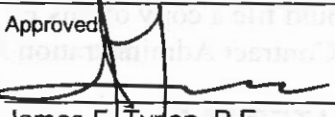


SUPERSEDED BY EB 15-031 EFFECTIVE 9/28/15	Modified By EI 12-010 Effective 9/6/12		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 11-018
Title: STANDARD SPECIFICATIONS – SECTION 729 TEMPORARY TRAFFIC CONTROL DEVICES				
Target Audience: ☒ Manufacturers (18) ☒ Local Govt. (31) ☒ Agencies (32)		☒ Surveyors (33) ☒ Consultants (34) ☒ Contractors (39) ☐ _____		
		Approved:  P.E. 9-21-11 James F. Tyrann, P.E. Deputy Chief Engineer (Construction)		
		Date		

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective upon signature.
- This EI supersedes EI 07-001, EI 08-036, and EI 09-015.
- This revision will be incorporated into a future update of the Standard Specifications.

PURPOSE:

- This EI issues revised Standard Specifications Section 729 *Temporary Traffic Control Devices*.

TECHNICAL INFORMATION:

- This EI is being issued concurrently with EI 11-016 Standard Specifications –Section 619 *Work Zone Traffic Control* and EI 11-017 Standard Specifications – Section 727 *Pavement Marking Materials*.
- Changes issued in EI 08-036 – *Barrier/Shadow Vehicles* and EI 09-015 - §729-15 *Arrow Panels* and §729-16 *Portable Variable-Message Signs* are incorporated.
- §729-16 *Portable Variable-Message Signs* – The distance that PVMS displayed messages that are clearly legible from was reduced from 900 feet to 800 feet. The 900 foot requirement was a long standing requirement in previous specifications, most of which were special specifications, and was derived based on speed limits, display times and intervals between messages. The 2009 MUTCD now contains an explicitly stated legibility distance requirement of 800 feet.
- §729-15 *Arrow Panels* and §729-16 *Portable Variable-Message Signs* – Arrow panels and PVMS are placed on the Approved List(s) based on satisfactory NTPEP testing results. Some vendors have experienced problems in getting products tested under NTPEP in a timely manner. The provisional acceptance of arrow panels and PVMS may be extended for an additional year to allow vendors who have applied to NTPEP to have testing conducted and obtain results. No extensions of 2 year provisional approval will be granted.
- §729-19 *Automated Flagger Assistance Devices (AFADs)* is a new subsection that updates material specifications referenced from §619-202 L.
- §729-20 *Portable Traffic Signal* is a new subsection that updates material requirements referenced from §619-2.02L. *Flagging and Traffic Control* and §619-2.18 *Temporary Traffic Signals*.
- §729-21 *Temporary Overlay Markers* is a new subsection that includes material requirements for a new temporary pavement marking material referenced in §619-3.06 *Temporary Pavement Markings*, consisting of a reflectorized flexible polymer “L” Shape road reflector.
- The noted changes should have no significant cost impact.

IMPLEMENTATION:

Main Office Design Quality Assurance Bureau will insert the Standard Specification revision into contract proposals beginning with projects submitted for the letting of 01/12/2012.

Engineers-in-Charge of ongoing contracts and those let prior to the inclusion of the shelf note in the contract proposal should file a copy of this EI in the contract records as documentation of the change in accordance with the Contract Administration Manual (CAM) §104-02.

TRANSMITTED MATERIALS:

This EI transmits standard specification revision *Temporary Traffic Control Devices* in both Metric and USC units.

CONTACT:

Questions regarding this EI should be directed to:

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Patrick Galarza (PGlarza@dot.state.ny.us) of Materials Bureau at (518) 457-4599.

TEMPORARY TRAFFIC CONTROL DEVICES

Make the following changes to the Standard Specifications of May 4, 2006:
Page 972 **Delete** Section 729 (Vacant) and **Replace** it with the following:

SECTION 729 – TEMPORARY TRAFFIC CONTROL DEVICES

729-01 DRUMS

SCOPE. This specification covers the material, fabrication, and performance requirements for traffic drums. Drums are defined by FHWA as a Category I device.

MATERIAL REQUIREMENTS. Drums shall conform to the requirements of the MUTCD, shall be NCHRP 350 or MASH approved and shall be orange plastic, one-piece or two-piece construction, with a closed top. Drums shall be a minimum of 450 mm in diameter (visible from all directions), a minimum of 900 mm in height. Drums shall have a maximum weight of 35 kg., including ballast. Two-piece drums shall consist of a base no more than 100 mm in height and an upper section. The base and upper section of two-piece drums shall be designed as a unit. One-piece drums shall include a base ring or elongation designed to hold ballast. The base and/or any nonflexible portion of the drum shall not extend more than 50 mm above the pavement surface.

Drums shall have 4 horizontal circumferential stripes of reflective sheeting a minimum of 100 mm wide, of alternating orange and white, starting with orange on the top. The top edge of the upper band shall be a maximum of 50 mm from the top edge of the drum. The space between stripes shall not exceed 50 mm.

Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B), or higher. Reflective sheeting shall be firmly bonded to the drum with an adhesive; mechanical fasteners to bond reflective sheeting to the drum will not be allowed.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-02 CONES

SCOPE. This specification covers the material, fabrication, and performance requirements for traffic cones. Cones are defined by FHWA as a Category I device.

MATERIAL REQUIREMENTS. Cones shall conform to the requirements of the MUTCD, shall be NCHRP 350 or MASH approved and shall be orange rubber or plastic. Cones shall have a maximum weight of 9 kg, including ballast.

Standard cones shall be approximately 710 mm in height with a minimum conical bottom width of 250 mm. Standard cones shall have two horizontal circumferential stripes of white reflective sheeting, the upper a minimum of 150 mm wide, with the upper edge 75 to 100 mm from the top of the cone, and the lower a minimum of 100 mm wide with the upper edge approximately 50 mm below the upper stripe.

Tall cones shall be approximately 915 mm in height with a minimum conical bottom width of 250 mm. Tall cones shall have two horizontal circumferential stripes of white reflective sheeting, the upper a minimum of 150 mm wide, with the upper edge 75 to 100 mm from the top of the cone, and the lower a minimum of 100 mm wide with the upper edge approximately 50 mm below the upper stripe.

Extra tall cones shall be a minimum of 1050 mm in height with a minimum conical bottom width of 175 mm. Extra tall cones shall have a minimum of four horizontal circumferential stripes of reflective sheeting from 100 - 150 mm wide, of alternating orange and white starting with orange on the top. The upper edge of the sheeting shall be 100 mm from the top of the cone. Nonreflective spaces between the stripes shall not exceed 75 mm wide.

