643 Traffic Control

643.1 Description

Revise name from "speed radar trailers" to "speed feedback trailers".

(1) This section describes providing, maintaining, repositioning, and removing temporary traffic control devices as follows:

Drums	Warning lights	42-inch cones
Barricades	Arrow boards	Portable changeable message signs
Flexible tubular markers	Signs	Channelizing curb system
Speed feedback trailers		

(2) This section also describes providing and removing temporary pavement marking.

643.2 Materials

643.2.1 General

(1) Furnish materials and devices conforming to the WMUTCD that are acceptable according to the ATSSA publication Quality Guidelines for Temporary Traffic Control Devices and Features.

(2) Place the name and telephone number of the agency, contractor, supplier, or person responsible for 24-hour emergency service on each drum, a rail of each barricade, arrow board, the back of each sign, Portable Changeable Message Sign, and cone. Use non-reflective letters at least 3/4 inch but no more than 2 inches high.

(3) Traffic control devices remain the contractor's property upon completion of the work unless the contract specifies otherwise.

643.2.2 Department's Approved Products List (APL)

(1) Furnish materials from the APL as follows:

- Drums
- Barricades
- Flexible tubular marker posts including bases
- Warning lights and attachment hardware
- Channelizing curb systems
- Arrow boards
- Sign sheeting
- 42-inch cone assemblies
- Portable changeable message signs
- Speed feedback trailers

643.2.3 Signs

643.2.3.1 General

Revise 643.2.3(6) to add bases and add crashworthy per MASH.

(1) Layout signs according to the plans. If the plans do not show the layout, conform to the department's Sign Plate Book. If neither the plans nor the Sign Plate Book shows the layout, conform to the FHWA Manual of Standard Highway Signs.

(2) If the contract does not specify the size, provide signs as large or larger than the size the WMUTCD specifies for higher-speed locations. The engineer may allow smaller signs if space is limited and the WMUTCD allows.

(3) Use the materials and methods specified in 637, for type II signs, to manufacture and assemble signs. In addition, the contractor may use the following:

1. For all signs, one or more of the following:
    1.1. An exterior grade B-B or better overlay plywood sign base 1/2-inch or thicker.
    1.2. For signs 24 inches or less wide, corrugated polypropylene or polyethylene plastic sign base.
        1.2.1. Provide a 0.4-inch thick base with a 0.035-inch wall thickness and 0.4-inch cell size.
    1.3. An aluminum/plastic laminate sign base.
        1.3.1. Provide an aluminum faced composite base 0.080 - 0.100 inches thick, with aluminum outer layers 0.010 - 0.020 inches thick surrounding a polyethylene or other thermoplastic core.
2. For signs mounted on portable sign supports or barricades, in addition to the materials and methods specified above, the contractor may also use one or more of the following:
    - For signs wider than 24 inches, corrugated polypropylene or polyethylene plastic sign base.
    - A retroreflective roll-up sign.
    - A sheet aluminum sign base 0.080 inches or thicker.

(4) Prepare the sign base as the sheeting manufacturer recommends.

(5) If using plywood sign bases with prismatic sheeting, use new plywood. For other sign base types, the contractor may use a reconditioned base if previous sheeting materials are removed before applying new prismatic sheeting. Do not remove messages and reapply new messages to existing signs with prismatic sheeting, except as specified for overlays in 643.2.3.2.

(6) Provide a sign support system as follows:

1. For signs mounted on posts, use sign supports and bases that are crashworthy per MASH and comforming as defined in Section 1A.13 of the WMUTCD.
2. For signs mounted on portable sign supports or barricades, use signs and supports from the departments approved products list.

643.2.3.2 Sign Message Overlays

643.2.3.2.1 General

(1) The contractor may alter the message on standard construction signs by applying demountable plaque overlays or direct-applied pressure-sensitive sheeting overlays. Do not apply more than one overlay per sign. Do not encompass more than one line of the sign message with the overlay. On W20-5 or W20-58 series signs, the contractor may use 2 overlays to independently alter the right/left lane message and the ahead/distance message.

(2) Match the specified letter height, letter series, and letter stroke width of the message on the sign on which mounting plaques or overlays.

