wind resistance of the current evaluation criteria of the NTPEP.

(H) Product Identification
Provide flexible delineator post that are permanently identified, on the rear side, with the manufacturer’s name and the month and year of fabrication in order to provide a tracking method for ongoing outdoor evaluation, and specification quality control. The letters shall be at least 1/4” in height and permanently affixed to the rear of the marker.

(I) Material Certification
Furnish a Type 2 and Type 3 material certification in accordance with Article 106-3 for all flexible delineators before use.

(J) Approval
All materials are subject to the approval of the Engineer.

SECTION 1089
TRAFFIC CONTROL

1089-1 WORK ZONE SIGNS

(A) General
Grade B fluorescent orange sheeting shall be used on rigid work zone sign substrates. The sheeting shall conform to Article 1092-2. Cover the entire sign face of the sign substrate with Department approved Grade B fluorescent orange reflective sheeting. No bubbles or wrinkles will be permitted in the material.

Roll-up sign retroreflective requirements shall conform to Article 1092-2.

(1) Work Zones Signs (Stationary)
Use Grade B fluorescent orange retroreflective sheeting that meets the reflective requirements in Article 1092-2. Use approved composite or aluminum substrate for sign backing. Signs and sign supports shall meet NCHRP 350 requirements for breakaway devices.

(2) Work Zones Signs (Barricade Mounted)
Use approved composite or roll-up signs for barricade mounted sign substrates. No other type of sign substrate is allowed on portable sign stands. Approved composite barricade mounted warning signs (black on orange) shall be Grade B sheeting that meets the retroreflective requirements of Article 1092-2. Sign and barricade assembly shall meet NCHRP 350 for Work Zone Category II devices.
Section 1089

(3) Work Zones Signs (Portable)

Use approved composite or roll-up sign substrates on portable sign stands. No other type of sign substrate is allowed on portable sign stands.

(a) Composite

Use Grade B fluorescent orange retroreflective sheeting that meets the reflective requirements in Article 1092-2. Signs and sign supports shall meet NCHRP 350 requirements for breakaway devices.

(b) Roll-up Signs

Use fluorescent orange retroreflective roll-up signs that meet the reflective requirements of Grade B in Article 1092-2.

Use roll up signs that have a minimum 3/16" x 1 1/4" horizontal rib and 3/8"x 1 1/4" vertical rib and has been crash test to meet NCHRP 350 requirements and Traffic Control qualified by the Work Zone Traffic Control Unit.

(B) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new reflective sheeting used on work zone signs meeting the retroreflective requirements of Article 1092-2. Furnish a Type 7 material certification for all used signs meeting the minimum retroreflective requirements of ASTM D4956.

(C) Approval

All materials are subject to the approval of the Engineer.

(D) Warranty

Refer to Subarticle 1092-2(B) for warranty requirements of rigid sign retroreflective sheeting.

Roll-up fluorescent orange retroreflective signs will maintain 80% of its retroreflectivity as described in Article 1092-2 for years 1 and 2 and 50% for year 3.

Rigid and rollup fluorescent orange signs shall maintain a fluorescence luminance factor of 13% for 3 years when measured in accordance with ASTM E2301.

Rigid and roll up fluorescent orange signs shall maintain a total luminance factor of 25 for 3 years and conform to Article 1092-2 when measured in accordance with ASTM D4956.

1089-2 WORK ZONE SIGNS SUPPORTS

(A) General

(1) Work Zone Signs (Stationary)

Provide work zone sign supports for work zone signs (stationary) that are sturdy, durable and crashworthy. Work zone signs (stationary) and their supports shall meet appropriate NCHRP 350 crash criteria for Category II work zone devices.

Use 3-lb U-channel steel posts, 4" x 4" wood posts or perforated square steel tubing posts for all work zone signs with surface areas greater than 16 sf. Dual mount signs with surface areas greater than 10 sf on either 3-lb U-channel steel posts, 4" x 4" wood posts or perforated square steel tubing posts having the equivalent or greater strength of 3-lb U-Channel Steel posts. Perforated square steel tubing breakaway posts certified by the manufacturer for single mounting purposes may be used for the single mounting of stationary work zone signs for signs greater than 10 sf.
Section 1089

Three-pound steel U-channel posts shall comply with Subarticle 1094-1(B) and may be galvanized steel or painted green by the post manufacturer.

