

Section 812. TEMPORARY TRAFFIC CONTROL FOR CONSTRUCTION ZONE OPERATIONS

812.01 Description. Take necessary measures to protect, regulate, warn, guide, and maintain traffic through and around the Construction Influence Area (CIA) and to protect the construction work area during the life of the contract.

Furnish, install, light, operate, relocate, clean, preserve, maintain, cover and remove necessary traffic control devices required within the CIA for the protection of the work area and for the protection and maintenance of traffic through and around the construction zone. The Department will furnish, install, and maintain all necessary traffic control devices required outside the CIA.

All temporary traffic control devices supplied by the Contractor will remain the property of the Contractor.

Temporary traffic control devices include but are not limited to signs, channelizing devices, concrete barrier, pavement markings, lighting devices, signals, and traffic regulator hand-held devices.

812.02 Materials. Materials, devices, and equipment shall meet the following.

Temporary Traffic Signs	922
Channelizing Devices	922
Temporary Pavement Markings	922
Lighting Devices	922
Temporary Traffic Signals	922
Traffic Regulator Equipment	922
Portable Changeable Message Board	922

For materials and devices noted, furnish the Engineer with certification that the materials and devices conform with the specifications. Furnishing a certification of compliance does not waive inspection, sampling, or testing of materials and devices.

812.03 Construction.

A. **Contractor Notification.** Notify the Engineer before starting work or installing traffic control devices on the project, in sufficient time that arrangements may be made for traffic maintenance.

B. **Emergency Control.** Provide emergency control according to subsection 104.10. Review the temporary traffic control operations and safety of each Subcontractor and ensure that they are properly coordinated with those of the Contractor.

If the Contractor is not available to take protective or corrective measures, the Department will authorize others to do the work. The cost associated with such work will be the responsibility of the Contractor.

C. **Contractor Damaged Highway Facilities.** Restore all Contractor damaged facilities and devices according to subsection 103.06. Furnish, install, and operate all traffic control devices required to warn and protect traffic from Contractor damaged highway facilities. The cost associated with this work will be the responsibility of the Contractor.

- D. **Changes in Stage Construction Plans.** Provide reasonable notice in writing to the Engineer before making changes in stage construction. The Department will:
1. Approve all changes in stage construction in writing.
 2. Pay for additional traffic control devices required according to subsection 812.04 when the change benefits the Department.
 3. Not pay for additional devices required as a result of an approved Contractor's option on work methods, progress, or convenience unless a benefit to the Department can be demonstrated.
- E. **Deficient Traffic Control Operations.** The Engineer will submit written notification of deficient, inadequate, or improperly placed traffic control devices, or unsafe conditions within the CIA. A statement of the required corrective action will accompany the notice. Failure to take immediate correction action, may result in the following action(s) by the Engineer.
1. Stop work on the project until corrective action is taken.
 2. According to Subsections 107.07, 108.02, 812.03.B., and in the interest of public safety, order corrective action by outside forces. The cost associated with such work will be the responsibility of the Contractor.
- F. **Placing Traffic Control Devices.** Provide traffic control devices meeting the quality requirements in the current edition of the *Quality Standards for Work Zone Traffic Control Devices* published by the American Traffic Safety Services Association (ATSSA).

Apply and place all traffic control devices within the CIA limits according to the MMUTCD, as shown on the plans, or as directed in writing.

Do not place commercial or Contractor identification signs within the highway right-of-way.

Display only traffic control devices appropriate to conditions. Cover, remove, modify, or relocate existing temporary or permanent signs with legends which are not applicable.

Make daily inspections of the traffic control devices at a frequency which will insure all devices are in place, properly positioned, aligned and oriented. During periods of inactivity inspect at a frequency agreed to by the Engineer. Record these inspections. Make the records available to the Engineer on a biweekly basis. The Department will take possession of the inspection records at completion of the project.

The Contractor is responsible for actions of Subcontractors regarding the condition, placement, maintenance, and removal of traffic control devices required on the project.

Remove temporary traffic control devices from the project when no longer required.

1. **Temporary Signs.** Erect temporary construction signs as directed:
 - a. On ground driven or portable supports.
 - b. At a minimum bottom height of 5 feet above the near edge of pavement;
 - c. At a minimum bottom height of 7 feet above ground if erected behind curb or within 6 foot of a pedestrian walkway.

- d. If a secondary sign is required below the primary sign, mount it with bottom height one foot less than the 5 foot or 7 foot height specified.
- e. Supports shall be vertical and the legend or symbol horizontal.

Light construction warning signs used during hours of darkness with one Type A warning light equipped with a one-way lens. Securely fasten the light to the top of the sign on the side nearest the traffic lane. Type A warning lights are not required on temporary construction signs with prismatic retroreflective sheeting.

Use flexible roll-up signs with fluorescent, prismatic retroreflective sheeting only during daylight hours in signing sequences for moving operations. Use of flexible roll-up signs will be at the discretion of the Engineer.

Do not use mesh signs.

Temporary or permanent traffic signs may be placed within the CIA by the Department, another Contractor, or other authorized agency when approved by the Engineer. The Engineer will approve such temporary or permanent signs for the safety and direction of traffic. The placing agency will be responsible for such signs, as prescribed herein.

2. **Sign Covers.** Cover the entire front of the sign panel for temporary and permanent signs mounted on fixed supports. For permanent signs mount the sign coverings by approved methods that will not damage the existing sign sheeting. Do not apply fastening devices such as nails, staples, screws, or adhesive materials directly on the reflective sheeting. Use spacers providing 2 inches of air space between the cover and the sign face to protect the sheeting from damage. Do not use burlap or similar material to cover Type I signs.

Install sign covers on Type I signs shown in the proposal or staging plans so that all of the conflicting information is obscured. Submit shop drawings of the Type I sign covers to the Engineer for approval before covering any Type I sign on the project.

Do not use sign plaque overlays that alter part of a sign's legend or symbol.

3. **Sign Supports.** Locate and construct sign supports to resist swaying, turning, or displacement. Provide fixed steel sign posts according to subsection 919.04 except that they may be painted or galvanized.

Mounting construction signs on portable sign support standards is allowed, only when fixed supports are not possible. Construct portable sign support standards from lightweight steel framing.

Use a yielding design for all fixed supports. Small lightweight trailers are allowed where portable supports are permitted for construction warning signs. Limit the weight of the trailer, exclusive of signs, flags, and warning flashers, to not more than 340 pounds. Do not use automobile or truck rear axle assemblies with differential housings.

