

SECTION 800 – TRAFFIC CONTROL DEVICES AND LIGHTING**SECTION 801 – TRAFFIC CONTROLS FOR CONSTRUCTION AND
MAINTENANCE OPERATIONS****801.01 Description**

This work shall consist of furnishing, placing, and maintaining signs, barricades, temporary pavement markings, and other traffic control devices at construction and maintenance operations in accordance with 105.03.

MATERIALS

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801.02 Materials

Materials shall be in accordance with the following:

	Coarse Aggregate, Class D or Higher, Size No. 73	904
	Construction Warning Lights	923.03
	Delineator Posts.....	910.15
	Delineators.....	926.02
	Field Paint	909.04
	Flashing Arrow Sign.....	923.04
20	Flexible Delineator Posts.....	926.01
	Pavement Marking Materials.....	921
	Portable Changeable Message Sign.....	923.05
	Steel Posts	910.14
	Temporary Barrier Delineator	926.02(d)
	Temporary Highway Illumination Materials	807
	Temporary Panel Signs.....	919.01
	Temporary Pavement Marking Tape.....	923.01
	Temporary Raised Pavement Markers.....	923.02
	Traffic Signal Materials and Equipment.....	922
30	Traffic Signs	802
	Tubular Marker.....	923.07
	Wood Sign Posts	911.02(e)
	Worksite Speed Limit Sign Assembly.....	923.06

Non-ground mounted temporary traffic sign backing material and supports shall both be certified to meet NCHRP 350 crash test standards and approved for use by the FHWA. Roll-up materials will not be allowed. A copy of the FHWA acceptance letter shall be provided to the Engineer upon request.

40 The background of construction signs shall be reflective sheeting in accordance with 919.01(b)1. The sheeting type used for construction signs shall be the same for the entire project. Reflective sheeting for drums shall be in accordance with 919.01(b)1. Effective on project lettings after July 1, 2006, the background for all construction signs shall be fluorescent orange reflective sheeting.

Steel sign posts need not be galvanized.

50 Wood posts for temporary panel signs shall be dense southern yellow pine or design calculations shall be provided to the Engineer identifying the type of wood and verifying the location and size of the holes to be drilled through the posts to provide break-away capability.

All temporary traffic control devices which will become the property of the Department shall be a new product at the time of final acceptance.

60 The basis for use for traffic paint; durable pavement marking materials; temporary marking tape type II; glass beads; barrels; barricades; construction warning lights; steel posts; temporary panel signs; traffic signs, except non-ground mounted signs; tubular markers; and wood sign post used for temporary traffic control will be visual inspection.

The connecting bolt or threaded rod used to connect adjoining sections of temporary barrier wall shall have a tensile strength of 120,000 psi. The spacers used between adjoining sections of temporary barrier wall shall be in accordance with ASTM A 36 with a tensile strength of 58,000 psi.

CONSTRUCTION REQUIREMENTS

801.03 General Requirements

70 The applicable requirements of the MUTCD shall apply to the installation and materials for traffic control devices subject to the requirements of 107.08 and 107.12. When the plans do not include a maintenance of traffic plan, the Engineer will provide such a plan to the Contractor. The Contractor shall be responsible for the field layout, placement, operation, maintenance, and removal of temporary traffic control devices. A worksite traffic supervisor certified by the American Traffic Safety Service Association, ATSSA, or approved equal certifying organization, shall direct all field layout, placement, operation, maintenance, and removal of temporary traffic control devices. The certified worksite traffic supervisor, CWTS, shall ensure that all traffic control devices, except temporary concrete barrier, meet acceptable standards as outlined in the plans, specifications, and ATSSA's "Quality Standards for Work Zone Traffic Control Devices" prior to installation. The CWTS shall also, prior to installation, ensure that all traffic control devices can be installed in accordance with the plans, specifications, and the MUTCD. All problems shall be reported to the Engineer so a resolution can be worked out prior to installation. The field layout will be reviewed and concurred with by the Engineer prior to placement of any temporary traffic control devices. The CWTS shall be present for the initial setup and all phase changes during the life of the project. The CWTS may designate responsible Contractor personnel to perform day to day operation and maintenance of the temporary traffic control devices. These responsible personnel shall work under the direction of the CWTS and their names shall be given to the Engineer on

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the project. A copy of the CWTS's certification shall be provided to the Engineer prior to the start of construction or placement of temporary traffic control devices or if the worksite traffic supervisor changes.

Regulatory control devices shall be erected only as directed.

Advisory speeds to be posted will be determined by the Department.

100 The names and telephone numbers of the superintendent and one other responsible employee shall be furnished. Such employees shall be on call or available at night, on weekends, or during other non-working periods to repair or replace all traffic control devices which may become damaged or inoperative.

When traffic lanes are restricted and when specified as a pay item, a patroller shall inspect and maintain traffic control devices. The patroller shall patrol the construction zone and shall immediately correct, maintain, and repair traffic control devices or notify the Contractor designated persons for immediate repair to such traffic control devices. A full time patroller shall be on duty during periods when work is not in progress.

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Temporary traffic control devices shall be maintained continuously, except as described herein, to ensure visibility and to protect the public. All reflective sheeting backgrounds and lights shall be kept clean of foreign matter. The Contractor shall complete a "Traffic Control Device Report" weekly. This report is supplied in the Proposal Book for the contract and is to insure that the traffic control devices are looked at daily. The report does not always need to be filled out by the CWTS but shall be reviewed by the CWTS for completeness and accuracy. The report shall be signed by the person who filled it out and initialed by the CWTS that it was reviewed. The Engineer will sign and date the report when received. The Engineer will not be responsible for the report's completeness and accuracy. If the CWTS feels that a situation exists where the temporary traffic control devices do not need to be checked daily for a certain period of time, the CWTS and the Engineer shall agree on how often they shall be checked.

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The location by reference post and the date and time of operation of Temporary Worksite Speed Limit sign assemblies shall be recorded daily on a form provided by the Department. The completed report shall be submitted weekly to the Engineer. The report shall be completed and signed by the CWTS or their designee and shall be reviewed by the CWTS for completeness and accuracy.

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Except for construction warning lights and temporary signals, the ATSSA brochure titled Quality Standards for Work Zone Traffic Control Devices will be used as a guide to determine if temporary traffic control devices are Acceptable, Marginal, or Unacceptable as defined in the brochure. Upon initial setup and phase changes of temporary traffic control devices, all individual devices shall be of the Acceptable classification. A device not completely covered or removed when the message does not apply or when directed, will be considered unacceptable.