(2) Work Zone Signs (Portable)

Use work zone signs and portable work zone sign stands that are sturdy, durable and crashworthy.

(B) Material Certification

Provide portable work zone signs and stands that are listed on the NCDOT Approved Product List. Furnish a Type 3 material certification in accordance with Article 106-3 for all new work zone sign (stationary) posts and a Type 7 material certification for all used work zone sign (stationary) posts before use.

Furnish a Type 3 material certification in accordance with Article 106-3 for all new portable work zone sign stand assemblies and a Type 7 material certification for all used portable work zone sign stand assemblies before use.

(C) Approval

All materials are subject to the approval of the Engineer.

1089-3 BARRICADES

(A) General

Construct barricades out of perforated square steel tubing, angle iron or other Department approved materials that meet or exceed NCHRP 350 crash criteria for Category II work zone devices.

Use barricade rails constructed of approved composite, hollow/corrugated extruded rigid polyolefin, HDPE or other Department approved material that have a smooth face and alternating orange and white retroreflective stripes that slope at an angle of 45°. Barricade rails shall meet or exceed NCHRP 350 crash criteria for Category II work zone devices.

(B) Supports

Support barricade rails in a manner that shall be visible to the motorist and provide a stable support not easily blown over by wind or traffic.

(C) Reflective Sheeting

Use Grade B retroreflective sheeting that meets Article 1092-2. Flame treat rails before applying the sheeting if required by the sign sheeting manufacturer. Apply the reflective sheeting with a pressure sensitive adhesive to both sides of the rails.

Use the same color sheeting on each rail of any individual barricade.

(D) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new barricades and a Type 7 material certification for all used barricades before use.

(E) Approval

All materials are subject to the approval of the Engineer.

1089-4 CONES

(A) General

Use cones made of ultraviolet stabilized plastic impact resistant material meeting MUTCD and this article. Orange will be the predominant color on cones.
Section 1089

Use cones conical in shape with a minimum height of 28" or 36". The 28" cones shall have a minimum base dimension of 13.75", and the 36" cones shall have a minimum base dimension of 14.5" as shown in the Roadway Standard Drawings. The 28" and 36" cones (excluding ballast) shall have a minimum weight of 7 lb and 10 lb respectively. When in an upright position, have the cones display the same dimensions regardless of their orientation to oncoming traffic.

(B) Ballast

Provide wind resistant cones that do not blow over under normal roadway conditions, including high speed truck traffic in close proximity to the cones when properly ballasted. Provide cones that do not permanently distort to a degree that would prevent reuse when struck.

Achieve ballasting of the cones by using any of the following methods:

(1) Cones with bases that may be filled with ballast,
(2) Doubling the cones or using heavier weighted cones, or
(3) Cones with special weighted bases or weights such as rubber rings that can be dropped over the cones and onto the base to provide increased stability.

Provide cones with 70% of the weight of the cone in the base. These added weights shall not present a hazard if the devices are inadvertently struck.

(C) Retroreflective Sheeting

Where retroreflective cones are required, provide a cone with flexible, prismatic cone sheathing having impact resistance and attached with precoated pressure sensitive adhesive. The retroreflective sheeting shall meet or exceed the retroreflectivity requirements of Grade B sheeting in Section 1092. Use 2 retroreflective bands, the top one is 6" wide and the bottom one is 4" wide; see Roadway Standard Drawings.

(D) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new cones with or without retroreflective sheeting and a Type 7 material certification for all used cones with or without retroreflective sheeting before use.

(E) Approval

All materials are subject to the approval of the Engineer.

1089-5 CHANNELIZING DEVICES

(A) Drums

(1) General

Provide drums composed of a body, alternating orange and white 4 band pattern of Type III-High Intensity or higher prismatic sheeting and ballasts evaluated by NTPEP.