When the trailer is in use, rest the tires on the ground or elevate with the bottom of the tires no greater than 3 inches above the ground. Where supplemental weights are required to achieve stability or for use as wheel chocks, use sandbags attached no higher than 12 inches above the ground. Detach and park the towing vehicle according to subsection 812.03.I.5. When the trailer mounted sign is not in use, park the trailer according to subsection 812.03.I.5.

The Department will permit lightweight trailers with mounted lighted display boards or changeable message board signs.

4. **Supplemental Weights.** Ensure that traffic control devices will remain upright and in proper alignment during use. When supplemental weights are necessary to achieve stability, use sand bags or an approved alternate.
5. **Channelizing Devices.** Install the lead-in signing and the lighted arrow (if applicable) before installing the channelizing devices. Install channelizing devices in the direction of traffic flow. Remove all channelizing devices in the direction opposite to traffic flow. Do not mix drums and cones within a traffic control signing sequence. Use the same channelizing devices to extend an existing lane closure.
 - a. Traffic cones are allowed for daytime use only. Use cones only where there is sufficient supervision to ensure they remain upright, in place, and do not interfere with traffic. Double-stack or weight the cones if needed. The method of weighting cones must not create a hazard to traffic.
 - b. Use only plastic drums with attached lights for nighttime use. Provide one Type A or Type C (depending on application) warning light on each plastic drum used during hours of darkness. Securely fasten the warning light specified by subsection 922.05. Ensure that plastic drums will stand upright and are sufficiently weighted to remain stable and prevent overturning. Do not mount signs on drums.
6. **Lighted Arrows.** When implementing a lane closure, place a lighted arrow Type B or Type C on the shoulder at the beginning of the taper of channelizing devices. Obtain the approval of the Engineer before using Type B panels. The bottom height must be 5.5 feet or greater for Type B panels and 7 feet or greater for Type C panels. Where the shoulder is narrow, or none exists, place the lighted arrow panel behind the channelizing devices as near to the beginning of the taper as physically possible. Place the lighted arrow panel level and positioned to be visible to oncoming traffic.

If approved by the Engineer, use more lighted arrow panels than shown on the plans. The cost associated with extra panels will be the responsibility of the Contractor.

When lighted arrow, Type C, Standby is shown as a pay item, have a lighted arrow at the project site, or at a location approved by the Engineer, available for immediate use as a replacement unit.

When installed, the arrow shall remain clearly legible from 2500 feet to within 200 feet of the lighted arrow from all lanes of traffic and from all roadway entrances. The Engineer will verify the legibility distances on a sunny day and a clear night. Do not place the lighted arrow on a horizontal or vertical curve that might interfere with this legibility requirement.

7. **Type III Barricade.** Use Type III barricades to accentuate delineation or warning and for total or partial road closures. Use barricades in 12-foot sections unless otherwise specified. When used for a complete road closure, extend the barricades completely across a roadway and its shoulders or from curb to curb.

Light Type III barricades during hours of darkness with three equally spaced Type C warning lights securely fastened to the top rail. Place all construction signs used at the

Type III barricades behind the barricades on their own supports. The bottom of the signs must be above the top rail of the barricade.

Do not place Type III barricades parallel to approaching traffic, at any time.

When the Department prohibits through traffic, use Type III barricades including the specified construction signs and lights. Arrange barricades and erect signs to permit the passage of local traffic and effectively discourage the passage of through traffic. Install a sign with the appropriate legend concerning permissible use by local traffic.

8. **Temporary Concrete Barrier.** Place temporary concrete barrier before diverting traffic or beginning the associated construction work. Provide barriers which are clean and in sound structural condition at the time of placement. When the temporary concrete barrier sections are placed on pavement, clean the pavement of all material (sand, gravel, dirt, ice, snow, etc.) that would reduce the friction between the barrier section and the underlying pavement. During installation of the barrier, protect traffic by the use or installation of standard warning and channelizing devices. Place barrier in the direction of traffic flow. Remove barrier in the direction opposite to traffic flow.

After linking sections together, pull barrier sections to fully engage the connection between sections. The gap between barrier sections with the end-attachments fully engaged must not exceed 4 inches. Maintain the barrier with end-attachments engaged and within 2 inches of plan alignment.

Install Type B high intensity lights (warning flashers) on temporary concrete barrier, according to Standard Plan R-126 Series.

If incomplete concrete barrier installations or removals result in barrier blunt ends exposed to traffic inside the clear zone for over eight hours, make these ends crash-safe according to standard plan R-52 Series or as directed.

Install barrier reflector markers on the temporary concrete barrier using the color and at the spacing specified. When temporary concrete barrier is relocated or adjusted, leave the existing reflector markers on concrete barrier intact if they are undamaged and the color is applicable. If the reflector color is not applicable, the Contractor is responsible for replacing with correct color reflector. Clean and replace damaged reflector markers each time the barrier is placed back in operation.

Completely remove barrier markers damaged after the temporary concrete barrier has been placed in initial operation and replace with new markers. Position the replacement markers directly in front of the damaged marker. The cost associated with replacing markers which are damaged by the Contractor's equipment will be the responsibility of the Contractor.

9. **Temporary Pavement Marking.** Apply temporary pavement markings on bituminous and concrete surfaces before opening to multi-lane traffic movement.

The type of temporary pavement marking specified depends on whether the markings need to be removed during the life of the contract (Type R), or whether the markings can be left in place (Type NR). Remove all Type R markings before placing permanent pavement markings.

Replace temporary pavement markings that are improperly applied, or come loose, as directed by the Engineer. The cost associated with this work will be the responsibility of the Contractor.

Type NR pavement markings may be specified to temporarily serve as permanent markings on the finished pavement surface. These markings must be placed within 4 inches of the permanent markings, measured laterally center to center between temporary and permanent marking locations. Remove and replace temporary pavement markings which exceed this tolerance. The cost associated with this removal and replacement will be the responsibility of the Contractor. The required removal of temporary Type NR markings in areas such as tapers, transitions, or intersections will be paid for.

- a. **Paint and Tape.** Place 4-foot dashed lines for centerline and lane line markings spaced at 50 feet center to center of marking.

In severe roadway curvatures, the Engineer may specify 2-foot dashed lines, spaced at 25 feet center to center of markings.