TEMPORARY TRAFFIC CONTROL DEVICES

Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher. Reflective sheeting shall be firmly bonded to the cone with adhesive.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-03 TEMPORARY TUBULAR MARKERS

SCOPE. This specification covers the material, fabrication, and performance requirements for tubular markers. Tubular markers are defined by FHWA as a Category I device.

MATERIAL REQUIREMENTS. Tubular markers shall conform to the requirements of the MUTCD, shall be NCHRP 350 or MASH approved and shall be orange, with a minimum height of 900 mm and a minimum outside diameter of 50 mm. Tubular markers shall be circular or elliptical in cross section. Tubular markers shall have a maximum weight of 6 kg, not including a mounting base.

The markers shall have two horizontal circumferential stripes of white reflective sheeting a minimum of 75 mm wide. The top edge of the upper band shall be a maximum of 50 mm from the top of the marker. The space between shall not exceed 150 mm.

Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher. The sheeting shall be bonded to the post with a precoated, pressure-sensitive adhesive or a tack-free, heat-activated adhesive. Mechanical fasteners to bond reflective sheeting to the post will not be allowed.

For free-standing tubular markers, the base and/or any nonflexible portion of the marker shall not be more than 50 mm in height.

For tubular markers fastened to pavement, the bonding system used to shall be a fast-setting chemical compound, mastic-type material, or mechanical fastener capable of fixing the tubular marker to either concrete or asphalt pavement. The bonding system shall not present a hazard to traffic if the tubular marker or base unit becomes unfixed from the pavement.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-04 VERTICAL PANELS

SCOPE. This specification covers the material, fabrication, and performance requirements for vertical panels. Vertical panels are defined by FHWA as a Category II device.

MATERIAL REQUIREMENTS. Vertical panels shall conform to the requirements of the MUTCD, shall be NCHRP 350 or MASH approved and shall be constructed of plastic, aluminum, or other lightweight materials. Vertical panels shall be supported by a base capable of maintaining the panel in an upright position and in the proper position and orientation.

Vertical panels shall have 100 to 150 mm wide diagonal stripes of alternating orange and white reflective sheeting, sloping downward at an angle of 45° toward the side on which traffic is to pass. Vertical panels which are 915 mm and larger shall have 150 mm wide diagonal stripes.

Standard vertical panels shall be a minimum of 600 mm in height and a minimum of 200 mm in width. The top of the panel shall be mounted a maximum of 920 mm high. Support posts for standard vertical panels shall not be located on the traffic face of the panel.

Oversized vertical panels shall be a minimum of 900 mm in height and have a minimum reflective area of 0.18 m².

Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher.

TEMPORARY TRAFFIC CONTROL DEVICES

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-05 STOP/SLOW PADDLES

SCOPE. This specification covers the material requirements for stop/slow paddles.

MATERIAL REQUIREMENTS. Stop/slow paddles shall conform to the requirements of the MUTCD and shall be constructed of plastic, aluminum, or other lightweight materials. Stop/slow paddles shall be a minimum of 600 mm wide and shall be mounted on a support staff with a minimum height of 1.8 m to the bottom of the panel. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type IX (Class E).

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-06 TYPE I CONSTRUCTION BARRICADES

SCOPE. This specification covers the material, fabrication, and performance requirements for Type I construction barricades. Type I construction barricades are defined by FHWA as a Category II device.

MATERIAL REQUIREMENTS. Type I construction barricades shall conform to the requirements of the MUTCD and shall be NCHRP 350 or MASH approved. Type I construction barricades shall be constructed of an A-frame with a single rail panel 200 mm to 300 mm wide and a minimum of 600 mm long. Rails on barricades used on expressways and other high-speed roadways shall have an area of at least 0.175 m². The top of the upper panel shall be mounted at a minimum height of 915 mm. Barricade frames shall be designed to maintain the proper orientation and location of the device during windy conditions. Non-rigid ballast may be placed on the frame, close to the ground, to hold the barricade in position, and shall not obscure the view of the rail panels to approaching traffic.

Barricade rail panels shall have 100 mm wide reflective, alternating orange and white diagonal stripes sloping at an angle of 45°. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B), or higher.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-07 TYPE II CONSTRUCTION BARRICADES

SCOPE. This specification covers the material, fabrication, and performance requirements for Type II construction barricades. Type II construction barricades are defined by FHWA as a Category II device.

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MATERIAL REQUIREMENTS. Type II construction barricades shall conform to the requirements of the MUTCD and shall be NCHRP 350 or MASH approved. Type II construction barricades shall be constructed of a frame with two rail panels 200 mm to 300 mm wide and a minimum of 600 mm long. Rails on barricades used on expressways and other high-speed roadways shall have an area of at least 0.175 m². The top of the upper panel shall be mounted at a minimum height of 915 mm. Barricade frames shall be designed to maintain the proper orientation and location of the device during windy conditions. Non-rigid ballast may be placed on the frame, close to the ground, to hold the barricade in position, and shall not obscure the view of the rail panels to approaching traffic.

Barricade rail panels shall have 100 to 150 mm wide reflective, alternating orange and white diagonal stripes sloping at an angle of 45°. Barricade rail panels 915 mm and longer shall have 150 mm wide stripes. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-08 TYPE III CONSTRUCTION BARRICADES

SCOPE. This specification covers the material, fabrication, and performance requirements for Type III construction barricades. Type III construction barricades are defined by FHWA as a Category II device.

MATERIAL REQUIREMENTS. Type III construction barricades shall conform to the requirements of the MUTCD and shall be NCHRP 350 approved. Type III construction barricades shall be constructed of a frame with three rail panels 200 mm to 300 mm wide and a minimum of 1220 mm long. The top of the upper panel shall be mounted at a minimum height of 1525 mm. Barricade frames shall be designed to maintain the proper orientation and location of the device during windy conditions. Nonrigid ballast may be placed on the frame, close to the ground, to hold the barricade in position, and shall not obscure the view of the rail panels to approaching traffic.

Barricade rail panels shall have 150 mm wide reflective alternating orange and white diagonal stripes sloping at an angle of 45°. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher.

Warning lights, when used, shall be securely mounted directly to the barricade frame, above the top rail, using a bolt, nut, and washer of sufficient strength to ensure that the light does not detach if impacted by a vehicle, and no part of the light or wiring shall cover the face of the rail. Batteries shall be placed at ground level, except that integral batteries weighing a maximum of 3.2 kg may be mounted on the barricade frame. Warning lights shall not be attached to the barricade rail.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-09 TEMPORARY SIGN SUPPORTS

SCOPE. This specification covers the material, fabrication, and performance requirements for temporary sign supports. Temporary sign supports are defined by FHWA as a Category II device.