140 A temporary traffic control device will be deemed to be in non-compliance when considered Unacceptable. A type of temporary traffic control device will be deemed to be in non-compliance when 25% or more of the individual devices are considered Marginal. Damages may be assessed in accordance with 105.14 for non-compliance.

Non-compliance of construction warning lights will be in accordance with 801.14.

150 All barricades, signs, or flashing arrow signs shall be moved from one location and re-erected at another location as shown on the plans or as directed.

Where two-way traffic is to be maintained on a one-way pavement, and where the existing shoulders on such roadway are earth, aggregate No. 73 shoulders shall be compacted in accordance with 303.06 as shown on the plans. Compacted aggregate shoulders shall remain in place unless subsequent construction activities on the contract require its removal.

160 Temporary drainage structures, temporary concrete median barrier units, and other temporary devices required and used for traffic maintenance shall remain the property of the Contractor.

801.04 Construction Signs

Construction signs shall include the typical sign standards or posts which support the sign, all necessary hardware, and specified construction warning lights.

170 A route or lane closure notice sign shall consist of a construction sign type A, in accordance with 801.04(a), which indicates route or lane closure. The sign shall be mounted for a maximum of 14 calendar days and a minimum of seven calendar days before the closure date shown on the sign. The sign shall be removed when the route or lane is closed.

Trailers in accordance with 910.14(f) may be used as supports for portable construction signs. The trailer shall be located to hold the sign in a proper position. The position of the tongue shall be so as to cause no hazard to traffic. Wheel chocks other than sandbags shall not be used. The tongue may be pinned to reduce wind-induced rolling if designed to pull up or break from vehicle impact. During non-working hours, trailers with signs that do not apply to existing conditions shall be stored in accordance with 107.08(c).

180 Sign posts and their foundations shall be located and constructed to hold signs in a proper position; to resist swaying, turning, or displacement; and minimize the hazard to motorists. No rigidly fixed sign supports will be allowed in exposed areas where it would be practicable to utilize a breakaway or yielding type design. Signs shall be completely covered or removed when the message does not apply.

If the work on a project, or a portion thereof, is not active, and the roadway is open to unrestricted traffic, construction signs may be removed until work resumes. Removal of such signs shall not relieve the Contractor of responsibilities or liabilities described elsewhere herein.

190 Temporary mounted construction signs shall not be used for operations which affect traffic lanes or paved shoulders. Temporary mounted construction signs shall not be used or left in place during nighttime hours.

(a) Type A

A type A sign shall consist of a construction sign as detailed in the MUTCD or on the standard drawings which is 9 sq ft or more in area.

(b) Type B

200 A type B sign shall consist of a construction sign as detailed in the MUTCD or on the standard drawings which is less than 9 sq ft in area.

(c) Type C

A type C sign shall consist of a construction sign which is not detailed in the MUTCD or on the standard drawings and which is 9 sq ft or more but less than 33 sq ft in area.

(d) Type D

A type D sign shall consist of a construction sign which is not detailed in the MUTCD or on the standard drawings and which is less than 9 sq ft.

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(e) Temporary Panel Sign

A temporary panel sign shall consist of a sign fabricated and constructed in accordance with 919.01 and which is greater than 33 sq ft. Temporary panel signs shall be mounted on wood posts as shown on the plans or as approved by the Department. External bracing shall not be used.

801.05 Detour Route Marker Assembly

220 Detour route marker assemblies shall be on a single post for a single route or may be on multiple posts for multiple routes. When two routes are being detoured across a common roadway, each route shall be shown by a separate detour route marker assembly. A detour route marker assembly-multiple route shall be used for three or more routes across a common roadway.

801.06 Road Closure Sign Assembly

Road closure sign assemblies shall be used at each road closure location where type III-A barricades or type III-B barricades are used. Road closure sign assemblies shall not be used within lane closures where adjacent lanes remain open to traffic, unless otherwise directed. Road closure sign assemblies may be required at other locations as directed.

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Permanent road closure sign assemblies shall be left in place after the contract is completed and shall become the property of the Department. They shall be installed just prior to final acceptance of the contract. Supports shall be painted with white field paint for wood.

801.07 Barricades

Barricades shall include rails, posts, and all incidentals necessary to complete this part of the work.

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High intensity reflective sheeting shall be placed on specified rails of all barricades. The colors for temporary barricades shall be orange and white, and for permanent barricades red and white.

All type III barricades shall be skid mounted within pavement, shoulder, or sidewalk areas, and on ground mounted posts in all other areas. Type III barricades shall be used on all slopes which are 3:1 or flatter for roadway closures.

(a) Type III-A Barricade

250 The type III-A barricade shall have rails which are reflectorized on one side and shall be used for roadway closures and lane closures where traffic can approach from only one side.

(b) Type III-B Barricade

Type III-B barricades shall have rails which are reflectorized on both sides and shall be used for roadway closures and lane closures where traffic can approach the barricade from both sides.

(c) Permanent Type III Barricade

260 Permanent type III barricades shall be 10 ft sections and shall be left in place after the contract is completed, and shall become the property of the Department. Permanent type III barricades shall be installed just prior to final acceptance of the contract. All non-reflectorized wood and non-galvanized steel shall be painted with white field paint. Such barricades shall otherwise be in accordance with 801.07(a).

801.08 Cones and Tubular Markers

Cones shall be made of a material to withstand impact without damage to striking vehicles. They shall have a substantial base to restrict overturning. Cones and tubular markers shall be as shown on the plans.

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Cones shall be used only during temporary activities where portability is advantageous and they remain in place and do not create a hazard to traffic. The use of cones in lieu of drums will be allowed as shown on the plans except cones shall not be used for interstate lane restrictions.

Tubular markers shall be used for separating two-lane two-way traffic as shown on the plans or as directed.

Cones and tubular markers shall be secured in place either by weighting or adhesives. The use of metal bases will not be allowed.

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801.09 Drums

Drums shall be molded orange polyethylene.

The shape of the drum shall appear basically cylindrical to the motorist from any direction in any given application. The top outside diameter shall not exceed the bottom outside diameter. Drums shall be multisided, elliptical or have a flattened side to inhibit rolling.

290 The top section of the drum shall have at least one construction warning light mounting bracket. The minimum drum height is exclusive of lifting handles or construction warning light mounting brackets.