(3) Ensure that the reflectivity and the color of the sheeting on plaques or sheeting overlays and base signs are similar enough that the composite sign exhibits the visual impact of one integral sign during both daytime and nighttime.

(4) Match the sign face material for overlays to the base sign reflective sheeting material.

(5) Do not use sign overlays for symbol messages, except for the lane reduction transition sign, WO4-2.

643.2.3.2.2 Demountable Plaque Overlays

(1) For the base material, furnish sheet aluminum conforming to 637.2.1.3. Furnish reflective sheeting for sign face material conforming to 637.2.2.2. Apply the sign message using stencil paste conforming to 637.2.3.2 and clear finish conforming to 637.3.2.5.

643.2.3.3 Sign Covering Material

(1) Furnish sheet aluminum, plywood, or corrugated plastic sign covers conforming to the requirements for sign base materials specified in 643.2.3.1, except the minimum thickness for aluminum covers is 0.040 inches. Do not use tape or other adhesives to fabricate or attach covers.

(2) Ensure that covers are blank, opaque, and match the sign face color or are flat black. Use only one color per sign.

(3) Furnish spacers, 0.08-inch nylon washers that will not damage the sign's reflective face.

643.2.4 Cellular Communication for Portable Changeable Message Signs (PCMS)

Revise 643.2.4(2) to provide a completed portable changeable message sign Integration Request Form.

(1) Furnish a cellular modem registered to a cellular carrier with a 12 volt DC power supply, a built-in security, port forwarding, and IP pass-through capabilities. Ensure that the modem can handle -30 C to +75 C temperatures.

(2) Provide the department with a completed PCMS Integration Request Form.

643.2.5 Temporary Pavement Markings

(1) Furnish pavement marking materials conforming to 646.2.

643.3 Construction

643.3.1 General

(1) Provide and maintain traffic control devices located where the plans show or engineer directs to maintain a safe work zone throughout the contract duration. Relocate as required to accommodate changing work operations. When not in use, place devices away from traffic outside of paved and gravel shoulder surfaces. Where there is barrier on the shoulder, the contractor may place devices not in use on the shoulder as close as possible to the barrier and delineated with drums. Lay signs and supports flat on the grade with uprights oriented parallel to and downstream from traffic. Do not stack devices or equipment. Promptly remove temporary devices from within the project limits as follows:

- That will not be used within 14 consecutive calendar days.
- Within 5 business days of substantial completion unless the engineer allows otherwise.

(2) Attach warning lights to traffic control devices with vandal resistant hardware.

(3) Do not power PCMS and arrow boards with a generator.

(4) Perform traffic control work according to part VI of the WMUTCD for temporary traffic control unless the contract specifies or engineer directs otherwise. Ensure the proper placement and operation of signs and traffic control devices before beginning associated work. Relocate signs and traffic control devices concurrently with moving work operations.

(5) Review signs, traffic control devices, and temporary pavement marking for location, position, visibility, and appropriateness for job conditions immediately after each setup. Do additional reviews as necessary to provide a safe work zone and ensure signs and traffic control devices conform to the contract. Perform work zone reviews from the direction of approaching traffic.

(6) Replace devices the ATSSA guide defines as unacceptable. Maintain traffic control devices on the project at or above the quality the ATSSA guide defines as marginal by doing the following:

1. Keep sheeting on drums, barricades, and other devices clean.
2. Promptly repair sheeting scratches, rips, and tears.
3. Repair or replace devices that have large areas of abrasion or missing sheeting.
4. Replace devices that have excessive color fading.
5. Do not use devices fractured, punctured, dented, or deformed severely enough to affect the overall dimensions, stability, visibility, or reflectivity.
6. Maintain the retro-reflectance of signs, drums, posts, and barricades at a level not less than 50 percent of the minimum value specified for the device-specific reflective sheeting in ASTM D4956 as follows:
    - Rigid signs and barricades: type XI.
    - Roll-up signs: type VI.
    - Devices with reboundable sheeting: type IV.

(7) Replace temporary markings that exceed allowable limits for missing or defective material as follows:

- Ten percent for tape, paint, message, symbol, or raised pavement markers.
- Two consecutive skip lines.
- Fifty continuous feet of solid line.
- Three consecutive temporary raised pavement markers.

