SECTION 1063

TEMPORARY TRAFFIC CONTROL DEVICES

1063.1 Scope. This specification covers material to be used for temporary traffic control devices.

1063.2 General Requirements. All temporary traffic control devices shall be manufactured as shown on the plans and as specified, in accordance with MUTCD requirements and shall be NCHRP 350 compliant. Nominal dimensions will be permitted for dimensional lumber where applicable. All temporary traffic control devices shall exhibit good workmanship and shall be free of objectionable marks or defects that affect appearance or serviceability. The brand name or model number shall be permanently identified on each traffic control device.

1063.3 Channelizers. All channelizers shall be manufactured from a non-metallic material, pigmented and molded of a Highway Orange color throughout and stabilized against fading by ultraviolet or other light rays by the incorporation of adequate inhibitors. Drum-like channelizers shall be closed-top. Retroreflective marking, as shown on the plans, shall be in accordance with Sec 1042 and ASTM D 4956, Supplemental Requirements, Section S2. Retroreflective marking on cones will not be required.

1063.4 Type III Movable Barricades. Type III movable barricades shall be entirely free standing and portable. Marking shall only be applied to one side of the barricade.

1063.5 Signs.

1063.5.1 Rigid Signs.

1063.5.1.1 Sign Substrate. All signs shall be fabricated of substrate designed to provide satisfactory structural rigidity.

1063.5.1.2 Sign Sheeting. All signs shall have a retroreflectorized background. Retroreflective sheeting shall be in accordance with Sec 1042, Type 3 or fluorescent orange, as shown on the plans. Sheeting shall be applied to the sign substrate in accordance with the manufacturer's recommendations and the surface shall be free of air bubbles, wrinkles or other blemishes as determined by the engineer.

1063.5.2 Roll-up Signs.

1063.5.2.1 Sign Substrate. Sign and overlay blanks shall consist of fluorescent orange microprismatic retroreflective sheeting sealed to a heavy-duty coated fabric or vinyl material. The sheeting shall have a minimum coefficient of retroreflection, expressed as candelas per footcandle per square foot (candelas/lux/m^2), as shown below, when measured in accordance with ASTM E 810. The color specifications shall be in accordance with ASTM D 4956. Material shall be submitted by the manufacturer to NTPEP for a minimum exposure time of one year. Results shall be published by NTPEP and available for MoDOT review. For all NTPEP test decks, weathered material shall be within the color specification limits.

Minimum Coefficient of Retroreflection for Fluorescent Orange Sheeting		
Observation Angle, Degrees	**Entrance Angle, Degrees**	**Candelas/footcandle/ft^2 (Candelas/lux/m^2)**
0.2	-4	200
0.2	+30	100
0.5	-4	80
0.5	+30	30

1063.5.2.2 Overlays. Overlays, when used, shall be mechanically fastened to the face of the sign in a manner that will ensure the overlay remains securely attached. Fasteners shall not detract from the appearance of the sign when the overlay is not in use. Velcro fasteners will not be permitted.

1063.5.2.3 Bracing. Each sign shall have a horizontal and vertical cross brace and at least one anti-kiting device located near the center of the sign. Cross braces of sufficient cross-section shall be fastened to each other at the midpoints and the ends securely held to the back of the sign by mechanical means. The design shall ensure that the sign remains taut and retains the sign's intended shape when exposed to normal field conditions.

1063.5.3 Legend and Borders. Legends and borders of all signs shall be vinyl or silk-screened. Vinyl shall be cut by die or a computer-driven cutter. Stencil ink used shall be in accordance with the sheeting manufacturer's recommendations. Free-hand legend and borders will not be permitted.

1063.5.4 Sign Layout and Design. Sign layout and design shall be as shown on the plans or as directed by the engineer.

1063.6 Strobe Lights. Strobe lights shall be 12/24 VDC battery or solar-powered with amber fresnel, high-profile lenses. Strobe lights shall have a flash rate of 60 to 80 flashes per minute. Each strobe light shall provide no less than 500,000 candlepower (5.382×10^6 lux) of illumination. Each light shall be fully visible through an arc of approximately 120 degrees when viewed facing the sign.

1063.7 Flashing Arrow Panels. All lamps shall have a nominal 5-inch (125 mm), 360-degree tunnel visor. A lamp on the back side of the flashing arrow panel shall be continuously energized during operation of the flashing arrow panel. Lamps shall be visible at an angle of 15 degrees to the left and right of center and 4 degrees above and below center during "on" time. The flashing arrow panel shall contain a device to align the arrow panel to oncoming traffic. Arrow panels shall be capable of displaying the flashing arrow, flashing double arrow and four corner flashing caution modes. Solar-powered flashing arrow panels shall be capable of operating in the flashing arrow mode for 20 consecutive days and shall be provided with a device to indicate the remaining charge in batteries.

1063.7.1 Trailer-Mounted Flashing Arrow Panels. Trailer-mounted flashing arrow panels shall be MUTCD, Type C. Trailer-mounted flashing arrow panels shall be 4 feet (1.2 m) high and 8 feet (2.4 m) wide and shall have a minimum of 15 lamps. Trailer-mounted flashing arrow panels shall be solar powered.

1063.7.2 Truck-Mounted Flashing Arrow Panels. Truck-mounted flashing arrow panels shall be MUTCD, Type B. Truck-mounted flashing arrow panels shall be 30 inches (0.75 m) high and 60 inches (1.5 m) wide and shall have a minimum of 13 lamps.

1063.8 Changeable Message Sign. Each Changeable Message Sign (CMS) shall consist of a message board, solar power supply, computer interface and mounting and transporting equipment.

1063.8.1 Message Board. Each sign shall consist of three lines containing eight individually changeable characters per line. Each character shall be yellow in display on a black background. The CMS shall be legible up to a distance of 650 feet (200 m) for both day and night operation.