The drums shall stand on end, be stable against overturning, and shall be internally or externally ballasted to resist wind speeds of up to 50 mph and gusts created by traffic. The weight of the ballast shall be 45 to 55 lb. The top of the drum shall be free from openings. Internally ballasted and externally collar ballasted drums shall not be mixed in each continuous set-up.

300 Internal ballast shall be sandbags, a molded plastic base filled with sand and closed with a locking cover, or a solid rubber base. The internal ballast shall be placed in the lower 1/4 of the drum. The ballast device shall be self-draining.

310 The external ballast shall be two rubber tire base collars. The tire base collars shall have a circumferential contact with the road surface. The maximum diameter of the tire base collar shall not exceed 36 in. The height of two tire base collars at the outside edge shall not exceed 5 in. The rubber ballasting collars shall be clean cut, proper in size, black in color, and not curved up at the edges. The interior and exterior circumference of the collar shall not be slit or cut. Drums which are external collar ballasted shall not be used in situations where the width of the collar interferes with proper placement of the drum. The Department's Guidelines for External Ballast will be used for determining acceptability of rubber tire base collars.

Upon impact by a vehicle traveling at a speed of 55 mph, the drum and ballast device shall be of a type that enables the body of the drum to separate from the base, thus allowing vehicles to easily pass over the base.

320 Flexible encapsulated lens reflective sheeting shall be used to achieve reflectorization. Construction warning lights shall be used in accordance with 801.14 and as shown on the plans and shall be securely fastened to the mounting brackets. Signs shall not be mounted on drums.

Permanent drums shall be left in place after the contract is complete, and shall become the property of the Department. They shall be installed just prior to final acceptance of the contract.

801.10 Temporary Traffic Barriers

Temporary traffic barrier shall be one of the following four types as shown on the plans.

330 **Type 1**

Type 1 temporary traffic barriers shall be used to separate two-way traffic and shall be precast concrete in accordance with applicable requirements of 707 and 602 and as shown on the plans. Type 1 barriers may also be used to separate traffic from the work zone. The surfaces of individual precast units shall vary no more than 1/4 in. in 10 ft from the specified cross section, as measured from a longitudinal straightedge. The maximum variation in the vertical and horizontal alignment of adjacent units shall be 1/4 in. across the joint, as measured from a 10 ft longitudinal straightedge. Sections that have obvious defects or visual cracks shall not be used. Sections that develop any of these conditions during the contract shall be repaired
340 with concrete or replaced within a reasonable amount of time.

Type 1 barrier units precast prior to 2003 shall not be used after January 1, 2012. Units precast after March 1, 2003 shall be clearly marked with the name or trademark of the manufacturer, the year of manufacture, and "INDOT". The markings shall be indented on an end or on the top of each barrier section. Units precast after January 1, 2007 shall be from the Department's list of Certified Precast Concrete Producers.

Type 2

350 Type 2 barriers may be used to separate traffic from the work zone. Type 2 temporary traffic barriers shall meet the appropriate test level 2 or 3 NCHRP 350 crash test standards and shall be approved for use by the FHWA. A 350 crash test letter of approval from the FHWA shall be provided the Engineer prior to placing the unit. The unit selected shall be appropriate for the location considering the maximum posted speed limit on the project and the allowable area for deflection. The unit shall be installed according to the manufacturer's recommendations.

If concrete barriers are used as type 2 barriers, they shall be in accordance with the requirements for type 1 barriers.

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Type 3

Type 3 temporary traffic barriers shall be those type 1 temporary traffic barriers that are to be left in place at the completion of the contract and shall become the property of the Department. They shall be in like-new condition at the completion of the contract. All necessary delineation and required anchor systems shall be left in place.

Type 4

370 Type 4 temporary traffic barriers shall be those types that are intended to be readily moveable to accommodate the shifting of traffic lanes on a daily basis to better facilitate the changing volumes of traffic during the peak hours of a day. Type 4 temporary traffic barriers shall meet the appropriate test level 3 NCHRP 350 crash test standards and shall be approved for use by the FHWA. A 350 crash test letter of approval from the FHWA shall be provided the Engineer prior to placing the unit.

(a) Placement

Temporary traffic barriers shall be located as shown on the plans or as directed. Temporary traffic barriers used to close a lane of traffic shall be flared at the rates as shown on the plans for the applicable regulatory speed within the construction zone.

380 If field conditions are such that the required flare rate cannot be utilized, the tapered alignment may be altered, with approval, to a 10:1 flare rate with a 20 ft minimum offset from the edge of the through traffic lane to the approaching end of the flared temporary traffic barrier. If field conditions are such that that the 10:1 flare rate cannot be utilized, the tapered alignment may be further altered, with approval, to a 6:1 flare rate with the 20 ft minimum offset. Flare rates for ends of temporary traffic barriers at locations where a lane of traffic is not being closed to traffic or where the lane has already been closed shall be the same as above, however the minimum offset from the edge of the through traffic lane may be 10 ft. The use of flare rates sharper than those shown on the plans may require additional traffic control devices

390 as directed.

Type 2 barriers shall not be intermixed with type 1 or type 3 barriers in any run. Type 2 barriers from different manufacturers shall not be intermixed in any run.

(b) Connection

Type 1 and type 3 barrier sections shall be connected as follows:

- 400 1. The adjacent barrier sections shall be placed end to end, with sufficient overlapping of the smooth bar hooks to allow placement of the connecting bolt or threaded rod and the top spacer.
2. The adjacent barrier sections shall then be moved in opposite directions for a sufficient distance to develop the maximum contact between the smooth bar hooks and the connecting bolt or threaded rod.
- 410 3. The bottom spacer and nut shall then be placed as shown on the plans. The nut shall be sufficiently tightened to eliminate all gaps between the adjacent bolt heads, spacers, nuts, and washers which form the connection.

Type 1 and type 3 precast units which have previously been cast meeting earlier Department standards may be used. The Contractor will be allowed to mix type 1

and type 3 units in a run as long as the units are in good condition and the connecting devices are compatible. If units meeting earlier Department standards are used, a 1 in. bolt will be allowed to link the units together. The spacer detail shall, however, be in accordance with the current standard. Units cast after March 1, 2003 shall be linked with the 1 1/4 in. bolt.

- 420 Type 2 temporary traffic barriers shall be connected as recommended by the barrier manufacturer.