All marking have a width of 4 inches, unless otherwise specified. Markings will be either white or yellow according to the MMUTCD.

Apply the paint at a rate of 16 gallons per mile of 4-inch solid line. Reflectorize by applying glass beads on the wet paint at a rate of 8 pounds per gallon of paint.

Replace markings that do not meet subsection 922.04 at the Contractor's expense.

- b. **Temporary Raised Pavement Markers.** Temporary Raised pavement markers (TRPM) Type 3 may be installed to supplement temporary markings (paint or preformed tape) on tangent sections, traffic transitions, run-arounds, and cross-overs, as directed. Remove TRPM before applying subsequent bituminous lifts.

On chip seal projects, use TRPM Type 1 for all temporary pavement markings.

10. **Temporary Traffic Signals and Street Lighting.** Furnish, install, operate, inspect, maintain, disconnect, cover, and remove the temporary traffic signals, street lighting, and all necessary equipment and materials. Adjust traffic signal timing, as directed by the Engineer, to ensure proper operations of the temporary traffic signal. When traffic signal timing changes are required by the Engineer, the Engineer will provide the Contractor a traffic signal plan including the location(s) and a signal timing permit for implementation of the approved timing changes.

Take possession of all equipment when removed, unless otherwise specified.

Obtain the Engineer's approval before using a traffic signal controller other than as called for on the plans. Any additional cost will be the responsibility of the Contractor.

Contact the utility company and apply for temporary electric service at least 14 days before the actual start of construction of the temporary traffic signals and street lighting. Make all arrangements to provide electric service on the project and for the removal of the electric service when the project is completed. Pay, directly to the utility company, the costs for installing and removing wood poles, wiring, and transformers required to provide secondary service for the project. Pay, directly to the utility company, the cost

of all electricity supplied to the signals and lighting system. The Engineer will not reimburse these costs

Provide for the satisfactory performance and maintenance of the temporary traffic signals and street lighting for the duration of the contract. Disconnect and cover the signals and lighting units during stages of the project in which roadways are closed to traffic, as determined by the Engineer. Remove the signals and lighting units at the end of the contract. Ensure that all work is performed by experienced and qualified personnel according to standards and practices of the local utility company, MDOT, the National Electric Code, the Electric Code of the local city, township, or county, the National Electrical Safety Code, and the Michigan Public Service Commission.

Test equipment in operation as a complete installation. Include sequence of operation, continuity, voltage, and ground resistance readings. Furnish results of these tests to the Engineer before putting the installation into service. Ground all equipment with 10 Ohms or less resistance to ground.

Provide all electric service equipment and wiring required between the secondary service terminal provided by the utility company and the signal controller.

Place hoods over or cover signals which cannot be placed in service on the day of installation.

Notify the Engineer before a traffic signal installation is placed in service. Then test the traffic signal installation in operation as specified above. Furnish instructions for positioning the lamp within the luminaire as designed. Adjust the luminaries uniformly to give optimum designed light distribution on the roadway and to present a uniform exterior appearance. Light control surfaces and glassware will be clean after installation. Perform required cleaning according to the luminaire manufacturer's recommendations. Add heat-resistant protective tips or sleeves to lamp cords, if the lamp cord connections are directly above the lamp. Provide protective tips or sleeves 12 or 14 inches in length to stagger joints.

11. **Portable Changeable Message Signs.** Use portable changeable message signs (PCMS) according to MDOT guidelines. When a PCMS is not needed, turn it off and remove it from the immediate traffic area according to subsection 812.03.I.5.

a. **PCMS Applications.**

Advance Time Notification - examples are ramp closures, lane closures, freeway closures, planned maintenance work.

Information During Existing Events - examples are detours/alternate routes, incident management, special event traffic conditions, notice of operations - obstructed view, traffic calming, construction zone backups.

- b. Use of PCMS is prohibited for any of the following uses.

As replacement for MMUTCD required static signing or pavement markings.

As a replacement for a lighted arrow.

For advance notice of new traffic signal or sign.

For advertising of any kind.

- c. **Message Content and Timing.** Generic non-emergency safety messages, such as “Drive Safely” or “Buckle Seat Belts” are prohibited. Use the message “Drive Safely” only as the default message if power is lost to the PCMS. All message sequences will consist of a maximum of two messages and a two-second display time for each message.

G. Sign Removal (Permanent Signs). Department owned permanent signs and supports may need to be removed to prevent damage or because the legend is not applicable during construction. Follow the manufacturer’s requirements for the removal, handling, and reinstallation of signs. Once removed, store the permanent signs outside the work area at a site within the CIA limits as directed. Reinstall Department owned permanent signs and supports within one day of work completion, unless otherwise directed by the Engineer.

Replace any sign, support or foundation damaged by the Contractor’s operations. The cost associated with this work will be the responsibility of the Contractor.

Remove locally owned signs and supports in the event a local agency has not removed them prior to commencement of work in the area. The affected local agency will be responsible for their later replacement and all related costs.

H. Pavement Marking Removal. Remove existing pavement markings that are in conflict with proposed temporary traffic markings before making any changes in the traffic pattern. If existing pavement markings on a roadway accommodating traffic are removed or obscured more than 24 hours before a change in the traffic pattern, place temporary pavement markings, Type R, before the close of the work day. Place markings in accordance with subsection 812.03.F.9.

Remove permanent pavement markings causing as little damage as possible to the surface texture of the pavement and by methods approved by the Engineer. Methods that can provide acceptable results are: sandblasting using air or water; high-pressure water; steam or super-heated water; mechanical devices such as grinders, sanders, scrapers, scarifiers, and wire brushes; and solvents or chemicals.

Immediately remove residue and dust where blast cleaning is used for the removal of permanent pavement markings and this removal is within 10 feet of a lane occupied by public traffic. Use a vacuum attachment operating concurrently with the blast cleaning operation for removal of residue and dust. Properly dispose of collected residue and dust.

Do not use paint or bituminous bond coat to cover existing and inappropriate pavement markings. Use tape only when authorized by the Engineer.

I. Maintaining Traffic Along Project. Maintain traffic along the project in a safe and orderly manner.

1. **Traffic Maintained by Part-Width Intersection Construction.** When part-width construction is specified, construct the new pavement on half an intersection at a time while maintaining through traffic on the remaining half intersection and shoulders. Temporary widening and surfacing of the shoulders may be required.
2. **Access Provisions for Local Traffic and Pavement Gapping.** Provide local traffic with reasonable access to property along the project using temporary roadways, culverts, railroad crossings, and bridges, or other means approved by the Engineer.