MATERIAL REQUIREMENTS. Temporary sign supports shall conform to the requirements of the MUTCD and shall be constructed in accordance with the Standard Sheets or shall be commercially manufactured, temporary sign supports that are NCHRP 350 or MASH approved.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

TEMPORARY TRAFFIC CONTROL DEVICES

729-10 TEMPORARY IMPACT ATTENUATORS - REDIRECTIVE

SCOPE. This specification covers the material and performance requirements for temporary impact attenuators. Temporary impact attenuators are defined by FHWA as a Category III device.

MATERIALS REQUIREMENTS. Temporary impact attenuators shall be NCHRP 350 or MASH approved as a redirective, non-gating device. Temporary impact attenuators that use liquid or other materials as a filler or to provide ballast will be evaluated for potential environmental impacts and/or seasonal limitations. Temporary impact attenuators meeting the requirements of NCHRP 350 or MASH Test Level 2 are acceptable only as Test Level 2 devices. A Temporary impact attenuator accepted as a Test Level 3 device is also acceptable as Test Level 2 device. Temporary impact attenuators will be approved for use in shielding an object of a maximum width as specified in the Approved List, and specific configurations may be approved for maximum speeds. Approach ends of Temporary impact attenuators shall have impact attenuator markings in accordance with the MUTCD.

Concrete Grouting Material

701-05

Anchoring Materials - Chemically Curing

701-07

If a temporary foundation slab is required, concrete shall be Class A concrete conforming to Section 501 *Portland Cement Concrete - General*; reinforcing steel shall conform to §709-01 *Bar Reinforcement, Grade 420*.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have Test Level 2 or Test Level 3 temporary impact attenuators approved shall prepare and submit copies of drawings, specifications, test reports, and Federal acceptance letters to the Director of the Materials Bureau. The review process requires a minimum of 30 calendar days. Upon approval, the name of the manufacturer and the product will be placed on the Approved List.

BASIS OF ACCEPTANCE. Test Level 2 or Test Level 3 temporary impact attenuators will be accepted on the basis of the product appearing on the Approved List and a material certification that the product is the same as the one appearing on the Approved List and that it conforms to this specification.

729-11 TEMPORARY IMPACT ATTENUATORS - GATING

SCOPE. This specification covers the material and performance requirements for temporary impact attenuators. Temporary impact attenuators are defined by FHWA as a Category III device.

MATERIALS REQUIREMENTS. Temporary impact attenuators shall be NCHRP 350 or MASH approved as a gating device. Temporary impact attenuators that use liquid or other materials as a filler or to provide ballast will be evaluated for potential environmental impacts and/or seasonal limitations. Temporary impact attenuators meeting the requirements of NCHRP 350 or MASH Test Level 2 are acceptable only as Test Level 2 devices. A Temporary impact attenuator accepted as a Test Level 3 device is also acceptable as Test Level 2 device. Temporary impact attenuators will be approved for use in shielding an object of a maximum width as specified in the Approved List, and specific configurations may be approved for maximum speeds. Approach ends of Temporary impact attenuators shall have impact attenuator markings in accordance with the MUTCD.

TEMPORARY TRAFFIC CONTROL DEVICES

Concrete Grouting Material
Anchoring Materials - Chemically Curing

701-05
701-07

If a temporary foundation slab is required, concrete shall be Class A concrete conforming to Section 501 *Portland Cement Concrete - General*; reinforcing steel shall conform to §709-01 *Bar Reinforcement, Grade 420*.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have Test Level 2 or Test Level 3 temporary impact attenuators approved shall prepare and submit copies of drawings, specifications, test reports, and Federal acceptance letters to the Director of the Materials Bureau. The review process requires a minimum of 30 calendar days. Upon approval, the name of the manufacturer and the product will be placed on the Approved List.

BASIS OF ACCEPTANCE. Test Level 2 or Test Level 3 temporary impact attenuators will be accepted on the basis of the product appearing on the Approved List and a material certification that the product is the same as the one appearing on the Approved List and that it conforms to this specification.

729-12 TRUCK-MOUNTED AND TRAILER MOUNTED IMPACT ATTENUATORS

SCOPE. This specification covers the material and performance requirements for truck mounted impact attenuators or trailer mounted impact attenuators (TMIA's) mounted on the rear of work vehicles and barrier trailers. Impact attenuators are defined by FHWA as a Category III device.

MATERIALS REQUIREMENTS. TMIA's shall be NCHRP 350 or MASH approved. TMIA's meeting the requirements of NCHRP 350 or MASH Test Level 3 are also acceptable as a Test Level 2 device. TMIA's meeting the requirements of NCHRP 350 or MASH Test Level 2 are acceptable only as Test Level 2 devices. Approach ends of TMIA's shall have impact attenuator markings in accordance with the MUTCD.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have products considered for inclusion on the Approved List shall prepare and submit copies of drawings, specifications, test reports, and Federal Acceptance Letters to the Director of the Materials Bureau. The review process requires a minimum of 30 calendar days. Upon approval, the name of the manufacturer and the product will be placed on the Approved List.

BASIS OF ACCEPTANCE. Test Level 2 or Test Level 3 TMIA's will be accepted on the basis of the product appearing on the Approved List and a material certification that the product is the same as the one appearing on the Approved List and that it conforms to this specification.

729-13 TEMPORARY SAND BARRELS

SCOPE. This specification covers the material and performance requirements for sand barrels. Sand barrels are defined by FHWA as a Category III device.

MATERIAL REQUIREMENTS. Sand barrels of each size module shall be NCHRP 350 or MASH approved. Sand barrels shall be yellow, durable, waterproof, ultraviolet-stable plastic. The first barrel in the array shall have impact attenuator markings in accordance with the MUTCD.

Sand barrels shall resist deformation from dynamic loadings due to vibration in the placement area and long-term stresses induced by thermal expansion/contraction and fill settlement. Sand barrels shall be free draining with respect to residual moisture in the fill sand. Lids shall divert precipitation and prevent

TEMPORARY TRAFFIC CONTROL DEVICES

moisture from entering the module. Lids shall be fastened or otherwise secured to provide a closed, reasonably vandal-resistant barrel.

The fill sand shall conform to the requirements of either §703-06 *Cushion Sand* or §703-07 *Concrete Sand*. Sodium chloride, as dry rock salt, equal to 3-5 percent by weight of the sand, shall be thoroughly mixed into the sand. Sodium chloride shall meet the requirements of §712-03 *Sodium Chloride*.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have products considered for inclusion on the Approved List shall prepare and submit copies of drawings, specifications, test reports, and Federal Acceptance Letters to the Director of the Materials Bureau. The review process requires a minimum of 30 calendar days. Upon approval, the name of the manufacturer and the product will be placed on the Approved List.