(c) Anchorage

Type 1 and type 3 temporary traffic barriers shall be anchored in accordance with the methods shown on the plans, at the locations described herein. Type 2 barriers shall be anchored as recommended by the barrier manufacturer and at locations described herein. Temporary concrete traffic barriers shall be anchored when located on or within 60 ft of a bridge, and along tapered alignments. Anchoring at locations in addition to those described herein will be required when directed.

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Chemical anchor systems with removable bolts, or mechanical anchors may be used to anchor type 1 barriers to bridge decks, concrete pavement, and concrete shoulders. Mechanical anchors may be ferrous or non-ferrous material. All anchors shall have a shear strength of 10,000 lb and an ultimate pullout strength of 6,500 lb.

Non-ferrous mechanical anchors shall be installed such that the top end of the sleeve is a minimum of 2 1/2 in. below the final finished concrete surface.

- 440 Ferrous mechanical anchors shall be completely removed when no longer required. All damage to the pavement shall be repaired as directed.

Non-ferrous anchor sleeves and the chemical adhesive component of chemical anchor systems may remain in place when no longer required. The holes remaining in the pavement shall be filled with appropriate material as directed.

(d) Delineation

- 450 Type 1 barriers used to separate two-way traffic shall be delineated with top mounted temporary barrier delineators and with side mounted delineators. The top mounted delineators shall be two-sided, shall be yellow, and shall be placed on every other section of barrier wall. The top mounted delineators shall be mounted perpendicular to the direction of traffic flow. The side mounted delineators shall be yellow and shall be mounted in accordance with 602.03(f).

Temporary traffic barriers in locations other than separating two-way traffic shall be delineated with either type C construction warning lights or top mounted temporary barrier delineators and with side mounted barrier delineators. The type C lights or the top mounted barrier delineators shall be spaced at the number of feet equal to the number of miles per hour in the posted speed limit with a minimum spacing of 20 ft. Bi-directional lenses will be required on the warning lights when the

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460 barrier is adjacent to a lane that is carrying alternating one-way traffic. The color of the barrier delineators shall be white when located on the right side of the traffic lane, and yellow when located on the left side of the traffic lane. The color of the barrier delineators shall be white when located adjacent to a lane that is carrying alternating one-way traffic.

Where the temporary traffic barrier is located along a tapered alignment and is located behind drums or other reflective delineation devices, the type C construction warning lights and barrier delineators shall not be used.

470 **(e) End Treatment**

Where possible, the ends of temporary traffic barriers shall be flared in accordance with 801.10(a). Where conditions do not allow the temporary traffic barrier to be flared in accordance with 801.10(a), appropriate end treatments shall be incorporated to protect vehicles from the ends of the barriers. The end treatments shall have re-direct capability and shall meet the appropriate test level 2 or 3 NCHRP 350 crash test standards and be approved for use by the FHWA.

(f) Storage

480 No barrier segments shall be stored on the right-of-way unless written permission is given by the Department. Requests for permission to store traffic barrier segments on the right-of-way will not be accepted until after the contract has been awarded.

801.10.1 Construction Zone Energy Absorbing Terminal, CZ

490 The construction zone energy absorbing terminal, CZ, shall have passed NCHRP 350 level 3 crash test for all Interstate and other construction sites having a construction zone speed limit in excess of 45 mph and level 2 for non-Interstate construction sites having a construction zone speed limit of 45 mph or less. All energy absorbing terminal, CZ, shall have redirect capabilities and shall be approved by the FHWA. A copy of the crash test results and a copy of the FHWA approval letter shall be furnished to the Engineer prior to the installation of the unit. The Contractor may also use the Guard Rail Energy Absorbing Terminal CZ, manufactured by Energy Absorption Systems, Inc. until January 1, 2011. All units of this type in use shall be replaced with a compliant product immediately after this date regardless of the date of letting. No additional payment will be made for this replacement.

The unit's nose cover shall be reflectorized to provide improved visibility.

500 Assembly and installation of the unit shall be supervised or performed at all times by an installer trained and certified by the unit's manufacturer. The size, assembly, and installation shall be in accordance with the manufacturer's recommendations at the locations shown on the plans. When required for bi-directional traffic protection, transition panels and all other necessary hardware shall be included in the installation. A copy of the installer's certificate shall be

provided to the Engineer prior to the start of work.

The Contractor shall provide the Department with all necessary manufacturer's installation manuals and working drawings in accordance with 105.02.

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Sufficient spare parts or complete units shall be stored in a safe, convenient, nearby location. Such standby materials are not shown in the Schedule of Pay Items. The standby materials shall be utilized to repair or replace damaged units in the shortest time possible. Standby materials used in the repair of damaged units shall be replaced within 24 h of their use.

801.11 Temporary Crossovers

Temporary crossovers shall be either type A or type B as shown on the plans and shall be constructed in accordance with the applicable sections of 207, 402 or 520 502. If applicable, a CMDS shall be submitted to the Engineer for approval. Utilization of the Department provided spreadsheet is not required. When required to maintain median drainage, a 15 in. diameter pipe shall be placed at the centerline of the median under the crossover. If the crossover is to remain in place for future construction, the pipe shall have appropriate grated box ends in accordance with 715.

The pavement structure for the temporary crossover shall be as shown on the plans.

530 Traffic control devices, including temporary pavement markings, shall be as shown on the plans. Separation of opposing vehicular traffic between two crossovers shall be as shown on the plans.

Refurbishing of a temporary crossover shall consist of the removal of drums or earth cover from an existing temporary crossover. The temporary crossover shall be patched and resurfaced as directed. Excavated soil resulting from the refurbishing operation, if not used as a part of the contract work, shall become the property of the Contractor. Removed drums will remain the property of the Department.

540 After construction is complete, and prior to the opening of all lanes to traffic, the temporary crossover shall be removed or closed.

Where guardrail is required to be removed for construction or refurbishing of crossovers, such removal and subsequent re-erection shall be done as shown on the plans or as directed.

Acceptance of HMA for temporary crossovers will be in accordance with 402.09.

801.12 Temporary Pavement Marking

550 Temporary pavement markings shall be new materials placed in accordance with 808.04 and 808.05. However, when temporary markings are to be in place for 14

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calendar days or less the dashed line pattern used on center line and lane lines may be 4 ft line segments on 40 ft centers and gore areas shall be marked by outline only and may be 5 in. wide lines. No-passing zones on all undivided two-way roadways shall be identified with signs and centerline markings. All temporary markings shall be maintained and replaced until they are no longer applicable.