1063.8.2 Computer Interface. The CMS shall have a modem and cellular phone capable of receiving a message over standard phone lines from a remote location and forwarding the message to the CMS controller to change the displayed message. Modems shall have a minimum baud rate of 14,400 bytes per second. In addition to the modem, the CMS shall have the necessary hardware to allow the message to be changed from the CMS location without a phone line connection. A minimum 5-foot (1.5 m) connecting cable shall be provided to connect the CMS controller to a notebook computer. The supplier shall provide the Commission the required software and licenses necessary to change the message from a remote location. This software shall be compatible with Windows 98, NT and 2000 operating systems and shall be able to issue Hayes or Hayes-compatible modem commands. The supplier shall provide technical assistance with the installation and operation of software.

1063.8.3 Solar Power Supply. The power supply shall use a battery bank with sufficient capacity to operate a full display of characters for 20 consecutive days with no sun. All terminals and connections shall be clearly labeled.

1063.8.4 Support. A factory trained service representative shall be available at the delivery location to provide technical assistance, including the installation and operation of software. No additional payment will be made for travel expenses.

1063.9 Portable Traffic Signals. Each portable traffic signal (PTS) system shall consist of two trailer-mounted PTS units, a controller assembly and communication link. Each PTS unit shall consist of signal heads and indications, a solar power supply, vehicle detection and mounting and transporting equipment. All components shall be capable of operating in a temperature range of -20 to 120 F (-30 to 50 C).

1063.9.1 Controller Assembly. The controller assembly shall be a minimum two-phase, solid-state traffic signal controller with a conflict monitor capable of operating the signals in accordance with MUTCD requirements and NEMA Standard TS1. The controller shall operate as a fully-actuated unit and shall have the capability of being manually operated to display simultaneous red on both phases. The controller shall be capable of red rest during non-actuated periods. Upon detection of a conflict, the system shall change to a solid red clearance interval followed by flashing red.

1063.9.2 Communication Link. A continuous communications link between the PTS units shall be provided. If a break in communications between the PTS units occurs, the system shall change to a solid red clearance interval followed by flashing red. Upon restoration of communications, the system shall change to a solid red clearance interval followed by normal operations.

1063.9.3 Signal Heads and Indications. Each unit shall consist of two polycarbonate signal heads, including backplates and visors. One signal head shall be mounted on the mast arm assembly and the other on the vertical upright. The signal head mounted on the mast arm shall provide a minimum lateral clearance of 9.5 feet (2.9 m) from the center of the outer signal head to the edge of the trailer and a minimum vertical clearance of 16 feet (4.88 m) from the bottom of the backplate to the roadway surface. The signal head mounted on the vertical

upright shall provide a minimum clearance of 8 feet (2.4 m) from the bottom of the backplate to the roadway surface. All signal indications shall be 12 inches (300 mm) in diameter. Traffic signal heads and indications shall be in accordance with the vehicle traffic control signal head requirements of ITE and NEMA Standard TS1 and TS2.

1063.9.4 Solar Power Supply. The power supply shall use a battery bank with sufficient capacity to operate the PTS for 20 consecutive days with no sun. All terminals and connections shall be clearly labeled.

1063.9.5 Vehicle Detection. Detection shall be provided by one of the non-intrusive vehicular detection methods specified in Sec 902 or temporary loop detectors with the capability of providing coverage for a 6-foot x 30-foot (1.8 m x 9 m) area. Temporary loops shall be preformed at the factory. The temporary loops shall have self-adhesive rubberized asphalt backing, which shall bond to the pavement.

1063.9.6 Support. A factory trained service representative shall be available at the delivery location to provide technical assistance and training, including the installation and operation of software. No additional payment will be made for travel expenses.

1063.10 Radar Speed Advisory System. Each radar speed advisory system shall consist of a radar unit, speed display, speed limit display, solar power supply and mounting and transporting equipment.

1063.10.1 Radar Unit. The radar unit shall include necessary cables for connection to the digital display and power supply, shall be capable of instantaneously displaying and locking readings and shall meet the following minimum requirements:

Radar Unit Requirements	
Speed range	15 to 99 mph
Accuracy	±1 mph
Internal test	32 mph check

1063.10.2 Speed Display. The speed display shall be a minimum of 12 inches (300 mm) high and shall be capable of displaying the radar unit output from 0 to 99 mph.

1063.10.3 Speed Limit Display. The speed limit display shall indicate the work zone speed limit by means of a 36 x 48-inch (900 x 1200 mm) speed limit sign. The speed limit sign may be comprised of a rigid or roll-up sign or a rigid sign with a variable speed display. The variable speed display shall be a minimum of 12 inches (300 mm) high and shall be capable of displaying two digits.

1063.10.4 Solar Power Supply. The power supply shall be capable of operating the radar unit, speed display and speed limit display, if applicable, for a minimum of eight hours per day.

1063.11 Truck Mounted Attenuators. Each Truck Mounted Attenuator (TMA) shall be in accordance with Test Level 3 criteria as set forth in NCHRP 350. Each TMA shall have a standard trailer lighting system, including brake lights, taillights, turn signal lights and Federal Motor Carrier Safety Administration identification bar lights. In the operating position, the rear facing of the TMA shall be marked with alternating 8-inch (200 mm) yellow and 8-inch (200 mm) black retroreflective sheeting. The marking shall form an inverted “V” at the center and slope downward at an angle of 45 degrees toward each side of the unit. The TMA shall be marked with this same pattern and shall have the same standard trailer lighting system noted above when the unit is in the transport position.

1063.12 Certification. The contractor shall furnish a manufacturer's certification for all material governed by this specification. The certification shall indicate full compliance with each applicable specification.