Obtain approval by the Engineer for all material used for temporary culverts prior to placement. Provide railroad crossings for local traffic according to subsection 107.20.

Maintain two-way traffic across all intersections using pavement gaps or other approved means. Provide a clear roadway on the cross road not less than 20 feet wide; the Engineer may vary the length of pavement gaps based on the type of vehicles being served through the intersection. At intersections of minor roads and streets, where volumes are low and traffic can be temporarily re-routed, the crossing may be closed with the approval of the Engineer and the local agency.

3. **Traffic Maintained on Shoulder.** Where the shoulder is designated to maintain traffic, improve the shoulder, or portions of it, as called for on the plans. Improvements may include:
 - a. Regrading or placing aggregate on the aggregate section of the shoulder
 - b. Placing additives to control dust or to improve density of the aggregate shoulder
 - c. Resurfacing the shoulder
 - d. Reconstructing or constructing shoulders.

If pay items covering this work are not in the contract then the work will be done as extra work.

The Contractor will be responsible for maintenance of the shoulder.

If the construction work is suspended, have sufficient labor, materials, and equipment ready for immediate repair and reconstruction of the shoulder to maintain traffic. Apply surfacing materials and dust palliatives when, where, and in quantities directed.

4. **Shoulders Under Construction.** Plan construction work such that shoulder areas adjacent to an open traffic lane will be left in usable condition during non-working hours. Where shoulders are low, high, soft, or rough due to construction, eliminate these unsatisfactory shoulder conditions immediately.

If circumstances are such that any portion of the shoulder area is left in an unsatisfactory condition during non-working hours, provide the following signs and channelizing devices.

- a. Install one W21-5 (48 by 48 inch) (SHOULDER WORK) sign in advance of the segment where the unsatisfactory shoulder begins.
 - b. Install W8-9a (SHOULDER DROP-OFF), W8-4 (SOFT SHOULDER), or W8-4a (ROUGH SHOULDER) signs as appropriate, in advance of the unsatisfactory shoulder and at a maximum of 2000-foot intervals for the entire length of the affected shoulder.
 - c. Place plastic drums on a short taper at the beginning of the unsatisfactory shoulder and at intervals specified by the Engineer for the entire length of the affected shoulder. Place plastic drums off the pavement edge.
5. **Storage Restrictions for Vehicles, Equipment, and Materials.** Select locations for parking vehicles and storing materials that provide minimum exposure to pedestrian and vehicular traffic.

- a. During working hours, park or place workers' vehicles, idle construction equipment, and stored materials, that cannot be removed from the site at least 20 feet behind curb faces for roadways having a barrier curb and a minimum of 30 feet back from the edge of the pavement for roadways having shoulders or mountable curbs.

Where such a setback is not possible, furnish and maintain, suitable and sufficient signs, lights, barricades, or concrete barriers to delineate parked vehicles, equipment and stored material, subject to approval by the Engineer. The cost associated with this work will be the responsibility of the Contractor.

- b. During non-working hours, remove vehicles, idle construction equipment, and materials to storage areas entirely clear of the roadway. Use storage areas that are at least 30 feet from the traffic lanes for this purpose when permitted by topography and right of way, subject to the approval of the Engineer.

6. **Maintaining Lights.** Position and maintain Type A and Type C lights to be visible on a clear night from a distance of 3000 feet. Maintain Type B high intensity lights to be visible on a sunny day from a distance of 1000 feet when viewed without the sun directly on or behind the light. Replace batteries when the lights do not meet these requirements. Provide and maintain Type C LED lights which meet or exceed all requirements in the MMUTCD. Maintain the intensity requirement of 2 candela in the field. This requirement does not preclude the Engineer from determining that a battery change is necessary.

Inspect each light in use immediately before initial use and at least once every seven days after that. Service if necessary. Supply the Engineer with a written certification of maintenance on electrical devices at least once each seven days. The certification will be in the format shown below and will include all types of battery-operated warning lights and other Contractor-furnished electrical devices. Include a written summary on the number of warning lights, by type, which are currently operated on the project.

Maintenance Certification of Electrical Devices

Certification Date: _____

Project: _____ Location: _____

All Battery-operated warning lights in use on this project have been inspected, cleaned and serviced to comply with the specifications.

Number of Units in Use:

Type A _____ Type B _____ Type C _____

Lighted Arrow _____ Other _____

Dates Maintenance was Performed _____

Contractor Name _____

Authorized Signature _____

7. **Cleaning Traffic Control Devices.** Clean the whole or partial inventory of plastic drums, signs, barricades, and attached lights in operation on the project as directed by

the Engineer. Frequency of cleanings will depend on exposure to unfavorable environmental conditions, and the dirt accumulated on the devices.

8. **Traffic Regulators (Flag Control).** When the movement of traffic is interrupted or is restricted to alternating one-way traffic operation through the construction area, provide traffic regulators (flaggers) for each direction of approaching traffic on primary and intermediate roads. The Engineer may require intermediate flaggers.

Equip traffic regulators with the required flagger's vests and the STOP/SLOW sign paddles. Also equip traffic regulators with a two-way radio system when they are not visible to each other. When a two-way radio system is required, provide a backup system on standby readily available to the flaggers. Notify and keep traffic regulators advised of all information necessary for the maintenance of traffic.

The Contractor will provide traffic regulators (flaggers) and other traffic control devices to facilitate the movement of materials and equipment that may otherwise interfere with traffic. The cost associated with this work, when performed for the Contractor's convenience, is the responsibility of the Contractor. This work is subject to the Engineer's approval.

All persons who are designated to regulate traffic (flagging) must receive training on proper flagging procedures before conducting any such operation. At a minimum, this training will consist of viewing the video *Traffic Regulating (Flagging) for Construction, Maintenance and Utility Work* and reading the current MDOT handbook, *Traffic Regulators Instruction Manual*. Designated traffic regulators must have received this training within 12 months previous to performing the work. Maintain documentation to this effect and make it available to the Engineer upon request.

9. **Flag Control Operations.** No flagging operation will exceed 2 miles in length, or stop traffic in any direction for more than 10 minutes at a time, except as directed by the Engineer.

- J. **Lighting for Night Work.** Submit a lighting plan for review and approval by the Engineer, prior to starting night work.