560 Where possible, when non-removable temporary markings are used on a final surface, such markings shall be placed at the same location where permanent markings will later be affixed or parallel to and within 12 in. of the permanent marking pattern.

Where temporary pavement markings are to be placed on a pavement which has existing markings, the existing markings which conflict with the temporary markings shall be removed in accordance with 808.10.

570 When working under traffic, the temporary pavement markings shall be placed before opening the lane to traffic. This shall include, but not be limited to, the marking patterns of gore areas, outside edge line of deceleration and acceleration lanes, narrow bridge markings, lane reduction transitions, lane lines, centerlines, and transverse markings as appropriate.

580 Temporary pavement markings which are to be in service from December 1 through the following March 31 shall be painted markings. Such markings shall be placed in the standard pavement marking pattern and applied prior to the suspension of the work, or within seven work days after the Contractor is directed to place the markings. Adjustments to these dates to accommodate actual seasonal suspension and continuance of work are subject to approval by the Engineer upon written request.

The prismatic reflectors shall be removed from snowplowable raised pavement markers which conflict with the temporary traffic marking pattern. Snowplowable raised pavement marker castings damaged by the removal of the reflector shall be replaced in accordance with 808.11. New prismatic reflectors shall be mounted on existing castings in accordance with 808.11 when the final traffic pattern is established.

Removal of temporary pavement markings shall be in accordance with 808.10.

590 **(a) Temporary Pavement Marking Methods**

Pavement markings shall be installed in accordance with 808.07 except that measurement of retro-reflectivity is not required by the Contractor and quality adjustments will not apply. All other performance measures shall apply.

1. Paint

Painted markings shall require a second application of paint and beads as soon as practical after the first application is dry.

2. Temporary Pavement Marking Tape

600 Temporary pavement marking tape shall be applied in accordance with the manufacturer's recommendations. Temporary marking tape shall be new type I or type II material.

All temporary pavement marking tape shall be removed prior to placing the next pavement course, prior to placing an overlay, prior to recycling the pavement, or prior to placing the final pavement markings, except as otherwise described herein.

a. Type I

610 Type I tape is a removable material. It may be used for longitudinal and transverse markings.

Type I tape shall be removed without the use of solvents, grinding, abrasive blasting, or other methods which may damage the pavement. All visible adhesive residue shall be removed without use of solvents or grinding.

b. Type II

620 Type II tape is a non-removable material. It may be used on PCCP to be removed or on PCCP to be overlaid with an HMA course greater than 165 lb/sq yd. Type II tape placed on HMA pavement shall be removed prior to placing the next pavement course.

If it is necessary to remove type II tape, it shall be removed without the use of solvents. All damage to the pavement shall be repaired.

3. Temporary Raised Pavement Marker

630 The temporary raised pavement marker shall be grade 1 or grade 2. When used, it shall be a supplement to other temporary pavement markings. The color of the reflector shall be in accordance with the other temporary pavement marking. The color of the shell of the grade 1 marker shall be in accordance with the color of the other temporary pavement marking.

Temporary raised pavement markers shall be removed before the next layer of pavement is placed and before the final pavement markings are applied. All damage to the pavement shall be repaired.

4. Temporary Buzz Strips

640 Temporary buzz strips shall be a set of transverse markings constructed of removable or durable marking material. Durable marking material shall be used in accordance with 808.07(b).

(b) Quality Assurance Unit

A quality assurance unit for longitudinal line shall be 500 lft on marked pavement in any combination or pattern, or portion thereof. A quality assurance unit

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for transverse marking shall be each. If a marking fails to be in accordance with the marginal standard as defined in the ATSSA Quality Standards for Work Zone Traffic Control Devices, the quality assurance assessment will be assessed in accordance with 801.03.

801.13 Temporary Illumination

650 The temporary highway illumination shall be in accordance with applicable requirements of 807 except as modified herein.

The electric energy necessary to power the luminaires on a continuous basis is the responsibility of the Contractor.

At completion of the contract work, the temporary illumination shall be removed and shall remain the property of the Contractor. After removal of the temporary illumination equipment, all holes and trenches shall be backfilled with B borrow.

660 **801.14 Construction Warning Lights**

Construction warning lights shall be portable, lens directed, enclosed lights that emit an amber color. All warning lights shall be mounted a minimum of 36 in. above the traveled way to the bottom of the lens, unless otherwise directed. Lights not working shall be repaired or replaced immediately. For each day that more than 5% of the required warning lights are not operating, a sum equal to \$4.00 per non-working light will be deducted from the monies due the Contractor.

(a) Type A

670 Type A lights shall be low intensity flashing warning lights. These lights shall be visible on a clear night from a minimum distance of 3,000 ft when there is no external illumination directly on or in the immediate vicinity of the light. They shall operate from dusk to dawn or when conditions exist which tend to obscure vision. Traffic control devices used for maintaining traffic will not require Type A warning lights during unobscured daylight hours.

(b) Type B

680 Type B lights shall be high intensity, flashing, warning lights. These lights shall be visible on a sunny day from a minimum distance of 1,000 ft when viewed without the sun directly on or behind the light.

(c) Type C

Type C lights shall be steady burning warning lights. These lights shall be visible on a clear night from a minimum distance of 3,000 ft when there is no external illumination directly on or in the immediate vicinity of the light. They shall operate from dusk to dawn or when conditions exist which tend to obscure vision.

(d) Vehicle Warning Lights

690 Vehicle warning lights shall be amber and shall be a strobe light or a flashing, oscillating, or rotating directed beam light. They shall be visible to all approaching traffic for a distance of 1,000 ft.

801.15 Electronic Devices

(a) Flashing Arrow Sign

Where specified, a flashing arrow sign shall be furnished, installed, and maintained. It shall be operated continuously, when necessary, to divert traffic.

700 The flashing arrow sign may be of the solar power assisted type only in stationary operations when the horizontal or vertical curvature in the road is such that motorists do not drive into and out of the beam width of the lighted arrow while within sight of the sign.

(b) Portable Changeable Message Signs, PCMS

This shall consist of furnishing, installing, and maintaining a trailer-mounted, portable sign upon which varying electronically generated messages will be displayed to traffic. The message being relayed to traffic shall be legible and easily understood for a minimum distance of 650 ft.