(2) Body

Provide a drum made of orange, impact resistant, ultraviolet plastic material capable of maintaining its integrity upon impact throughout a temperature range of 20°F to 125°F. When struck, the drum shall not permanently distort to a degree that would prevent reuse, nor roll excessively after impact. Design the drum to prevent water from accumulating and freezing in the top or bottom.
Provide a drum that is cylindrical in shape with the following dimensions; a minimum height of 36", a minimum top outer diameter of 18", a bottom outer diameter of 21" to 24", and a minimum weight of 7 lb. The top outer diameter shall not exceed the bottom outside diameter. Provide closed tops on drums to prevent accumulation of debris.

(3) Retroreflective Stripes

Provide at least 4 retroreflective bands with 2 orange and 2 white alternating horizontal circumferential bands. The top band shall always be orange. Use a 6" to 8" wide band Type III—High Intensity prismatic retroreflective sheeting or better that meets Article 1092-2 for each band. Do not exceed 2" for any non-reflective spaces between orange and white stripes. Do not splice the retroreflective sheeting to create the 6" band. Apply the retroreflective sheeting directly to the drum surface. Do not apply the retroreflective sheeting over a pre-existing layer of retroreflective sheeting. Do not place bands over any protruding corrugations areas. No damage to the reflective sheeting should result from stacking and unstacking the drums, or vehicle impact.

(4) Ballast

Ballast drums using the sandbag ballast method, the tire sidewall ballast method or by the preformed weighted base ballast method. When properly ballasted, the drums shall be wind resistant to the extent of withstanding wind created by traffic under normal roadway conditions, including high speed truck traffic in close proximity to the drums. Do not place ballast on top of the drum.

(a) Sandbag Ballast Method

Supply a sandbag with 50 lb of sand with each drum. Place the sandbag inside the body on top of the detachable base. Upon impact the main body of the drum shall deform and become detached from the base, allowing vehicles to easily pass over the remaining base.

(b) Tire Sidewall Ballast Method

Design the base of the drums to accommodate no more than 2 tire sidewalls that when combined will have a weight of at least 30 lb and no more than 50 lb. Use the manufacturer’s required tire sidewall ballast. Upon impact the main body of the drum shall deform and become detached from the tire sidewalls, allowing vehicles to easily pass over the tire sidewall ballasts.

(c) Preformed Weighted Base Ballast Method

Supply a preformed base specifically designed for the model drum. The weight of each drum’s preformed base will be self-certified by the manufacturers. Each drum with preformed bases shall be approved by the Work Zone Traffic Control Unit. Upon impact, the main body of the drum shall deform and become detached from the base allowing vehicles to easily pass over the remaining base.

(5) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new drums and a Type 7 material certification for all used drums before use.

(6) Approval

All materials are subject to the approval of the Engineer.
Section 1089

(B) Skinny Drums

(1) General

Provide skinny drums composed of a body, reflective stripes and ballasts evaluated by NTPEP.

(2) Body

Provide a skinny drum made of orange, impact resistant, ultraviolet plastic material capable of maintaining its integrity upon impact throughout a temperature range of -20°F to 125°F. When struck, the skinny drum shall not permanently distort to a degree that would prevent reuse, nor roll excessively after impact. Design the skinny drum to prevent water from accumulating and freezing in the top or bottom.

Provide a skinny drum that is cylindrical in shape with the following dimensions; a minimum height of 42", a minimum top outer diameter of 4" and a bottom outer diameter of 7.5". The top outer diameter shall not exceed the bottom outside diameter. Provide closed tops on drums to prevent accumulation of debris.

(3) Retroreflective Stripes

Provide at least 4 retroreflective bands with 2 orange and 2 white alternating horizontal circumferential bands for each skinny drum. The top band shall always be orange. Use a 6" to 8" wide band Type III–High Intensity or higher prismatic retroreflective sheeting that meets Article 1092-2 for each band. Do not exceed 2" for any non-reflective spaces between orange and white stripes. Do not splice the retroreflective sheeting to create the 6" band. Apply the retroreflective sheeting directly to the skinny drum surface. Do not apply the retroreflective sheeting over a pre-existing layer of retroreflective sheeting. Do not place bands over any protruding corrugation areas. No damage to the reflective sheeting should result from stacking and unstacking the skinny drums, or vehicle impact.