(8) Promptly restore traffic control devices damaged or disturbed within 2 hours of becoming aware of a deficiency.

(9) If, in the engineer's judgment, the contractor fails to provide the traffic control required to maintain a safe work zone under the contract, the engineer may restrict construction operations.

643.3.2 Flexible Tubular Markers

(1) Attach bases to the pavement as the plan details show.

(2) Attach the posts to the base using a locking pin or other engineer-approved system. Use new marker posts with reflective sheeting for installation in new locations. The contractor may furnish used posts, in like-new condition with new reflective marking, as replacement posts.

(3) Remove bases in a way that minimizes damage to the pavement. If bolted, remove the bolts below the pavement surface. Repair damage done during removal as the engineer directs.

643.3.3 Arrow Boards

(1) The contractor may use solar arrow boards only in stationary setups.

(2) Operate arrow boards during the hours of darkness at an illumination level of not more than 50 percent of the daytime level. Ensure the following:

- The lamps are visible at a minimum 18 degrees horizontal angle and 8 degrees vertical angle, measured from a perpendicular to the arrow board plane.
- The minimum lamp "on" time is 50 percent and no lamps remain illuminated during "off" time.

(3) Do not display arrows or chevrons by lighting in sequence from left to right, or right to left.

643.3.4 Signs

643.3.4.1 General

Add 643.3.4 to mimimize pavement damage and repair, as directed, following sign base removal for post mounted into concrete.

(1) Install post mounted signs as the plans show. Trim posts neatly with top of sign, so that no portion of the post protrudes above the sign. Do not install signs on existing posts unless the plans show or the engineer or post owner allows. Do not install signs or sign posts on guardrail posts.

(2) Use spacers when fastening a sign or sign cover on existing signs and attach at a minimum of four points per panel as follows:

- For aluminum signs: use 3/16 inch diameter aluminum rivets or aluminum self-tapping screws.
- For plywood signs: use 3/16 inch diameter wood screws.
- Space screws or rivets at least 12 inches apart and at least 1/4 inch from the edge of the cover.

(3) Repair or replace damaged permanent signs resulting from covering as the engineer directs. Remove covers when no longer necessary.

(4) For post mounted sign bases, mark the base stubs with wood lathe painted with high visibility orange paint anytime the signpost is not using the base.

(5) For sign post bases mounted into pavement, remove bases in a way that minimizes damage to the pavement. If bolted, remove the bolts. Repair damage from removal as the engineer directs.

643.3.4.2 Sign Message Overlays

(1) Fasten plaque overlays to base signs with 4 bolts or screws, one in each corner of the plaque. Apply sheeting overlays so that no curling or lifting of the overlay occurs during use. Promptly replace the sign if any part of the overlay curls or lifts.

(2) Position plaques or sheeting overlays on base signs so that they appear to be an integral part of the message. Ensure that plaques or sheeting overlays completely cover the underlying sign message that is no longer applicable. Do not overlay any other part of base sign messages, or let the overlay extend beyond the base sign border.

643.3.4.3 Covering Signs

(1) If a sign message is no longer relevant, promptly remove the sign or cover all or, if the engineer allows, part of the sign with materials conforming to 643.2.3.3.

- Make Type I sign covers square or rectangular and sized in increments of 12 inches.
- Cover Type II signs completely.

643.3.4.4 Fixed Message Signs

(1) Custom signs, or standard signs with a dimension greater than 60 inches are fixed message signs. If fastening a fixed message sign to an existing sign, completely cover the underlying sign message that is not applicable.

643.3.5 Portable Changeable Message Signs

Add 643.3.5(5) to not use PCMS in lieu of arrow board and change name from "cellular" to "traffic management center".

643.3.5.1 General

(1) Ensure that the Portable Changeable Message Sign (PCMS) is level and operating satisfactorily before activating. Maintain the PCMS in good working condition. Repair damaged or malfunctioning PCMS units within 2 hours after discovering a problem.