710 The messages shall be as shown on the plans or as approved or directed by the Engineer. Messages shall be formatted in accordance with INDOT Guidelines for Portable Changeable Message Signs. Only upper case letters shall be used. Each message phase shall be displayed for at least 2 s. Display time for an entire message shall not exceed 8 s.

720 Placement of PCMSs shall be as shown on the plans or as directed by the Engineer. A minimum clearance of 7 ft from pavement to the bottom of the PCMS shall be provided. Units shall be level and PCMSs shall be turned away from traffic, placed in stand-by mode, or left blank until there is a valid message to be displayed. When in use PCMSs shall be turned approximately 3° from perpendicular towards oncoming traffic to minimize glare. A drum shall be placed immediately in front of the PCMS trailer at both corners for delineation.

(c) Temporary Worksite Speed Limit Sign Assembly

This shall consist of furnishing and placing portable speed limit signs as shown on the plans or as directed in areas of work activity. When used, the worksite speed limit flashing strobe lights shall be activated when the worksite speed limit is in effect. This shall be only where and while work is actually in progress and workers are present. Each strobe light shall be visible through a range of 120° when viewed facing the sign and shall be visible from a distance of 750 ft.

730 Wherever a permanent speed limit sign exists within the limits controlled by the worksite speed limit sign assemblies, additional worksite speed limit sign assemblies shall be placed at the permanent signs. The permanent signs shall be covered or removed during continuous worksite speed limit use.

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A worksite speed limit authorized for intermittent use shall only be activated when workers are present at the site. The intermittent worksite speed limit shall only be used in the area of work. A worksite speed limit authorized for continuous use shall not include the flashing strobe lights or the S4-4 "WHEN FLASHING" plaque.

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The worksite speed zone signage shall be placed and maintained by the Contractor. The worksite speed limit will be as shown on the plans or as directed by the Engineer and at least 10 mph below the posted speed limit for the roadway under construction.

A worksite reduced speed advance warning sign assembly shall be placed in advance of the first worksite speed limit sign assembly when the reduction in speed limit is greater than 10 mph.

750

(d) Temporary Traffic Signals

This work shall consist of furnishing, installing, and maintaining temporary traffic signals in accordance with 805 except as modified herein.

Except as shown on the plans, all materials not furnished by the Department shall remain the property of the Contractor after work is completed and the equipment is removed.

The traffic signal equipment shall be as specified, but may be either new or used. Used equipment shall be in satisfactory working condition and will be approved prior to use.

760

Two signal heads shall be displayed for each approach. Signals shall be displayed overhead on a span, catenary, and tether utilizing an aircraft cable, unless otherwise directed.

Electric energy necessary to power the temporary signal is the responsibility of the Contractor. Prior to the start of construction, the schedule of activities shall be coordinated with the power company.

770

The Contractor shall obtain permits from local officials, companies, or individuals for the use of poles, right-of-way, or other property incidental to the installation of temporary signals. Although entering into the contract implies permission and authority to install conduit under pavement, sidewalks, and alleys, all damage to underground utilities or interruption of such service shall be the responsibility of the Contractor.

The location, spacing, and timing of signals will be determined by the Engineer.

780

An IMSA certified level II technician shall be available 24 h a day to respond within 2 h for the maintenance of the traffic signal equipment.

Signal cable may be extended across bridges through conduit which shall be attached to the underside of the coping. Type and spacing of clamps shall be approved prior to installation.

Conduit shall be steel or plastic. Flexible conduit will be an acceptable alternate for use as ground rod entry, magnetometer, or microloop installations.

790 The controller shall be solid state digital. When detection is required, the controller shall be traffic actuated solid state, digital.

Vehicle detection, if required, shall be installed as shown on the plans or as otherwise directed and shall be operational prior to signal activation.

801.16 Temporary Traffic Control Zone

A temporary traffic control zone is a work zone with frequently changing operation, a maximum duration of seven calendar days; mobile operation; or a temporary traffic stoppage.

800 Daytime lane closures on two-lane two-way roads shall be limited in length to a maximum of 1 mi or the length of a half day's operation, whichever is less, or as shown on an approved alternate traffic control plan.

(a) Temporary Traffic Control Signs

Temporary traffic control signs, TTCS, are construction signs in a temporary traffic control zone.

810 Trailer mounted TTCS shall be positioned such that the tongue and the method of pinning shall minimize the hazard to motorists. Wheel chocks other than sandbags shall not be used. During non-working hours, trailers with signs that do not apply to existing conditions shall be stored in accordance with 107.08.

TTCS shall not be mounted on barricades or other non-approved supports. When the vertical mounting height for TTCS is between 12 in. and 18 in. to the bottom of the sign, tripod supports may be used. When allowed for use, the signs on tripod supports shall be installed so that the angle from vertical does not exceed 30°.

(b) Maintenance of Traffic for Mobile Operations

820 Signs, flagging, flashing arrow signs, and other required traffic control devices shall be furnished in accordance with the details shown on the plans or as directed. The Engineer reserves the right to stop work at any time to relieve traffic congestion.

Flagging operations shall be conducted under the supervision of either the designated CWTS or a flagger certified by ATSSA or approved equal certifying organization. The person supervising the flagging operation shall ensure that the flaggers are trained in proper flagging procedures and that the flagging operation is in compliance with the applicable sections of the MUTCD.

(c) Traffic Control for Temporary Traffic Stoppage

830 Traffic shall not be allowed to pass directly beneath personnel or equipment working on an overhead structure. Traffic stoppage during an overhead operation shall not exceed 20 minutes at one time. There shall be enough time between consecutive stoppages to allow traffic to return to normal flow.

Three working days prior to commencing work which necessitates temporary stoppage of traffic, written notice shall be given to the Department and the Indiana State Police that highway traffic shall be stopped temporarily at a specific location, time, and date to accomplish specified work. Traffic shall be safely controlled during the stoppage. The following minimum requirements shall be met.

840

1. On Multi-Lane Divided Highways

Advance warning signs shall be located as specified or as otherwise directed. For each direction of road closure two flaggers shall be located at the site of the work and a minimum of two additional flaggers shall be used to warn approaching traffic.

2. On Non-Divided Highways

Advance warning signs shall be located as specified or as otherwise directed. For each direction of road closure, one flagger shall be located at the site of the work and a minimum of one additional flagger shall be used to warn approaching traffic.