(4) Ballast

Ballast skinny drums using a preformed base specifically designed for the model skinny drum. Each base shall be at least 15 lb and circular or polygonal with equal sides. When properly ballasted, the skinny drums shall be wind resistant to the extent of withstanding wind created by traffic under normal roadway conditions including high speed truck traffic in close proximity to the skinny drums. Do not place ballast on top of the drum. Upon impact, the main body of the drum shall deform and become detached from the base allowing vehicles to easily pass over the remaining base.

(5) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new skinny drums and a Type 7 material certification for all used skinny drums before use.

(6) Approval

All materials are subject to the approval of the Engineer.

1089-6 FLASHING ARROW BOARDS

(A) General

Provide a trailer mounted arrow board that meets or exceeds the physical and operational requirements of the MUTCD and which has been evaluated by NTPEP. The following specifications supplement those basic requirements. Provide a totally mobile complete unit capable of being located as traffic conditions demand.
The display housing shall meet the minimum size requirements of a Type C panel with a 15 or 25 lamp configuration.

The display housing shall have a hand-crank mechanism to allow raising and lowering the display with a locking device to ensure the display housing will remain secured in either position.

The display housing will have a minimum height of 7 ft from the bottom of the sign to the ground when raised in the upright position.

The display housing assembly shall be of weather resistant construction.

The lamps shall be controlled to provide the following modes as a minimum: Flashing Right or Left Arrow, Flashing Double Arrow and Caution Mode (4 outermost corner lamps).

(B) Power System

Provide a unit that is solar powered and supplemented with a battery backup system that includes a 110/120 VAC powered on-board charging system.

The unit shall also be capable of being powered by standard 110/120 VAC power source.

The batteries, when fully charged, shall be capable of powering the display for 20 continuous days with no solar power.

Store the battery bank and charging system in a lockable, weather and vandal resistant box.

(C) Controller

Provide an automatic brightness/dimming of the display and a manual override dimming switch.

The controller shall provide a battery-charge status indicator.

Mobile radio or any other radio transmissions shall not affect the controller.

Store the controller in a lockable, weather and vandal resistant box.

(D) Trailer

Finish all exterior metal surfaces with Federal orange enamel per Federal Standard 595a, color chip ID# 13538 or 12473 respectively. The trailer shall be able to support a 100 mph wind load with the display fully extended.

The trailer shall be equipped with leveling jacks capable of stabilizing the unit in a horizontal position when located on slopes 6:1 or flatter.

The trailer shall be properly equipped in compliance with North Carolina Law governing motor vehicles.

Provide a minimum 4" wide strip of fluorescent orange retroreflective sheeting to the frame of the trailer. Apply the sheeting to all sides of the trailer. The sheeting shall meet the requirements of Section 1088-1. Drums may be supplemented around the unit in place of the sheeting.

(E) Reliability

Provide a sign unit that all components are rated to operate at temperatures ranging from -30°F to 165°F.

The sign manufacturer shall notify the Work Zone Traffic Control Unit whenever modifications are made to a prequalified sign on the NCDOT Approved Products List.
Section 1089

The Work Zone Traffic Control Unit will review changes and per its discretion either make no change to the sign’s status or remove it from the list until the sign can be reevaluated.

(F) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new flashing arrow boards, a Type 7 material certification for all used flashing arrow boards, and wind load certifications required in Subarticle 1089-6(D) for all new and used flashing arrow boards before use.

(G) Approval

The sign shall be on the NCDOT Approved Products List before use on construction projects in North Carolina. A sign may be removed from the NCDOT Approved Products List due to unsatisfactory field performance and shall not return to the list until the manufacturer identifies the reason for the failure and the problem has been corrected to the satisfaction of the Department.

The sign manufacturer shall notify the Department whenever modifications are made to their sign that was prequalified on the NCDOT Approved Products List. The Department will review changes and per its discretion, either make no change to the sign’s status on the NCDOT Approved Products List or remove the sign from the list until the sign can be reevaluated.

1089-7 PORTABLE CHANGEABLE MESSAGE SIGNS

(A) General

Provide trailer mounted portable changeable message signs that meet MUTCD and have been evaluated by NTPEP.