Furnish, install and maintain fixed, portable, or equipment mounted lighting systems to allow workers and inspectors to clearly see and perform all nighttime operations and inspections. Supply a power source with sufficient capacity to operate the lighting system.

Provide lighting fixtures conforming to the current edition of MMUTCD, Part VI, for floodlights. In no case will floodlighting be permitted to glare, shine, or be directed into the eyes of oncoming drivers. Drive through and observe the lighted area from each direction on the main roadway after initial floodlight setup to determine the adequacy of floodlight placement and potential for glare. Adjust lighting alignment if necessary.

Provide backup lighting to replace failed lights and equipment during nighttime operations. Keep the backup equipment on the project and available for use at all times during nighttime operations. The backup system must meet the criteria described above.

The Engineer will suspend all nighttime operations except traffic control if lighting is inadequate.

- K. **Chip Seal Surface Treatment and HMA Construction.** Requirements for the maintenance of traffic during the placement of chip seals and hot mix asphalt (HMA) are as follows:

1. **General.** Complete rolling and allow the surface to cool sufficiently to prevent damage from traffic before allowing traffic on the surface. When the use of the shoulders for two-way traffic is impractical, arrange for radio controlled, alternating one-way traffic around the section being surfaced. Furnish and operate lighted arrows at each end of the section under traffic control during all paving operations.

Provide warning signs, cones, drums, warning lights, and traffic regulators in sufficient number to keep traffic off sections being surfaced and provide for safe travel.

If conditions permit, and when approved by the Engineer, route traffic to avoid sections where the mixture is being placed. Provide and maintain all temporary routes in a condition satisfactory to the Engineer. The cost associated with this work is the responsibility of the Contractor.

2. **Chip Seal Surface Treatment.** Unless the road is closed to traffic, treat only one-half of the road width at a time, and do not allow traffic on the part being treated until 30 minutes after the application and rolling of cover material is completed.

When called for on the plans or in the proposal, maintain a traffic regulator (flagger) in accordance with subsection 812.03.I.8 to maintain alternating one-way traffic.

3. **Aggregate Surface and HMA.** Divide the project into increments, of lengths determined by the Engineer, to facilitate the handling of traffic. Keep traffic off the surfacing area of each section during surface preparation, placing bond coat and HMA, and rolling.

During such operations, maintain traffic along the right-of-way or on one-half the road where the construction procedure permits, or over a temporary route approved by the Engineer. Each increment must be completed and opened to traffic before the next section is closed. Always, provide reasonable means for local traffic to reach property along the project.

During darkness, place and maintain lighted drums to adequately protect traffic. For windrow sections in the center of the travel way, install drums with warning lights at the ends of the windrow and along each side of the windrow, alternating the placement of drums, with a maximum distance for 150 feet between the drums on each side; and at the ends of all breaks in the windrow where traffic passes through or crosses the windrow.

4. **Protection of Uncured Pavements.** In addition to the traffic control devices specified in the MMUTCD, keep traffic off freshly placed HMA pavement by installing cones or drums on tangent, separating the traffic lane from the closed lane, as shown in Figure 812-1 or 812-2 and by installing two or more cones across each lane being resurfaced at intervals not to exceed 600 feet after finish rolling or as directed. Place additional cones or drums at crossroads and commercial driveways to direct the traffic to the lanes being used for travel.

Conduct the paving operations in the sequences shown in Figure 812-1 or 812-2.

After the compactive operations are completed, if the air temperature is below 70 °F the pavement may be opened to traffic; if the air temperature is between 70 °F and 80 °F, keep traffic off the pavement for an additional hour; if the air temperature is more than 80 °F, keep traffic off the paving for two hours.