BASIS OF ACCEPTANCE. Sand barrels will be accepted on the basis of the product appearing on the Approved List and a material certification that the product is the same as the one appearing on the Approved List and that it conforms to this specification.

729-14 VEHICLE-ARRESTING SYSTEMS

SCOPE. This specification covers the material and performance requirements for vehicle-arresting systems. Vehicle-arresting systems are defined by FHWA as a Category III device.

MATERIAL REQUIREMENTS. Vehicle-arresting systems shall be NCHRP 350 or MASH approved.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have products considered for inclusion on the Approved List shall prepare and submit copies of drawings, specifications, test reports, and Federal Acceptance Letters to the Director of the Materials Bureau. The review process requires a minimum of 30 calendar days.

BASIS OF ACCEPTANCE. Vehicle-arresting systems will be accepted on the basis of the product appearing on the Approved List and a material certification that the product is the same as the one appearing on the Approved List and that it conforms to this specification.

729-15 ARROW PANELS

SCOPE. This specification covers the material and performance requirements for arrow panels. Arrow panels are defined by FHWA as a Category IV device.

MATERIAL REQUIREMENTS. Arrow panels shall be signs with a matrix of illuminated elements capable of either flashing or sequential arrow displays that meets the requirements of the MUTCD. Arrow panels shall be equipped with a sign control console, mounted in a lockable, weather-resistant compartment.

Arrow panels shall not bear any advertising message or any other message that is not related to traffic control. A non-retroreflective logo or name and telephone number of the contractor or supplier may be located on the back of the arrow panel or on the arrow panel trailer. The logo shall not exceed 0.1 m². The name and telephone number shall not exceed 50 mm in height. The rear face of the arrow panel shall contain one or more clear lamp(s) to indicate that the arrow board is operating properly.

Truck-Mounted Series B. Arrow panels consist of a 1500 mm x 750 mm rectangular panel mounted at a minimum of 1.5 m above the roadway. The arrow display shall be legible at a minimum distance of 1200 m on a bright, sunny day or a clear night when the sight line is unobstructed.

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Trailer-Mounted or Truck-Mounted Series C. Arrow panels consist of a 2400 mm x 1200 mm rectangular panel mounted at a minimum of 2.1 m above the roadway for trailer mounted arrow panels and 1.5 m above the roadway for truck mounted arrow panels. Arrow panels shall be powered by self-contained engine-driven generator systems, capable of energizing the arrow displays for 72 hours unattended and shall be capable of being powered by 110V AC supply; solar-powered, capable of energizing the arrow displays continuously for 21 days unattended; or powered by a truck. Arrow panel operation controls shall be mounted in a lockable enclosure. The arrow display shall be legible at a minimum distance of 1600 m on a bright, sunny day or a clear night when the sight line is unobstructed.

TESTING. Manufacturers or material suppliers desiring to have Truck-Mounted Series B arrow panels considered for inclusion on the Approved List shall submit a material certification that the arrow panel conforms to this specification and the requirements of the MUTCD, and provide an arrow panel to the Director, Materials Bureau in Albany for initial field testing. Field testing will include evaluation of arrow panel operation during various light conditions for brightness, legibility, and angularity. The review process requires a minimum of 30 calendar days.

Manufacturers or material suppliers desiring to have Trailer-Mounted or Truck-Mounted Series C arrow panels considered for inclusion on the Approved List shall submit test results from the AASHTO National Transportation Product Evaluation Program (NTPEP), a material certification that the arrow panel conforms to this specification and the requirements of the MUTCD, and provide an arrow panel to the Director of the Materials Bureau in Albany for initial field testing. Field testing will include evaluation of arrow panel operation during various light conditions for brightness, legibility, and angularity. The review process requires a minimum of 30 calendar days.

BASIS OF APPROVAL. Truck-Mounted Series B arrow panels meeting the requirements of this specification and having satisfactory initial field test results will be placed on the Approved List.

Trailer-Mounted or Truck-Mounted Series C arrow panels meeting the requirements of this specification and satisfactory initial field test results, as well as satisfactory NTPEP test results will be placed on the Approved List. Trailer-Mounted or Truck-Mounted Series C arrow panels for which NTPEP test results have not been submitted may be provisionally placed on the Approved List for a maximum of one year. After one year of provisional approval, the manufacturer may request an extension for one additional year based on a pending application filed with NTPEP for testing. No extensions of provisional approvals past two years will be granted. If satisfactory test results are not provided by the expiration date of the provisional approval, all units provided or in use shall be removed and replaced by the Contractor with approved units at no additional cost to the State. Arrow panels on the Approved List that have repeated poor evaluations will be removed from the Approved List.

BASIS OF ACCEPTANCE. Arrow panels will be accepted on the basis of the product appearing on the Approved List and a material certification that the product meets this specification and is the same as the one appearing on the Approved List.

729-16 PORTABLE VARIABLE-MESSAGE SIGNS (PVMS)

SCOPE. This specification covers the material and performance requirements for variable-message signs. Variable-message signs are defined by FHWA as a Category IV device.

TEMPORARY TRAFFIC CONTROL DEVICES

MATERIAL REQUIREMENTS. Portable variable-message signs (PVMS) shall be tested by the National Transportation Product Evaluation Program (NTPEP) of the American Association of State and Highway Transportation Officials (AASHTO) demonstrating the arrow panel meets the requirements of this specification and the MUTCD. PVMS shall be trailer mounted and equipped for use on public highways in accordance with NYS Vehicle and Traffic Law. The unit shall operate primarily from a solar-powered electrical system and shall be capable of energizing the message display for a minimum of 21 days without auxiliary charge. The electrical system shall consist of batteries and a solar array panel and on-board auxiliary charging system to enable the batteries to be recharged via a 110V AC connection.

PVMS shall have a 3 line display with a minimum of 8 characters per line, and shall be capable of displaying 3 separate messages in a cyclical sequence. Characters shall be a minimum of 450 mm high.

PVMS shall be visible at a minimum distance of 800 m during the day and at night. For highways with a posted pre-construction speed limit of 55 mph or greater, PVMS messages shall be legible from a minimum distance of 245 m during the day, and 185 m at night. For highways with a posted pre-construction speed limit of 50 mph or less, PVMS messages shall be legible from a minimum distance of 200 m during the day. PVMS shall not bear any advertising message or any other message that is not related to traffic control. A non-retroreflective logo or name and telephone number of the contractor or supplier may be located on the back of the PVMS or on the PVMS trailer. The logo shall not exceed 0.1 m². The name and telephone number shall not exceed 50 mm in height.