850

801.17 Method of Measurement

Construction signs, detour route marker assemblies, detour route marker assemblies-multiple routes, temporary worksite speed limit sign assemblies, road closure sign assemblies, portable changeable message signs, Aries Field Processor for PCMS, and temporary raised pavement markers will be measured by the number of units installed, maintained, and removed.

860 Temporary panel signs will be measured by the square foot. Temporary panel sign supports, when required, will be measured by the linear foot, complete and in place.

Type III-A, type III-B, and permanent type III barricades will be measured by the linear foot of the width of closure.

870 Temporary traffic barrier will be measured by the linear foot per the type specified. Anchored traffic barrier will be measured by the linear foot, separately from unanchored temporary concrete barrier per the type specified. End treatments used on a type 2 or type 4 temporary traffic barrier will be measured by the linear foot as part of the barrier.

Construction zone energy absorbing terminals, CZ, used on type 1 and type 3 temporary traffic barriers will be measured by the number of terminals placed.

Temporary crossovers type A and type B will be measured per each crossover. The refurbishing of temporary crossovers will be measured per each type of crossover refurbished. HMA mixtures for temporary crossovers will be measured by the ton in accordance with 109.01(b). Initial resurfacing and initial patching of refurbished crossovers will be measured in accordance with 402.19. Temporary drainage pipe for temporary crossovers will be measured by the linear foot. Seeding and sodding placed due to the construction and removal or refurbishing and closing of temporary crossovers, will be measured in accordance with 621.13. Removal and subsequent replacement of permanent pavement markings and snowplowable raised pavement markers for temporary crossovers will be measured in accordance with 808.12. Removal and resetting of guardrail, if required for temporary crossovers, will be measured in accordance with 601.13.

Flashing arrow signs will be measured by the number of calendar days each unit is operated.

890 Patroller will be measured by the number of calendar days during the phase or phases of traffic control, as shown on the plans or as otherwise directed, that require the patroller's presence. Each portion of a day will be measured as a whole day.

Temporary pavement message markings will be measured by the number of each type placed. Longitudinal and transverse temporary pavement markings will be measured by the linear foot of material actually placed. Temporary buzz strips will be measured by the linear foot for each 8 in. strip placed, without regard to the number of passes required to attain the specified height.

900 Removal, when necessary, of any type of non-removable temporary pavement markings will be measured in accordance with 808.12. Removal of removable temporary pavement markings will not be measured for payment.

Where temporary pavement markings are to be placed on a pavement which has existing markings, removal of existing markings which conflict with the temporary markings will be measured in accordance with 808.12.

The removal and replacement of prismatic reflectors on existing snowplowable raised pavement markers will be measured in accordance with 808.12.

910 Compacted aggregate No. 73 used for shoulder material will be measured in accordance with 303.09. Excavation of the existing earth shoulder will not be measured for payment.

Cones and tubular markers will not be measured for payment. Permanent tubular markers will be measured per each.

Temporary illumination, temporary traffic signals, and maintaining traffic will not be measured for payment.

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801.18 Basis of Payment

The accepted quantities of construction signs, detour route marker assemblies, detour route marker assemblies-multiple routes, temporary worksite speed limit sign assemblies, road closure sign assemblies, permanent road closure sign assemblies and temporary raised pavement markers will be paid for at the contract unit price per each. Payment for temporary worksite speed limit assemblies, PCMS, and Aries Field Processors will be made for the maximum number of such assemblies in place at any one time during the life of the contract. Type III-A, type III-B, and permanent type III barricades will be paid for at the contract unit price per linear foot.

930

Temporary traffic barrier and anchored temporary traffic barrier will be paid for at the contract unit price per linear foot per the type specified. Payment will be made only once, regardless of the number of times the barrier is moved to accommodate different phases of traffic maintenance or construction operations as shown in the contract. End treatments used on a type 2 or type 4 temporary traffic barrier will be paid for on a linear basis as part of the barrier.

940

Construction zone energy absorbing terminal, CZ, when used with type 1 or type 3 temporary traffic barriers will be paid for at the contract unit price per each for energy absorbing terminal, CZ, of the test level placed. Each unit will be paid for only once regardless of how many times it is moved. Construction zone energy absorbing terminal, CZ, when used with type 2 or type 4 temporary traffic barriers will be paid for at the contract unit price per linear foot of type 2 or type 4 temporary traffic barrier. Back-up units will be paid for as energy absorbing terminal, CZ, of the test level placed, if they are placed in service due to non-repairable damage to the units already in service. Due to the nature of the TRACC-350 unit, the Engineer **will need to** agree that the in-service unit has been damaged to the extent that it is non-repairable before a standby TRACC-350 unit will be considered for payment.

950

The accepted quantities of temporary crossovers will be paid for at the contract unit price per each for the type specified. The accepted quantities of refurbishing existing temporary crossovers will be paid for at the contract unit price per each for the type specified. The accepted quantities of HMA for temporary crossovers will be paid for as HMA for temporary pavement at the contract unit price per ton in accordance with 402.20. Temporary drainage pipe for temporary crossovers will be paid for at the contract unit price per linear foot. Sodding and seeding for temporary crossovers will be paid for in accordance with 621.14. Removal and subsequent replacement of permanent pavement markings and snowplowable raised pavement markers for temporary crossovers will be paid for in accordance with 808.13.

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Removal and resetting of guardrail, if required for temporary crossovers, will be paid for in accordance with 601.14.

If more than one construction sign is mounted on a common support with the messages facing opposite directions, the largest sign will be paid for at the contract unit price of the sign, and each additional sign will be paid for at half the unit price of the sign if it had been erected independently.

970 Temporary panel signs will be paid for at the contract unit price per square foot as shown on the plans. Temporary panel sign supports will be paid for at the contract unit price per linear foot, complete and in place.

A temporary worksite speed limit sign assembly for continuous use includes two signs; each will be paid for at the contract unit price for construction sign.

Flashing arrow signs and patrollers will be paid for at the contract unit price per day per each.

980 Temporary pavement message markings placed will be paid for at the contract unit price per each, for the message specified. Longitudinal and transverse temporary pavement markings and temporary buzz strips, will be paid for at the contract unit price per linear foot of material, complete in place.

Removal, when necessary, of non-removable temporary pavement lines and message markings will be paid for in accordance with 808.13. The cost of removal of removable temporary pavement markings shall be included in the cost of the pay item for placement of the markings.

990 Where temporary pavement markings are to be placed on a pavement which has existing markings, removal of the existing markings which conflict with the temporary markings will be paid for in accordance with 808.13.