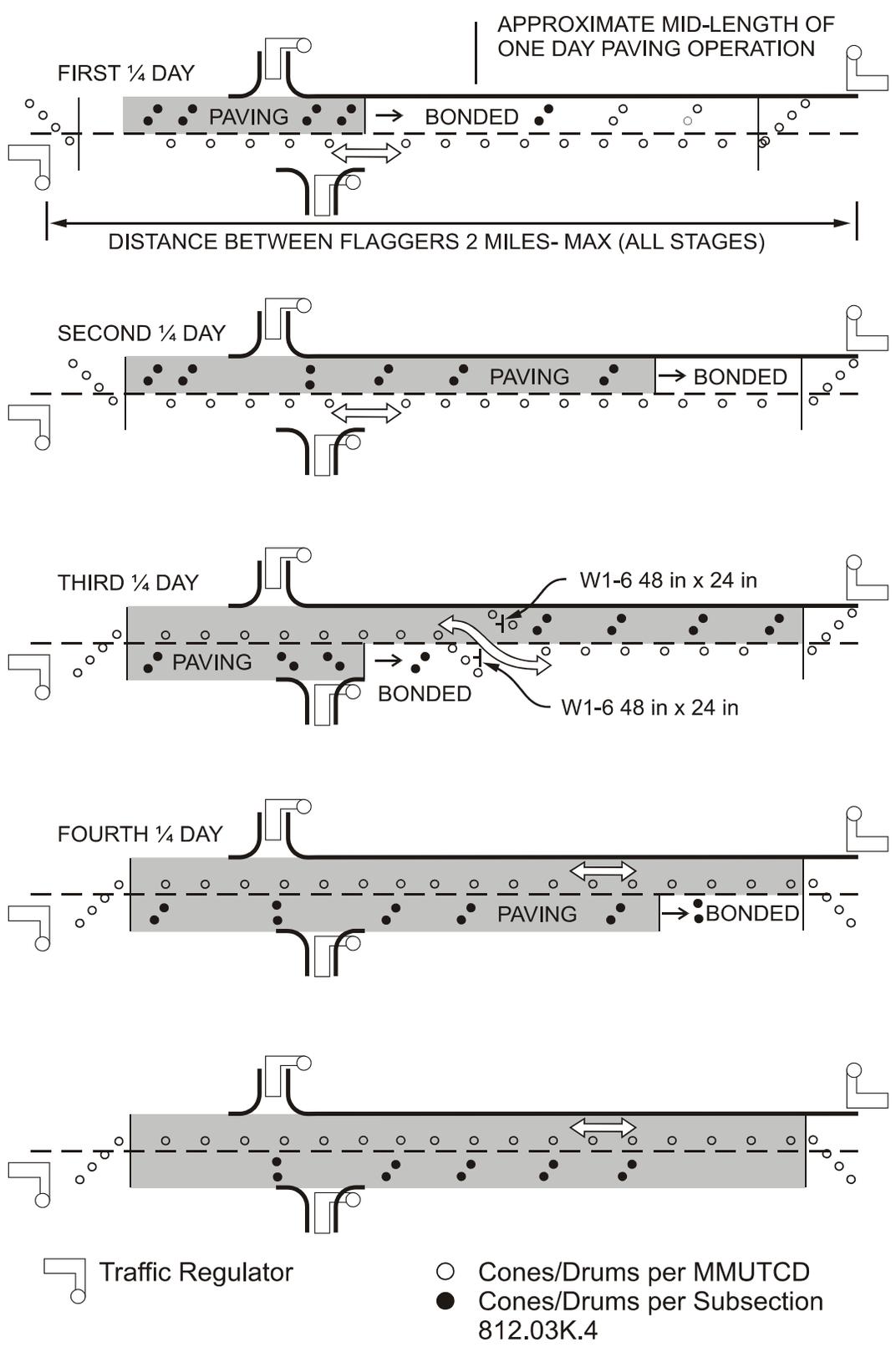
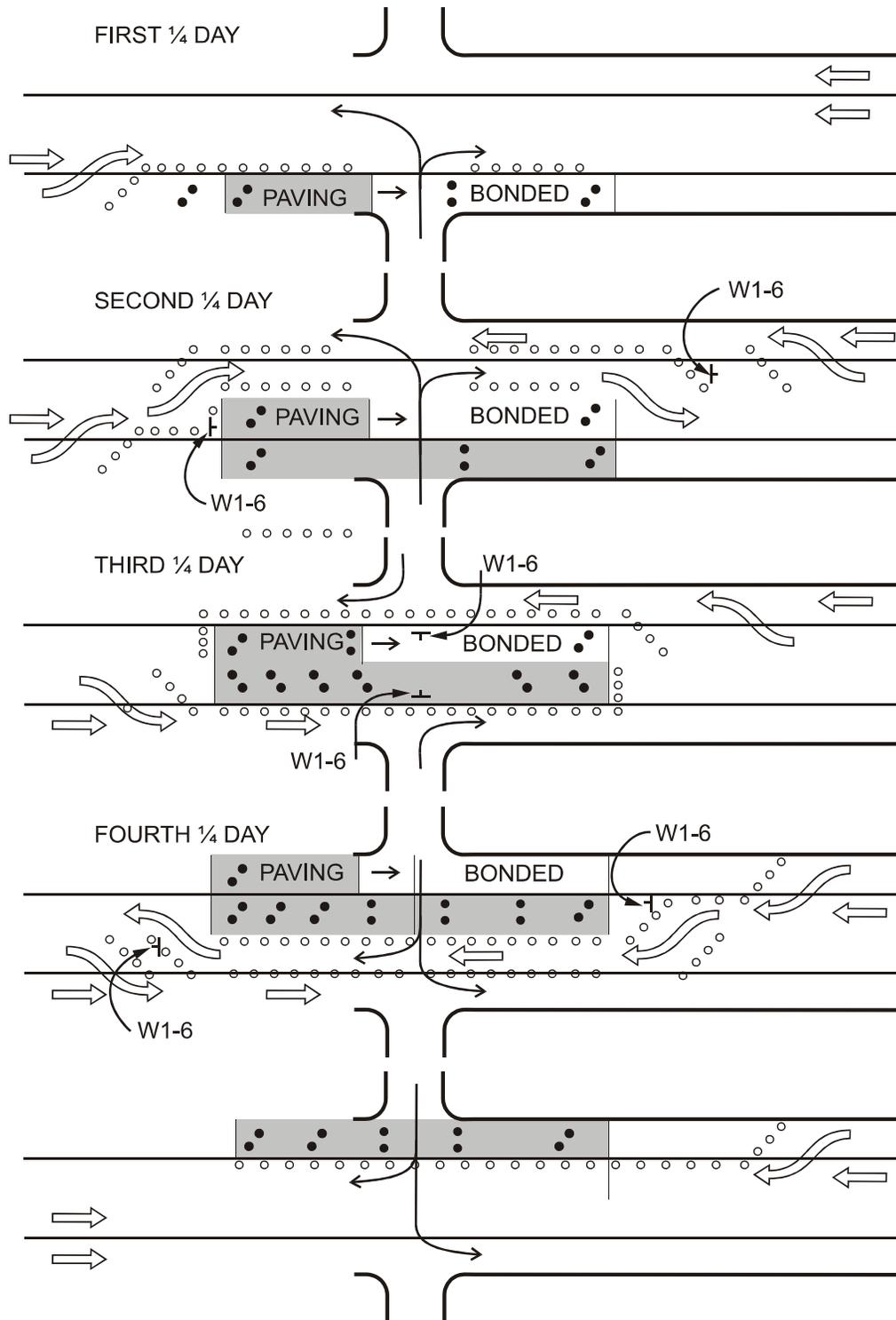