Provide a totally mobile complete sign unit capable of being located as traffic conditions demand.

(B) Display Panel

Provide 3 lines of a programmable message with at least 8 characters per line and a character height of at least 18".

The display characters will be composed of LED elements. The display panel may be of the following types- Full Matrix, Continuous Line Matrix, and Character Matrix.

Messages are to be automatically centered and proportionally spaced on each line of a Full Matrix and Continuous Line Matrix displays. Character Matrix displays shall display odd number character messages one character left of the centerline.

The display characters shall be protected with a polycarbonate lens that shall not decrease the daytime visibility of the sign.

The display panel shall have an electro-hydraulic system to allow raising and lowering the display with 360° rotation capability. A locking device(s) shall be provided to ensure the display will remain secure in the raised, lowered and rotated positions. The sign shall have the capability to be raised and rotated to its operating position by one person.

A manual backup mechanism for the raising and lowering the display panel shall be provided in the event the electro-hydraulic system fails.

The display panel assembly shall be of weather resistant construction

(C) Power System

The unit shall be Solar powered and supplemented with a battery backup system which includes a 110/120 VAC powered on-board charging system.
The batteries, when fully charged, shall be capable of powering the display for 20 continuous days with no solar power. The unit shall be capable of being powered by standard 110/120 VAC power source.

Store the battery bank and charging system in a lockable, weather and vandal resistant box.

(D) Controller

The controller shall provide at a minimum; a keyboard, a display for message review and editing, a light source for nighttime operations, an event time clock and all other required controls for the operation of the display. Access to controller operations shall have the capability to be password protected.

The controller shall include the following capabilities; manually dimming the display, storing at least 99 user generated messages, adjusting the flash rate of display and display phasing and monitoring battery-charge status.

Mobile radio or any other radio transmissions shall not affect the controller.

The controller shall be stored in a lockable, weather and vandal resistant box.

The controller shall be pre-programmed with messages shown below and stored in memory:

<table>
<thead>
<tr>
<th>MAX SAFE SPEED 25 MPH</th>
<th>MAX SAFE SPEED 30 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP AHEAD</td>
<td>YIELD AHEAD</td>
</tr>
<tr>
<td>MAX SAFE SPEED 35 MPH</td>
<td>MAX SAFE SPEED 40 MPH</td>
</tr>
<tr>
<td>MAX SAFE SPEED 45 MPH</td>
<td>MAX SAFE SPEED 50 MPH</td>
</tr>
<tr>
<td>ONE LANE BRIDGE</td>
<td>SURVEY CREW</td>
</tr>
<tr>
<td>MAX SAFE SPEED 55 MPH</td>
<td>DETOUR AHEAD</td>
</tr>
<tr>
<td>CAUTION DETOUR AHEAD</td>
<td>LANE CLOSED AHEAD</td>
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<tr>
<td>RIGHT LANE CLOSED</td>
<td>LEFT LANE CLOSED</td>
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<tr>
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<td>SINGLE LANE AHEAD</td>
</tr>
<tr>
<td>MERGE LEFT</td>
<td>MERGE RIGHT</td>
</tr>
<tr>
<td>KEEP LEFT</td>
<td>KEEP RIGHT</td>
</tr>
<tr>
<td>PASS LEFT</td>
<td>PASS RIGHT</td>
</tr>
<tr>
<td>USE LEFT LANE</td>
<td>USE RIGHT LANE</td>
</tr>
<tr>
<td>MERGE AHEAD</td>
<td>ROAD MACHINES AHEAD</td>
</tr>
<tr>
<td>ROAD WORK AHEAD</td>
<td>FLAGGER AHEAD</td>
</tr>
<tr>
<td>BUMP</td>
<td>DIP</td>
</tr>
<tr>
<td>STOP AHEAD</td>
<td>YIELD AHEAD</td>
</tr>
<tr>
<td>BE PREPARED TO STOP</td>
<td>SIGNAL AHEAD</td>
</tr>
<tr>
<td>SIGNAL NOT WORKING</td>
<td>DO NOT PASS</td>
</tr>
<tr>
<td>ONE LANE BRIDGE</td>
<td>SURVEY CREW</td>
</tr>
<tr>
<td>SHOULDER WORK</td>
<td>SOFT SHOULDER</td>
</tr>
<tr>
<td>PAVEMENT ENDS</td>
<td>LANE ENDS</td>
</tr>
<tr>
<td>ROAD CLOSED 1/4 MILE</td>
<td>ROAD CLOSED 1/2 MILE</td>
</tr>
<tr>
<td>ALL TRAFFIC EXIT LEFT</td>
<td>ALL TRAFFIC EXIT RIGHT</td>
</tr>
<tr>
<td>ROAD NARROWS</td>
<td>ROAD CLOSED AHEAD</td>
</tr>
<tr>
<td>RAMP CLOSED</td>
<td>REDUCE SPEED</td>
</tr>
<tr>
<td>ROAD PAVING AHEAD</td>
<td>ALL TRAFFIC MUST STOP</td>
</tr>
<tr>
<td>SLOW MOVING TRAFFIC</td>
<td>NIGHT WORK AHEAD</td>
</tr>
<tr>
<td>CAUTION FLAGGER AHEAD</td>
<td>RUNAWAY TRUCK RAMP</td>
</tr>
<tr>
<td>MEDIAN WORK AHEAD</td>
<td></td>
</tr>
<tr>
<td>LEFT LANE NARROWS</td>
<td>RIGHT LANE NARROWS</td>
</tr>
<tr>
<td>TEST PATTERN A^</td>
<td>TEST PATTERN B^</td>
</tr>
</tbody>
</table>