PVMS shall be equipped with a sign control console, mounted in a lockable, weather-resistant compartment. The sign controller shall have programmable memory capable of storing messages pertinent to planned construction activities, including emergency messages. The controller shall be equipped with 14 day calendar programming capability, providing the ability to start and stop the display of a minimum of three (3) different messages on a repeating schedule without an operator present. The controller shall be capable of producing an accurate log of all messages and the times they were displayed. The controller shall have programmable messages, display rate, and display interval settings. The controller shall blank the sign if the output voltage drops below the manufacturer's recommended output level.

PVMS shall be equipped with control software using a Microsoft Windows operating system. The Contractor shall supply the Engineer with two copies of operating instructions for the PVMS and the control software. Electronic copies of software instructions are acceptable.

A. Light-Emitting Diode (LED) Type. LED type PVMS shall have light-emitting diodes arranged in arrays and the arrays shall be arranged in a matrix for each character to be 7 pixels high by 5 pixels wide. The LED display shall have the ability to display characters at a minimum height of 450 mm. The controller shall provide a means of dimming the pixels.

B. Hybrid Flip-Disk Type. Hybrid, flip-disk type PVMS shall have pixels consisting of individual electromagnetic disks with at least two (2) high-output amber LEDs. The disk face shall be covered with yellow prismatic retroreflective sheeting or an approved equal. The PVMS shall operate using both flip-disk and light-emitting diode (LED) during nighttime and low-light periods. The hybrid flip disk type shall be arranged in a matrix of 7 disks high by 5 disks wide for each character.

C. Cellular Communications Option. PVMS with cellular communications shall be equipped with a cellular telephone with cellular service and a modem capable of remotely operating the control software. The phone numbers for PVMS on a contract shall be sequential whenever possible to facilitate remote control of multiple devices. The unit shall accept a land line telephone connection mode without rewiring or modification.

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D. Radar Option. The PVMS with radar shall be equipped with a radar speed detection option, providing the system with the ability to determine the speed of an approaching vehicle and interrupt the programmed sequence with a special default message displaying the vehicle's speed. The unit shall collect and store vehicle speed data for retrieval.

E. NTCIP Communication Protocol Option. PVMS units that will be operated by the Department, typically from a Transportation Management Center (TMC), shall be equipped with communications and control systems that are National Transportation Communications for ITS Protocol (NTCIP) compliant.

TESTING. Manufacturers or material suppliers desiring to have PVMS considered for inclusion on the Approved List shall submit test results from the AASHTO National Transportation Product Evaluation Program (NTPEP), a material certification that the PVMS conforms to this specification and the requirements of the MUTCD, and provide a PVMS to the Director, Materials Bureau in Albany for initial field testing. Field testing will include evaluation of PVMS operation during various light conditions for brightness, legibility, and angularity. The initial testing process requires a minimum of 30 calendar days.

BASIS OF APPROVAL. PVMS meeting the specification, having satisfactory NTPEP test results, and having satisfactory initial field test results will be placed on the Approved List.

PVMS meeting the specification, and having satisfactory initial field test results, that do not have NTPEP test results may be provisionally placed on the Approved List for a maximum of one year. After one year of provisional approval, the manufacturer may request an extension for one additional year based on a pending application filed with NTPEP for testing. No extensions of provisional approvals past two years will be granted. If satisfactory test results are not provided by the expiration date of the provisional approval, all units provided or in use shall be removed and replaced by the Contractor with approved units at no additional cost to the State. PVMS on the Approved List that have repeated poor evaluations will be removed from the Approved List.

BASIS OF ACCEPTANCE. PVMS will be accepted on the basis of the product appearing on the Approved List and a material certification that the product meets this specification and is the same as the one appearing on the Approved List.

729-17 TEMPORARY GLARE SCREENS

SCOPE. This specification covers the material and performance requirements for temporary glare screens. Glare screens are not defined separately by FHWA, but rather are considered a system component.

MATERIAL REQUIREMENTS. Temporary glare screens shall consist of a opaque screen on a horizontal base which is, in turn, mounted on a concrete barrier. The system shall be modular to allow flexible use and ease of maintenance.

The screen shall be constructed of durable, lightweight, flexible, weather-resistant and impact-resistant materials of a single, uniform dark color. The minimum height of the screen shall be approximately 600 mm. The screen shall be reflectorized at a uniform maximum spacing of 12 m. If barrier delineation is blocked, the screen shall be reflectorized on both sides with a 75 mm wide by 150 mm high (minimum) piece of reflective sheeting, ASTM Type I (Class A), ASTM Type III (Class B) or higher. Yellow reflective sheeting shall be used facing traffic which is to pass to the right of the glare screen. White reflective sheeting shall be used facing traffic which is to pass to the left of the glare screen.

TEMPORARY TRAFFIC CONTROL DEVICES

Individual temporary glare screen modules shall not span a joint between concrete barrier sections, and bases shall not overhang the face of the barrier. Temporary glare screens shall not have any horizontal rigid members that could potentially spear an impacting vehicle, or shall be NCHRP 350 or MASH approved if the system has horizontal rigid members.

The base shall have sufficient rigidity to facilitate ease of handling and proper screen support and position. The connection of the base to the vertical components shall prevent unintentional screen rotation or dislocation. The base shall be properly secured to prevent it from being dislodged upon impact.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-18 WARNING LIGHTS

SCOPE. This specification covers the material and performance requirements for warning lights. Warning lights are not defined separately by FHWA, but rather are considered a system component.

MATERIAL REQUIREMENTS. Warning lights shall be mounted on signs or channelizing devices in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield. Warning lights shall be Type A (low-intensity flashing), Type B (high-intensity flashing), or Type C (steady-burning). Warning lights shall meet the requirements of the MUTCD Section 6F.83 and the ITE *Purchase Specification for Flashing and Steady Burn Warning Lights*. Warning lights shall have a minimum nominal diameter of 175 mm and shall emit yellow light. Flashing warning lights shall flash between 55 and 75 times per minute. Flashing warning lights required to operate 24 hours per day shall be Type B. Steady-burning warning lights shall operate from one-half hour after sunset to one-half hour before sunrise. Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens. Warning lights shall be powered by batteries, line power, or solar cells adequate to maintain the required luminance during all periods of required operation.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-19 AUTOMATED FLAGGER ASSISTANCE DEVICES

SCOPE. This specification covers the material and performance requirements for automated flagger assistance devices (AFAD) designed to control road users through work zones to be remotely operated by a flagger. AFADs are defined by FHWA as a Category IV device.