Figure 812-1 Protection of Bituminous Surface on Two-Lane Pavements



† W1-6 Signs are
48 in x 24 in

○ Cones/Drums per MMUTCD
● Cones/Drums per Subsection
812.03K.4

Figure 812-2 Protection of Bituminous Surface
on Four or More Lanes of Pavement

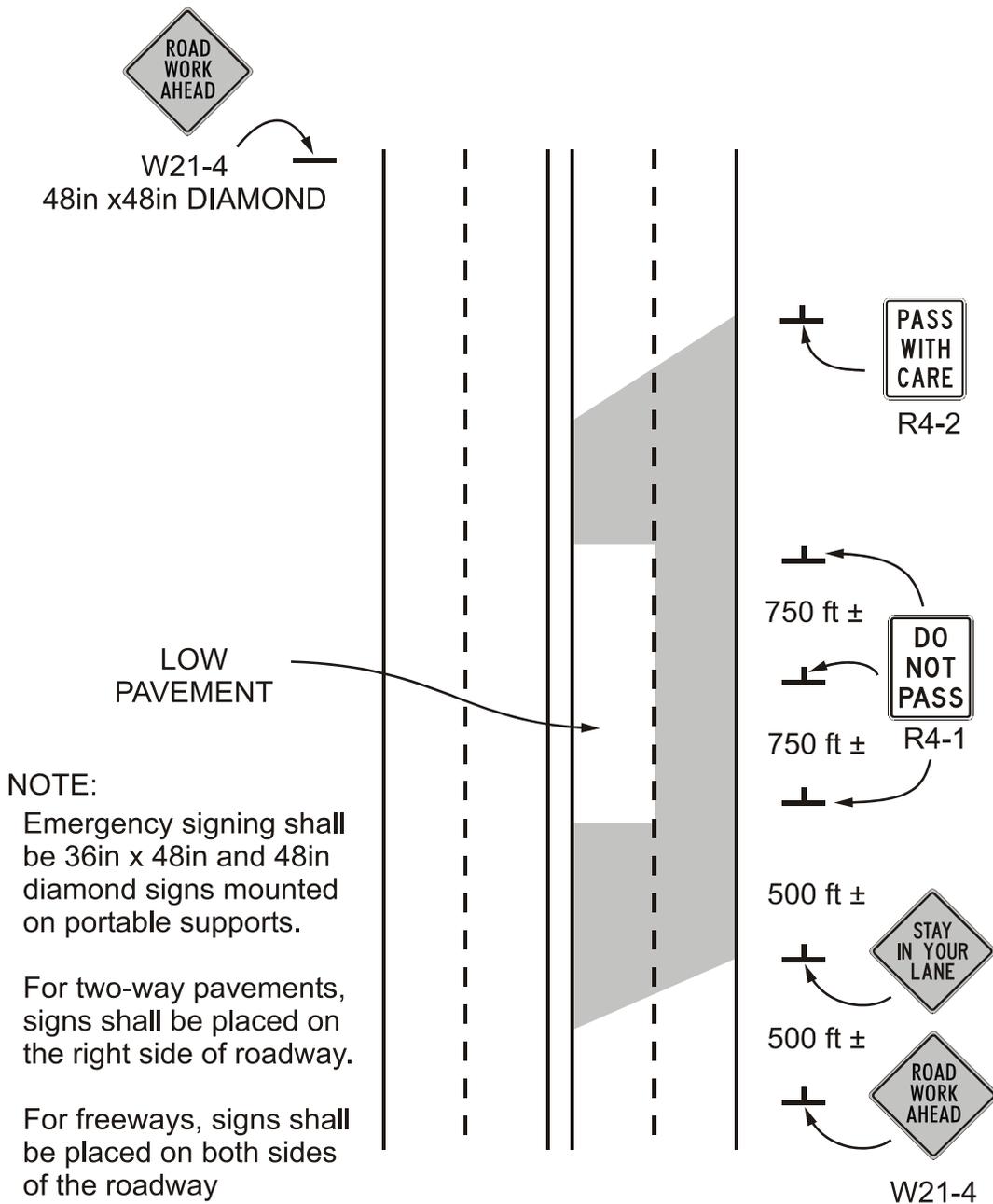


Figure 812-4 Emergency Signing for Four-Lane Two-Way Pavements or Freeways

5. **Staggered Lane Endings with Vertical Longitudinal Joints.** Surface all lanes to within one load of the same point of ending at the completion of each day's work to avoid any uneven longitudinal joints from remaining open overnight. The center lanes of 2-way pavements with an odd number of lanes are excluded from this requirement.

Before starting any HMA paving operations, provide on the site, the necessary signing to implement emergency signing in the event staggered lane endings remain open overnight.

When uneven longitudinal joints remain open overnight, maintain traffic according to the following requirements:

- a. When the differential in the points of ending of adjacent lanes of pavement is 250 feet or more, install temporary signs according to Figure 812-3 or 812-4 regarding emergency signing.
 - b. When the differential in the points of ending of adjacent lanes of pavement is less than 250 feet, install lighted drums at 30 feet intervals for the length and on each side of the affected pavement. In addition, place ROAD WORK AHEAD signs ahead of the area.
6. **Tapered Overlapping Longitudinal Joints.** Do not expose the tapered overlapping longitudinal joints to traffic beyond a 24 hour period except when delayed by inclement weather or when approved by the Engineer. When a tapered joint is used, place 48 by 48 inch UNEVEN LANES signs (W8-11) in advance and at a maximum of 2000-foot intervals throughout before allowing traffic on the newly paved lane. Place a minimum of two UNEVEN LANES signs in each direction. Leave these signs in place until the adjacent lane is brought to the same elevation.

- L. **Reflective Conspicuity Tape for Vehicles and Equipment in Work Zones.** Equip all vehicles and equipment within the work zone area, and vehicles delivering materials or equipment to the job site with red and white reflective conspicuity tape that meets ASTM D 4956 Type V requirements for reflective sheeting. Two exceptions to this requirement are foreman's pickup truck(s) with a beacon, in use, and heavy equipment, working or parked outside of the project clear zone.

Mark vehicles and equipment, including trucks, trailers, tank trucks, dump trucks, compactors, rollers, pavers, graders, lighted arrows, portable changeable message signs, etc. in use in work zones or delivering materials or equipment to the job site with the following.

1. Apply one 2-inch wide (minimum) horizontal stripe of conspicuity tape to a minimum of 50 percent of the length of each side of the vehicle or equipment. Space lengths of tape evenly.
2. Outline the rear perimeter of the vehicle or equipment with 2-inch wide (minimum) conspicuity tape. Apply the vertical and horizontal markings as close as practical to the edge of the vehicle or equipment.
3. Delineate Lighted Arrow, Type C trailers and portable changeable message signs with a 4 by 18 inch strip of reflectorized red and white conspicuity tape on each of the four sides; one strip at each corner of the trailer.