A. Test Pattern A is 1/2 of the LEDs/flip-discs/or combination on at a time.

B. Test Pattern B is for the remaining 1/2 of the LEDs/flip-discs/or combination on at a time.
Section 1089

(E) Trailer

Finish all exterior metal surfaces with Federal orange enamel per Federal Standard 595a; color chip ID# 13538 or 12473 respectively except for the sign face assembly that shall be flat black.

Provide a minimum 4" wide strip of fluorescent orange retroreflective sheeting to the frame of the trailer. Apply the sheeting to all sides of the trailer. The sheeting shall meet Article 1088-1. Drums may be supplemented around the unit in place of the sheeting.

The trailer shall be able to support a 100 mph wind load with the display fully extended.

The trailer shall be equipped with leveling jacks capable of stabilizing the unit in a horizontal position when located on slopes 6:1 or flatter.

The trailer shall be properly equipped in compliance with North Carolina Law governing motor vehicles.

(F) Reliability

Provide a sign unit that all components are rated to operate at temperatures ranging from -30°F to 165°F.

(G) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new changeable message signs, a Type 7 material certification for all used changeable message signs and wind load certifications required in Subarticle 1089-7(E) for all new and used changeable message signs before use.

(H) Approval

The sign shall be on the NCDOT Approved Products List before use on construction projects in North Carolina. A sign may be removed from the NCDOT Approved Products List due to unsatisfactory field performance and shall not return to the list until the manufacturer identifies the reason for the failure and the problem has been corrected to the satisfaction of the NCDOT.

The sign manufacturer shall notify NCDOT whenever modifications are made to their sign that was prequalified on the NCDOT Approved Products List. The Department will review changes and per its discretion either make no change to the sign’s status on the NCDOT Approved Products List or removed the sign from the list until the sign can be reevaluated.

1089-8 TEMPORARY CRASH CUSHIONS

(A) General

Provide temporary crash cushions that meet NCHRP 350 for Work Zone Test Level 2 for work zones that have a posted speed limit of 45 mph or less. Provide temporary crash cushions that meet NCHRP 350 for Work Zone Test Level 3 devices for work zones that have a posted speed limit of 50 mph or greater. Provide temporary crash cushions that shall remain intact after a side impact, and without maintenance, be capable of sustaining additional side or head-on impacts.

Contain the temporary crash cushion debris resulting from impact within the structure of the temporary crash cushion.