MATERIAL REQUIREMENTS. AFADs shall meet the requirements of the MUTCD. Each AFAD shall consist of a remotely controlled self-contained trailer or movable cart consisting of *STOP/SLOW* signs or *RED/YELLOW* lenses.

Stop/Slow Sign AFAD shall consist of:

- A STOP/SLOW sign (R1-1/W20-8) having an octagonal shape of at least 900 mm x 900 mm with letters at least 300 mm high.
 - One red stop beacon, 300 mm diameter red Light Emitting Diode (LED), mounted above the *STOP* sign.
 - At least one amber beacon, 300 mm diameter amber Light Emitting Diode (LED) or Type B high-intensity flashing warning light mounted above, below or to the side(s) of the *SLOW* sign.

TEMPORARY TRAFFIC CONTROL DEVICES

- A gate arm capable of extending up to 2.6 m.
- *WAIT ON STOP* (R1-7) and *GO ON SLOW* (R1-8) signs mounted under the *STOP/SLOW* sign.
 - *WAIT ON STOP* sign shall be a 600 mm x 750 mm with black legend and black border on a white background with letters at least 50 mm high.
 - *GO ON SLOW* sign shall be a 600 mm x 750 mm with black legend and black border on a white background with letters at least 50 mm high.
- All sign sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type IX (Class E).

RED/Yellow Lens AFAD shall consist of:

- Circular red and circular yellow 300 mm diameter Light Emitting Diode (LED) displays.
- A gate arm capable to extend up to 2.6 m.
- STOP HERE ON RED sign, (R10-6), 600 mm x 750 mm.
- All sign sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type IX (Class E).

The AFADs shall be controlled by a single flagger with a remote control, which shall allow safe operation of two AFADs remotely, employ bi-directional communications to verify each command sent from the handheld was successfully received, be equipped with conflict monitoring to prevent displaying a SLOW message simultaneously in both directions, permit an override feature to allow a simultaneous slow display, and show the current status of each AFAD. The control console and power supply shall be housed in a locked compartment. Each trailer/cart shall be equipped with a remote control warning horn alerting workers of intruding vehicles.

Trailers/carts shall display a minimum of 50 mm wide band of reflective sheeting on all four sides of the trailer. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type III (Class B), ASTM Type VII (Class C) or ASTM Type IX (Class E). The sheeting need not be continuous, but the sum of the length of the segments shall be at least one-half the length of the trailer. AFADs shall not bear an advertising message(s) or any other message that is not related to traffic control. A nonretroreflective logo or name and telephone number of the contractor or supplier not to exceed 0.1 square meter may be located on the trailer or cart. The name and telephone number shall not exceed 50 mm in height.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have AFADs be considered for inclusion on the Approved List shall submit a material certification that the AFADs meet this specification and the requirements of the MUTCD, as well as provide one AFAD for initial field testing to the Director of the Materials Bureau in Albany for review. Initial field testing will include evaluating the AFADs for operation, sign visibility/legibility, retractable arm functionality/visibility and beacon/warning light brightness and angularity. The review process requires a minimum of 30 calendar days.

AFADs having acceptable certifications and satisfactory initial field test results will be placed on the Approved List. AFADs that consistently have repeated poor evaluations will be removed from the approved list.

BASIS OF ACCEPTANCE. AFADs will be accepted on the basis of the product appearing on the Approved List and a material certification that the product is the same as the one appearing on the Approved List and that it conforms to this specification.

729-20 PORTABLE TRAFFIC SIGNALS

SCOPE. This specification covers the material and performance requirements for portable traffic signals. Portable traffic signals are defined by FHWA as a Category IV device.

TEMPORARY TRAFFIC CONTROL DEVICES

MATERIAL REQUIREMENTS. Portable traffic signals shall meet the requirements of the MUTCD. Portable traffic signals shall consist of two self-contained, trailer-mounted traffic signals, each with a vertical signal mast, horizontal mast arm and two - 3 section traffic signal heads. Each traffic signal head shall have 300 mm diameter circular red, yellow and green Light Emitting Diode (LED) modules.

The portable traffic signal system shall be able to function continuously and independent of utility power sources. The signal control console and power supply shall be housed in a locked compartment. The traffic signal controller shall be password protected, capable of providing traffic-actuated control with microwave detector sensors, have a built-in conflict monitor to prevent the display of conflicting indications, shall be hard-wired or radio-controlled to keep the signal indications synchronized, and have adequate phasing to serve expected traffic movements.

Trailers shall display a minimum of 50 mm wide band of reflective sheeting on all four sides of the trailer. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type III (Class B), ASTM Type VII (Class D) or ASTM Type IX (Class E). The sheeting need not be continuous, but the sum of the length of the segments shall be at least one-half the length of the trailer. Portable traffic signals shall not bear an advertising message(s) or any other message that is not related to traffic control. A nonretroreflective logo or name and telephone number of the contractor or supplier may be located on the portable traffic signal trailer. The logo shall not exceed 0.1 square meter. The name and telephone number shall not exceed 50 mm in height.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have Portable Traffic Signals considered for inclusion on the Approved List shall submit a material certification that the Portable Traffic Signal meets this specification and the requirements of the MUTCD, as well as one portable traffic signal for initial field testing to the Director of the Materials Bureau in Albany for review. Initial field testing will include evaluating the traffic signal system for phasing, clearances, detector operation and layout of the signal faces for brightness and angularity. The review process requires a minimum of 30 calendar days. Portable traffic signals having acceptable certifications and satisfactory initial field test results will be placed on the Approved List.

Portable traffic signals on the Approved List that consistently have poor evaluations will be removed from the Approved List.

BASIS OF ACCEPTANCE. Portable traffic signals will be accepted on the basis of the product appearing on the Approved List and a material certification that the product is the same as the one appearing on the Approved List and that it conforms to this specification.

729-21 TEMPORARY OVERLAY MARKERS

SCOPE. This specification covers the material and performance requirements for temporary overlay markers.

MATERIAL REQUIREMENTS. Temporary overlay markers are flexible polymer "L" shaped road reflectors with an adhesive on its base to adhere to the pavement surface. Temporary overlay markers are approximately 100 mm wide by 50 mm high with at least a 25 mm base. Yellow temporary overlay markers have a yellow reflective sheeting strip a minimum of 6 mm in height at the top of the vertical section on both sides. White temporary overlay markers have a white reflective strip a minimum of 6 mm in height at the top of the vertical section on one side only. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type III (Class B), ASTM Type VII (Class D) or ASTM Type IX (Class E).