(2) Place the sign so that in the operating mode the bottom of the message panel is 7 feet or higher above the top of curb or near edge of pavement. In rural areas with no view obstructions, the contractor may reduce the minimum mounting height to 5 feet. Orient the message panel so the message is legible from 850 feet under both day and night conditions.

(3) Store predetermined messages in the controller memory for recall on demand. In addition, store other messages as the engineer directs. Display messages using all upper case alphanumeric characters 18 inch high by 11 inch wide.

(4) Provide password protection to the PCMS control unit unique to the project.

(5) Do not use PCMS in lieu of an arrow board.

643.3.5.2 Traffic Management Center Communication

(1) Install the cellular modem in a lockable, weatherproof compartment in the PCMS. Mount the antenna at the highest practical location on the PCMS.

(2) A minimum of 14 days before deployment, demonstrate to the department that the cellular modem is capable of communications with the Traffic Management Center (TMC). If remote communications are interrupted or temporarily unavailable, the department will notify the contractor to change messages manually. Update messages within 2 hours of receiving notification.

643.3.6 Traffic Channelizing Curb Systems

(1) Install curb sections according to the channelizing curb system manufacturer's recommendations,

(2) Remove systems in a way that minimizes damage to the pavement. Repair damage done during removal as the engineer directs.

643.3.7 Temporary Pavement Marking

(1) Construct conforming to the following:

General marking 646.3.1.1
Long-line 646.3.1.2
Removing marking 646.3.1.4

(2) Do not groove in temporary marking.

(3) Apply liquid marking and glass beads uniformly across the line at or exceeding the following:

LIQUID MARKING	THICKNESS (mils)	BEAD APPLICATION (pounds per gallon)
Paint	12	4 - 5
Epoxy	16	12 - 15

(4) If installing raised pavement markers at a new location, use new markers. If installing replacement markers, the contractor may install used markers in like-new condition.

(5) For pavements open to traffic, apply long-line marking as follows:

- On intermediate layers, including milled surfaces, on the same day the pavement is placed or milled.
- On the upper layer, on the same day the pavement is placed unless the contractor applies permanent marking on the same day the pavement is placed.
- If weather conditions preclude same-day application, delineate the travel lanes with drums, 42-inch cones or type II temporary raised pavement markers and provide signing as the engineer directs. Apply long-line marking as soon as conditions allow. The engineer may restrict operations until these markings are completed.

(6) If required to apply no passing zone temporary pavement marking, reference the beginning and end of existing no-passing barrier lines. Apply temporary no-passing barrier lines at those existing locations. If the contract contains the Locating No-Passing Zones bid item, relocate permanent no-passing zones as specified in 648.

(7) Protect freshly applied paint marking until dry enough to prevent pickup under traffic. Replace temporary marking, including raised markers, that deteriorates or fails to adhere to the extent that the roadway is not adequately delineated.

(8) Inspect and maintain temporary marking, including raised markers, as specified in 643.3.1(7).

643.3.8 Interim Lane Closures

(1) Install and reposition traffic control devices as required to close a traffic lane. Remove and return the devices to their previous configuration when the closure is no longer required.

643.3.9 Traffic Control

(1) Under the Traffic Control bid item, install and reposition traffic control devices as required to restrict access to a portion or all of the roadway to public traffic. This work includes initial set up, stage changes, and removal after the work is completed.

643.4 Measurement

643.4.1 Items Measured by the Day

(1) The department will measure the number of calendar days acceptably completed that each sign or each device under a bid item is in use. The department will not measure a sign or a device on days it is not required. The department will deduct one day for each calendar day a sign or a device is required but out of service for more than 2 hours.

(2) The department will only measure the Traffic Control PCMS bid items on days the PCMS is available for exclusive use under the contract.

643.4.2 Flexible Tubular Markers

(1) The department will measure the Traffic Control Flexible Tubular Marker bid items as each individual installation and removal acceptably completed. The department will measure replacement posts and bases damaged by public traffic.

643.4.3 Fixed Message Signs

(1) The department will measure Traffic Control Signs Fixed Message by the square foot acceptably completed, measured as the area of the sign face.

643.4.4 Covering Signs

(1) The department will measure the Traffic Control Covering Signs bid items as each individual cover/uncover cycle acceptably completed per location, measured as the number of cover/uncover cycles for existing signs. The department will not measure additional cover/uncover cycles as might be required to accommodate the contractor's operations.