Include in the temporary crash cushion package any required rear transition panels to connect the back of the temporary crash cushion to rigid or flexible barrier systems as well as any required portable base as recommended by the manufacturer of the temporary crash cushion, to connect the bottom of the temporary crash cushion to a paved surface. Temporary crash cushion shall not be placed on an unpaved surface.
(B) Retroreflective End Treatments

Provide a yellow nose wrap that visually matches the color chip that corresponds to the Federal Standard No. 595a for Yellow (Color No. 13538) for all temporary crash cushions.

The reflective end treatment shall meet the requirement for reflectivity in Article 1088-1 and Roadway Standard Drawings.

(C) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new temporary crash cushions and a Type 7 material certification for all used temporary crash cushions before use.

(D) Approval

Use temporary crash cushions that are on the NCDOT Approved Products List.

1089-9 TRUCK MOUNTED ATTENUATORS

(A) General

Provide truck mounted attenuators that meet NCHRP 350 Test Level II for work zones that have a posted speed limit of 45 mph or less. Provide truck mounted attenuators that meet NCHRP 350 Test Level III for work zones that have a posted speed limit of 50 mph or greater.

Use trucks with gross vehicle tare weight as described in the NCHRP 350 crash test for the impact attenuator provided. Provide 2 axle flat bed type trucks with minimum gross vehicle tare weight of 5,000 lb that may be ballasted with sections of portable concrete barrier attached to the bed of the truck with bolts or straps, or concrete poured into the bed of the truck and attached to the truck with bolts, or a continuous layer of asphalt placed in the bed of the truck and attached to the truck with bolts.

Mount the attenuator on a truck chassis to provide a uniform clearance, as required by the truck mounted attenuator’s manufacturer, between the bottom of the shell and the roadway. Use a steel backup support assembly of sufficient size and strength to permit mounting on the chassis by brackets, as required by truck mounted attenuator’s manufacturer.

Provide truck mounted attenuators equipped with cartridges that have a standard trailer lighting system, including brake lights, tail lights and turn signals.

(B) Retroreflective End Treatment

The reflective end treatment shall meet Article 1088-1 and Roadway Standard Drawings.

(C) Material Certification

Furnish a Type 3 material certification in accordance with Article 106-3 for all new truck mounted attenuators and a Type 7 material certification for all used truck mounted attenuators before use.

(D) Approval

Use only truck mounted attenuators that are on the NCDOT Approved Products List.
Section 1090

1089-10 FLAGGER

(A) Stop and Slow Paddle

(1) Reflective Sheeting

Use reflective sheeting with a smooth, sealed outer surface that will display the same color both day and night. Cover the entire sign face with Grade B reflective sheeting. Reflective sheeting shall meet Article 1092-2. The distance from the bottom of the sign to the ground shall be at least 7 ft.

(2) Material Certification

Furnish a Type 3 material certification in accordance with Sections 106-3 for all new reflective sheeting used on flagger paddles and a Type 7 material certification for all used sheeting before use.

(3) Approval

All materials are subject to the approval of the Engineer.

(B) Vest

(1) Reflective Sheeting

Use reflective sheeting with sealed outer surface that will display the same color both day and night. Design the reflective sheeting similar to Department chevron vests. Reflective sheeting shall meet Article 1092-2.

(2) Material Certification

Furnish a Type 3 material certification in accordance with Sections 106-3 for all new reflective sheeting and a Type 7 material certification for all used sheeting on flagger vests before use.

(3) Approval

All materials are subject to the approval of the Engineer.

SECTION 1090

PORTABLE CONCRETE BARRIER

1090-1 PORTABLE CONCRETE BARRIER

(A) General

Use portable concrete barrier that meets Section 854, Section 1077 and the plans. The requirement for approved galvanized connectors will be waived if the barrier remains the property of the Contractor.

(B) Used Portable Concrete Barrier

Used barrier will be acceptable provided the following conditions have been met:

(1) The Contractor has furnished a Type 7 material certification in accordance with Article 106-3.

(2) The strength of the concrete in each barrier unit is at least 4,500 psi as evidenced by nondestructive tests made in place by a rebound hammer in accordance with ASTM C805.

(C) Anchor Bolts

Use anchor bolts that meet ASTM A325.

(D) Approval

All materials are subject to the approval of the Engineer.