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

TEMPORARY TRAFFIC CONTROL DEVICES

Make the following changes to the Standard Specifications of May 1, 2008:

Page 1021, **Delete** Section 729 *Temporary Traffic Control Devices* and **Replace** it with the following:

SECTION 729 – TEMPORARY TRAFFIC CONTROL DEVICES

729-01 DRUMS

SCOPE. This specification covers the material, fabrication, and performance requirements for traffic drums. Drums are defined by FHWA as a Category I device.

MATERIAL REQUIREMENTS. Drums shall conform to the requirements of the MUTCD, shall be NCHRP 350 or MASH approved and shall be orange plastic, one-piece or two-piece construction, with a closed top. Drums shall be a minimum of 18 inches in diameter (visible from all directions), a minimum of 36 inches in height. Drums shall have a maximum weight of 75 lbs., including ballast. Two-piece drums shall consist of a base no more than 4 inches in height and an upper section. The base and upper section of two-piece drums shall be designed as a unit. One-piece drums shall include a base ring or elongation designed to hold ballast. The base and/or any nonflexible portion of the drum shall not extend more than 2 inches above the pavement surface.

Drums shall have 4 horizontal circumferential stripes of reflective sheeting a minimum of 4 inches wide, of alternating orange and white, starting with orange on the top. The top edge of the upper band shall be a maximum of 2 inches from the top edge of the drum. The space between stripes shall not exceed 2 inches.

Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B), or higher. Reflective sheeting shall be firmly bonded to the drum with an adhesive; mechanical fasteners to bond reflective sheeting to the drum will not be allowed.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-02 CONES

SCOPE. This specification covers the material, fabrication, and performance requirements for traffic cones. Cones are defined by FHWA as a Category I device.

MATERIAL REQUIREMENTS. Cones shall conform to the requirements of the MUTCD, shall be NCHRP 350 or MASH approved and shall be orange rubber or plastic. Cones shall have a maximum weight of 20 lbs, including ballast.

Standard cones shall be approximately 28 inches in height with a minimum conical bottom width of 10 inches. Standard cones shall have two horizontal circumferential stripes of white reflective sheeting, the upper a minimum of 6 inches wide, with the upper edge 3 to 4 inches from the top of the cone, and the lower a minimum of 4 inches wide with the upper edge approximately 2 inches below the upper stripe.

Tall cones shall be approximately 36 inches in height with a minimum conical bottom width of 10 inches. Tall cones shall have two horizontal circumferential stripes of white reflective sheeting, the upper a minimum of 6 inches wide, with the upper edge 3 to 4 inches from the top of the cone, and the lower a minimum of 4 inches wide with the upper edge approximately 2 inches below the upper stripe.

Extra tall cones shall be a minimum of 42 inches in height with a minimum conical bottom width of 7 inches. Extra tall cones shall have a minimum of four horizontal circumferential stripes of reflective sheeting from 4 to 6 inches wide, of alternating orange and white starting with orange on the top. The upper edge of the sheeting shall be 4 inches from the top of the cone. Nonreflective spaces between the stripes shall not exceed 3 inches wide.

TEMPORARY TRAFFIC CONTROL DEVICES

Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher. Reflective sheeting shall be firmly bonded to the cone with adhesive.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-03 TEMPORARY TUBULAR MARKERS

SCOPE. This specification covers the material, fabrication, and performance requirements for tubular markers. Tubular markers are defined by FHWA as a Category I device.

MATERIAL REQUIREMENTS. Tubular markers shall conform to the requirements of the MUTCD, shall be NCHRP 350 or MASH approved and shall be orange, with a minimum height of 36 inches and a minimum outside diameter of 2 inches. Tubular markers shall be circular or elliptical in cross section. Tubular markers shall have a maximum weight of 12 lbs, not including a mounting base.

The markers shall have two horizontal circumferential stripes of white reflective sheeting a minimum of 3 inches wide. The top edge of the upper band shall be a maximum of 2 inches from the top of the marker. The space between shall not exceed 6 inches.

Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher. The sheeting shall be bonded to the post with a precoated, pressure-sensitive adhesive or a tack-free, heat-activated adhesive. Mechanical fasteners to bond reflective sheeting to the post will not be allowed.

For free-standing tubular markers, the base and/or any nonflexible portion of the marker shall not be more than 2 inches in height.

For tubular markers fastened to pavement, the bonding system used to shall be a fast-setting chemical compound, mastic-type material, or mechanical fastener capable of fixing the tubular marker to either concrete or asphalt pavement. The bonding system shall not present a hazard to traffic if the tubular marker or base unit becomes unfixed from the pavement.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-04 VERTICAL PANELS

SCOPE. This specification covers the material, fabrication, and performance requirements for vertical panels. Vertical panels are defined by FHWA as a Category II device.

MATERIAL REQUIREMENTS. Vertical panels shall conform to the requirements of the MUTCD, shall be NCHRP 350 or MASH approved and shall be constructed of plastic, aluminum, or other lightweight materials. Vertical panels shall be supported by a base capable of maintaining the panel in an upright position and in the proper position and orientation.

Vertical panels shall have 4 to 6 inch wide diagonal stripes of alternating orange and white reflective sheeting, sloping downward at an angle of 45° toward the side on which traffic is to pass. Vertical panels which are 36 inches and larger shall have 6 inch wide diagonal stripes.

Standard vertical panels shall be a minimum of 24 inches in height and a minimum of 8 inches in width. The top of the panel shall be mounted a maximum of 36 inches high. Support posts for standard vertical panels shall not be located on the traffic face of the panel.

Oversized vertical panels shall be a minimum of 36 inches in height and have a minimum reflective area of 2.0 square feet.

Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher.

TEMPORARY TRAFFIC CONTROL DEVICES

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-05 STOP/SLOW PADDLES

SCOPE. This specification covers the material requirements for stop/slow paddles.

MATERIAL REQUIREMENTS. Stop/slow paddles shall conform to the requirements of the MUTCD and shall be constructed of plastic, aluminum, or other lightweight materials. Stop/slow paddles shall be a minimum of 24 inches wide and shall be mounted on a support staff with a minimum height of 6 feet to the bottom of the panel. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type IX (Class E).

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-06 TYPE I CONSTRUCTION BARRICADES

SCOPE. This specification covers the material, fabrication, and performance requirements for Type I construction barricades. Type I construction barricades are defined by FHWA as a Category II device.