Permanent tubular markers and permanent drums will be paid for at the contract unit price per each.

Compacted aggregate used for shoulder material will be paid for as compacted aggregate No. 73 in accordance with 303.10.

1000 The removal and replacement of reflectors on existing snowplowable raised pavement markers will be paid for in accordance with 808.13.

Temporary illumination will be paid for at the contract lump sum price.

All temporary traffic control devices which are specified as separate pay items and used for maintenance of traffic will be paid for as set out in the Schedule of Pay Items. The furnishing, placing, moving, removal, and maintenance of all other temporary traffic control devices will be paid for at the contract lump sum price for maintaining traffic.

1010 The accepted temporary traffic signal, complete in place and later removed as specified, will be paid for at the contract lump sum price.

Payment will be made under:

	Pay Item	Pay Unit Symbol
	Aries Field Processor for PCMS	EACH
	Barricade, _____	LFT
	type	
	Barricade, III, Permanent	LFT
1020	Barrier, Direction Indicator	EACH
	Construction Sign, _____	EACH
	type	
	Detour Route Marker Assembly	EACH
	Detour Route Marker Assembly, Multiple Routes	EACH
	Drum, Permanent	EACH
	Energy Absorbing Terminal, CZ, TL - _____	EACH
	test level	
	Flashing Arrow Sign	DAY
	Maintaining Traffic	LS
1030	Patroller	DAY
	Portable Changeable Message Sign	EACH
	Road Closure Sign Assembly	EACH
	Road Closure Sign Assembly, Permanent	EACH
	Temporary Buzz Strips	LFT
	Temporary Crossover Drainage Pipe	LFT
	Temporary Crossover, _____	EACH
	type	
	Temporary Crossover, _____, Refurbish	EACH
	type	
1040	Temporary Illumination	LS
	Temporary Panel Sign Supports	LFT
	Temporary Panel Signs	SFT
	Temporary Pavement Marking, _____ in.	LFT
	width	
	Temporary Pavement Marking, Removable, _____ in.	LFT
	width	
	Temporary Pavement Message Marking, _____	EACH
	description	
	Temporary Pavement Message Marking, Removable, _____	EACH
1050	description	
	Temporary Raised Pavement Marker, _____	EACH
	grade	
	Temporary Traffic Barrier, _____	LFT
	type	
	Temporary Traffic Barrier, Anchored, _____	LFT
	type	
	Temporary Traffic Signal with Detectors	LS
	Temporary Traffic Signal	LS

1060	Temporary Transverse Pavement Marking, _____ in.....LFT width
	Temporary Transverse Pavement Marking, Removable, _____ in.LFT width
	Temporary Worksite Speed Limit Sign AssemblyEACH
	Tubular Marker, Permanent.....EACH

The cost of delineation of temporary traffic barrier shall be included in the cost of temporary traffic barrier.

1070 Damage done to pavement by removal of temporary traffic barriers and anchors shall be repaired with no additional payment.

The cost of all materials, equipment, labor, and incidentals necessary to install, maintain, repair, and to remove the unit shall be included in the cost of energy absorbing terminal, CZ. The cost of stockpiling standby terminals and terminal materials, whether incorporated into the work or not, shall be included in the cost of energy absorbing terminal, CZ. All units shall remain the property of the Contractor upon completion of the contract.

1080 The cost of the excavation required for placement of compacted aggregate shoulders No. 73 will be included in the pay item maintaining traffic.

The cost of installation, maintenance, and removal or closure of the temporary crossover, including excavation, compaction, subgrade preparation, and reshaping damaged median area shall be included in the cost of temporary crossover.

The cost of removal of earth cover, removal of drums, reshaping damaged median areas, and closure or removal of temporary crossover shall be included in the cost of temporary crossover, refurbish.

1090 The cost of furnishing, installing, maintaining, and subsequent removal of temporary raised pavement marker shall be included in the cost of temporary raised pavement marker.

The cost of placement, maintenance and replacement of temporary pavement markings shall be included in the cost of the markings.

1100 The cost of cleaning existing pavement and removal of buzz strips shall be included in the cost of buzz strips. Damage to the pavement caused by removal of buzz strips and temporary pavement markings shall be repaired as directed with no additional payment.

No payment will be made for temporary pavement markings which are in the standard pavement marking pattern, and which are to be in service from December 1 through the following March 31 due to the Contractor's failure to complete the work

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as scheduled. However, payment will be made for these markings **if** the failure to complete the work as scheduled **is** due to conditions beyond the Contractor's control.

1110 The cost of the second application of paint and beads for painted temporary markings shall be included in the cost of the first application of painted temporary pavement markings.

The cost of furnishing, installing, maintaining, and subsequent removal of the detour marker, route marker, or street or road name sign, cardinal directional marker, directional arrow marker, posts which support the assembly, and all necessary hardware shall be included in the cost of detour route marker assembly or detour route marker assembly, multiple routes.

1120 The cost of installing, maintaining, and subsequent removal of signs, construction warning lights, assembly supports, and all necessary hardware shall be included in the cost of road closure sign assembly.

The cost of furnishing all materials, erection, maintenance, removal, and necessary incidentals shall be included in the cost of barricades.

1130 Each construction sign, barricade, temporary worksite speed limit sign assembly, road closure sign assembly, or flashing arrow sign will be paid for only once regardless of how many times each is moved, replaced, or how many times each is altered to change the sign message. Payment will not be made for signs or barricades used for the convenience of the Contractor.

Additional materials necessary to place the **portable changeable message sign** in a secure and level manner for site conditions shall be included in the cost of the pay item. All costs to furnish, install, program, activate, deactivate, change messages, **move, replace,** and maintain the PCMS shall be included in the cost of the pay item. The cost of IP cellular phone service shall be included in the cost of the pay item.

1140 If a temporary worksite speed limit sign assembly, for intermittent use is not flashing when required beginning 2 h after work begins, or if such assembly is flashing when no work has been taking place for 2 h or longer, \$200.00 will be deducted from payment for such work for each 4 h period or part thereof, beginning after the 2 h grace period.

If the Contractor elects to use more than two simultaneous operations during the installation of snowplowable pavement markers or reflectors, the cost of required traffic protection devices for additional operations shall be included in the cost of maintaining traffic.

The cost of necessary flaggers; protection of traffic at structure foundations; and furnishing, erecting, placing, maintaining, relocating, and removing lights, cones,