643.4.5 Traffic Channelizing Curb Systems

(1) The department will measure Traffic Channelizing Curb System by the linear foot acceptably completed.

643.4.6 Temporary Pavement Marking

(1) The department will measure the Temporary Marking EACH bid items under this section as each individual unit acceptably completed and the Temporary Marking LF bid items under this section by the linear foot of line acceptably completed.

643.4.7 Interim Lane Closure

(1) The department will measure Traffic Control Interim Lane Closure as each individual reposition/return cycle, acceptably completed. The department will not measure additional moves or configuration changes as might be required solely to accommodate the contractor's operations.

(2) The department will measure the closures by traffic lane and roadway. The department will not measure multiple closures in the same traffic lane on a project.

643.4.8 Traffic Control

(1) The department will measure Traffic Control once for the contract acceptably completed and will not include work performed under other specific traffic control contract bid items.

643.5 Payment

643.5.1 General

Revise name from cellular to traffic management center (TMC) for bid item 643.1051 and from radar to feedback trailer for bid item 643.1500.

(1) The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
643.0300	Traffic Control Drums	DAY
643.0400 - 0449	Traffic Control Barricades (type)	DAY
643.0500	Traffic Control Flexible Tubular Marker Posts	EACH
643.0600	Traffic Control Flexible Tubular Marker Bases	EACH
643.0650	Traffic Control Channelizing Curb System	LF
643.0700 - 0799	Traffic Control Warning Lights (type)	DAY
643.0800	Traffic Control Arrow Boards	DAY
643.0900	Traffic Control Signs	DAY
643.0910	Traffic Control Covering Signs Type I	EACH
643.0920	Traffic Control Covering Signs Type II	EACH
643.1000	Traffic Control Signs Fixed Message	SF
643.1050	Traffic Control PCMS	DAY
643.1051	Traffic Control PCMS with TMC Communications	DAY
643.1070 - 1079	Traffic Control Cones (height)	DAY
643.1500	Traffic Control Speed Feedback Trailer	DAY
643.3100 - 3299	Temporary Marking Line (material/type) (width)	LF
643.3300 - 3399	Temporary Marking Crosswalk (material) 6-Inch	LF
643.3500 - 3599	Temporary Marking Arrow (material)	EACH
643.3600 - 3699	Temporary Marking Word (material)	EACH
643.3700 - 3799	Temporary Marking Raised Pavement Marker (type)	EACH
643.3800 - 3899	Temporary Marking Stop Line (material) 18-Inch	LF
643.3900 - 3959	Temporary Marking Diagonal (material) 12-Inch	LF
643.3960 - 3999	Temporary Marking Removable Mask Out Tape (width)	LF
643.4100	Traffic Control Interim Lane Closure	EACH
643.5000	Traffic Control	EACH

643.5.2 Signs and Devices

(1) Payment for the signs and devices bid items is full compensation for furnishing and maintaining those signs and devices. Payment also includes the following:

- Repairing pavement damaged by removing bases under Traffic Control Flexible Tubular Marker Bases.
- Posts or other sign supports as well as partially or fully covering or uncovering signs under Traffic Control Signs and Traffic Control Signs Fixed Message.

(2) The department will not pay for replacing unacceptable signs and devices or for damaged signs and devices.

643.5.3 Covering Signs

(1) Payment for the Traffic Control Covering Signs bid items is full compensation for providing full or partial sign covers, for removing covers, and for repairing or replacing damaged signs.

643.5.4 Temporary Marking

(1) Payment for the Temporary Marking bid items is full compensation for providing the marking or marker; for maintaining, and for removing the marking or marker. Placing and removing temporary markings applied under the 646 contractor option for same-day marking are incidental to the associated permanent pavement marking bid item.

(2) The department will not pay for replacing marking or damaged markers.

643.5.5 Interim Lane Closure

(1) Payment is full compensation for closing and re-opening the affected traffic lane.

643.5.6 Traffic Control

(1) Payment for Traffic Control is full compensation for costs associated with traffic control required under 643 but not included in other 643 contract bid items.