MATERIAL REQUIREMENTS. Type I construction barricades shall conform to the requirements of the MUTCD and shall be NCHRP 350 or MASH approved. Type I construction barricades shall be constructed of an A-frame with a single rail panel 8 to 12 inches wide and a minimum of 24 inches long. Rails on barricades used on expressways and other high-speed roadways shall have an area of at least 2.0 square feet. The top of the upper panel shall be mounted at a minimum height of 36 inches. Barricade frames shall be designed to maintain the proper orientation and location of the device during windy conditions. Non-rigid ballast may be placed on the frame, close to the ground, to hold the barricade in position, and shall not obscure the view of the rail panels to approaching traffic.

Barricade rail panels shall have 4 inch wide reflective, alternating orange and white diagonal stripes sloping at an angle of 45°. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B), or higher.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-07 TYPE II CONSTRUCTION BARRICADES

SCOPE. This specification covers the material, fabrication, and performance requirements for Type II construction barricades. Type II construction barricades are defined by FHWA as a Category II device.

TEMPORARY TRAFFIC CONTROL DEVICES

MATERIAL REQUIREMENTS. Type II construction barricades shall conform to the requirements of the MUTCD and shall be NCHRP 350 or MASH approved. Type II construction barricades shall be constructed of a frame with two rail panels 8 to 12 inches wide and a minimum of 24 inches long. Rails on barricades used on expressways and other high-speed roadways shall have an area of at least 2.0 square feet. The top of the upper panel shall be mounted at a minimum height of 36 inches. Barricade frames shall be designed to maintain the proper orientation and location of the device during windy conditions. Non-rigid ballast may be placed on the frame, close to the ground, to hold the barricade in position, and shall not obscure the view of the rail panels to approaching traffic.

Barricade rail panels shall have 4 to 6 inch wide reflective, alternating orange and white diagonal stripes sloping at an angle of 45°. Barricade rail panels 36 inches and longer shall have 6 inch wide stripes. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-08 TYPE III CONSTRUCTION BARRICADES

SCOPE. This specification covers the material, fabrication, and performance requirements for Type III construction barricades. Type III construction barricades are defined by FHWA as a Category II device.

MATERIAL REQUIREMENTS. Type III construction barricades shall conform to the requirements of the MUTCD and shall be NCHRP 350 or MASH approved. Type III construction barricades shall be constructed of a frame with three rail panels 8 to 12 inches wide and a minimum of 48 inches long. The top of the upper panel shall be mounted at a minimum height of 60 inches. Barricade frames shall be designed to maintain the proper orientation and location of the device during windy conditions. Nonrigid ballast may be placed on the frame, close to the ground, to hold the barricade in position, and shall not obscure the view of the rail panels to approaching traffic.

Barricade rail panels shall have 6 inch wide reflective alternating orange and white diagonal stripes sloping at an angle of 45°. Reflective sheeting shall conform to §730-05 *Reflective Sheeting* ASTM Type I (Class A), ASTM Type III (Class B) or higher.

Warning lights, when used, shall be securely mounted directly to the barricade frame, above the top rail, using a bolt, nut, and washer of sufficient strength to ensure that the light does not detach if impacted by a vehicle, and no part of the light or wiring shall cover the face of the rail. Batteries shall be placed at ground level, except that integral batteries weighing a maximum of 7 lbs may be mounted on the barricade frame. Warning lights shall not be attached to the barricade rail.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

729-09 TEMPORARY SIGN SUPPORTS

SCOPE. This specification covers the material, fabrication, and performance requirements for temporary sign supports. Temporary sign supports are defined by FHWA as a Category II device.

MATERIAL REQUIREMENTS. Temporary sign supports shall conform to the requirements of the MUTCD and shall be constructed in accordance with the Standard Sheets or shall be commercially manufactured, temporary sign supports that are NCHRP 350 or MASH approved.

BASIS OF ACCEPTANCE. Upon request, the Contractor shall provide a material certification that the product conforms to this specification.

TEMPORARY TRAFFIC CONTROL DEVICES

729-10 TEMPORARY IMPACT ATTENUATORS - REDIRECTIVE

SCOPE. This specification covers the material and performance requirements for temporary impact attenuators. Temporary impact attenuators are defined by FHWA as a Category III device.

MATERIALS REQUIREMENTS. Temporary impact attenuators shall be NCHRP 350 or MASH approved as a redirective, non-gating device. Temporary impact attenuators that use liquid or other materials as a filler or to provide ballast will be evaluated for potential environmental impacts and/or seasonal limitations. Temporary impact attenuators meeting the requirements of NCHRP 350 or MASH Test Level 2 are acceptable only as Test Level 2 devices. A Temporary impact attenuator accepted as a Test Level 3 device is also acceptable as Test Level 2 device. Temporary impact attenuators will be approved for use in shielding an object of a maximum width as specified in the Approved List, and specific configurations may be approved for maximum speeds. Approach ends of Temporary impact attenuators shall have impact attenuator markings in accordance with the MUTCD.

Concrete Grouting Material

701-05

Anchoring Materials - Chemically Curing

701-07

If a temporary foundation slab is required, concrete shall be Class A concrete conforming to Section 501 *Portland Cement Concrete - General*; reinforcing steel shall conform to §709-01 *Bar Reinforcement, Grade 420*.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have Test Level 2 or Test Level 3 temporary impact attenuators approved shall prepare and submit copies of drawings, specifications, test reports, and Federal acceptance letters to the Director of the Materials Bureau. The review process requires a minimum of 30 calendar days. Upon approval, the name of the manufacturer and the product will be placed on the Approved List.

BASIS OF ACCEPTANCE. Test Level 2 or Test Level 3 temporary impact attenuators will be accepted on the basis of the product appearing on the Approved List and a material certification that the product is the same as the one appearing on the Approved List and that it conforms to this specification.

729-11 TEMPORARY IMPACT ATTENUATORS - GATING

SCOPE. This specification covers the material and performance requirements for temporary impact attenuators. Temporary impact attenuators are defined by FHWA as a Category III device.

MATERIALS REQUIREMENTS. Temporary impact attenuators shall be NCHRP 350 or MASH approved as a gating device. Temporary impact attenuators that use liquid or other materials as a filler or to provide ballast will be evaluated for potential environmental impacts and/or seasonal limitations. Temporary impact attenuators meeting the requirements of NCHRP 350 or MASH Test Level 2 are acceptable only as Test Level 2 devices. A Temporary impact attenuator accepted as a Test Level 3 device is also acceptable as Test Level 2 device. Temporary impact attenuators will be approved for use in shielding an object of a maximum width as specified in the Approved List, and specific configurations may be approved for maximum speeds. Approach ends of Temporary impact attenuators shall have impact attenuator markings in accordance with the MUTCD.