812.04 Measurement and Payment.

Contract Item (Pay Item)	Pay Unit
Minor Traf Devices	Lump Sum
Flag Control	Lump Sum
Sign, Type __, Temp, Furn	Square Foot
Sign, Type __, Temp, Oper	Square Foot
Sign, Type __, Temp, Prismatic, Furn	Square Foot
Sign, Type __, Temp, Prismatic, Oper	Square Foot
Sign Cover	Each
Sign Cover, Type I	Each
Lighted Arrow, Type __, Furn	Each
Lighted Arrow, Type __, Oper	Each
Lighted Arrow, Type C, Standby	Each
Sign, Portable, Changeable Message, Furn	Each
Sign, Portable, Changeable Message, Oper	Each
High Intensity Light, Type B, Furn	Each
High Intensity Light, Type B, Oper	Each
Plastic Drum, High Intensity, Furn	Each
Plastic Drum, High Intensity, Oper	Each
Plastic Drum, High Intensity, Lighted, Furn	Each
Plastic Drum, High Intensity, Lighted, Oper	Each
Barricade, Type III, High Intensity, Furn	Each
Barricade, Type III, High Intensity, Oper	Each
Barricade, Type III, High Intensity, Lighted, Furn	Each
Barricade, Type III, High Intensity, Lighted, Oper	Each
Conc Barrier, Temp, Furn	Foot
Conc Barrier, Temp, Oper	Foot
Conc Barrier, Temp, Adjusted	Foot
Conc Barrier, Temp, Relocated	Foot
Conc Barrier Reflector Replacement	Each
Pavt Mrkg, Type R, 4 inch, (color), Temp	Foot
Pavt Mrkg, Type NR, Tape, 4 inch, (color), Temp	Foot
Pavt Mrkg, Type NR, Paint, 4 inch, (color), Temp	Foot
Pavt Marker, Raised, Temp, Type __, (color), Monodirectional	Each
Pavt Marker, Raised, Temp, Type __, (color), Bidirectional	Each
Pavt Mrkg, Longit, 5 inch or Less Width, Rem	Foot
Pavt Mrkg, Longit, 5 inch to 10 inch Width, Rem	Foot
Pavt Mrkg, Longit, Greater than 10 inch Width, Rem	Foot
Part Width Intersection Construction	Each
Dust Palliative, Applied	Ton
Culv, Temp	Each
Traf Signal, Span Wire Type	Each
Traf Signal System, Temp, Oper	Lump Sum
Ltg for Night Work	Lump Sum

A. Damage Compensation. Notify and allow the Engineer the opportunity to verify the condition of damaged temporary traffic control devices eligible for payment before replacement and disposal. Replacement of temporary traffic control devices or equipment

which are damaged by vehicular traffic, other than the Contractor's vehicles and equipment, to the extent that replacement is necessary, will be paid as follows.

1. The furnished unit price bid will be paid for if a device is paid for as furnished.
2. The unit price bid for the contract item will be paid if a device is not paid for as furnished.
3. The manufacturer's invoice cost will be paid for devices required by the Engineer and not paid for separately under a contract item.
4. Thirty-three percent of the Furnished unit price bid will be paid for all replacement of **Barricade, Type III, High Intensity** panels required by the Engineer.
5. A flat rate of fifteen dollars (\$15.00) each will be paid if only the Type A or C light needs replacing on a device (but not to exceed the furnishing cost of the initial installation of the lighted device).
6. Temporary traffic control devices that are missing or stolen must be replaced at the Contractor's expense as determined by the Engineer.
7. Damaged equipment on lump sum maintaining traffic will be paid at the manufacturer's invoiced cost.

B. Cleaning Traffic Control Devices. This work will not be paid for separately but is included in the unit price bid for **Plastic Drum, High Intensity, Oper; Plastic Drum, High Intensity, Lighted, Oper; Barricade, Type III, High Intensity, Oper; Barricade, Type III, High Intensity, Lighted, Oper; Sign, Type __ Temp, Oper; and Sign, Type __ Temp, Prismatic, Oper.**

If notice is given by the Engineer that cleaning is necessary and this work is not completed within 72 hours, excluding weekends and holidays listed in 101.02, these items will be subject to a five percent reduction in the unit bid price. This reduction will be based on the actual field count of devices placed on notice and in violation past the 72 hour deadline. Once notice has been given, this five percent reduction will be assessed for each 72 hours in which cleaning has not been performed.

C. Maintaining Lights on High Intensity Plastic Drums, and Type III, High Intensity Barricades. If notice is given by the Engineer that maintenance is necessary on more than ten percent of the Type C LED lights in service on plastic drums and Type III, high intensity barricades and these lights are not maintained according to subsection 812.03.I.6 within 72 hours, a five percent reduction in the bid unit price for **Plastic Drum, High Intensity, Lighted Furn; Plastic Drum, High Intensity, Lighted, Oper; Barricade, Type III, High Intensity, Lighted, Furn; and Barricade, Type III, High Intensity, Lighted, Oper** will be applied. This reduction will be applied to the actual field count of devices in place at the time of the inspection, regardless of the maintenance history. Once notice has been given, this five percent reduction will be assessed on the total number of devices in place for each 72 hours in which the batteries have not been replaced according to subsection 812.03.I.6.

D. Furnished. Contract items designated as furnished will be measured as the maximum number of units required by the Engineer on one project, at one time during the life of the contract. **Sign Type __ , Temp, Furn** and **Sign, Type __ , Temp, Prismatic, Furn** will

be measured as the total cumulative area of the maximum number of signs with dissimilar sign legends in use, on one project, at any one time during the life of the contract and includes portable and driven sign supports. Payment for furnished items includes furnishing the item in operable condition (including required equipment, supplemental weights, hardware, and labor to make the device operable) and initially installing the item; and for replacing an item damaged by vehicular traffic other than the Contractor's vehicles or equipment. Payment for **Sign Type __, Temp, Furn** also includes installation of one Type A light on each sign. A furnished item is eligible for payment only when it has been placed into operation; and only once per project, unless a price adjustment for an authorized extension of time is approved.

E. **Operated.** Contract items designated as operated will be measured as the maximum number of units required by the Engineer on one project, at one time during the life of the contract. **Sign Type __, Temp, Oper** and **Sign, Type __, Temp, Prismatic, Oper** will be measured as the total cumulative area of the maximum number of signs with dissimilar sign legends in use, on one project, at any one time during the life of the contract. Payment for contract items designated as operated, (with exception of **Conc Barrier, Temp** and **Traf Signal System, Temp**) includes operating, inspecting, maintaining, cleaning, relocating, and removing the item from the project.

F. **Minor Traffic Devices and Flag Control.**

1. Furnishing, installing, maintaining, relocating, and removing all traffic cones and other traffic devices not identified on the plans or in the proposal will be paid for as **Minor Traf Devices**.
2. Maintaining local traffic is included in **Minor Traf Devices** except that the contract items listed for earth excavation; culverts, temporary; structures, temporary; and temporary traffic control device, surfacing materials, and dust palliatives, used in the construction and maintenance of temporary roadways and temporary approaches required by the Department will be paid for separately at the unit prices bid for the contract items involved.
3. Removing, storing, and reinstalling permanent signs and supports (Department owned) to avoid damage according to subsection 812.03.G, or for the Contractor's convenience, will be paid for as **Minor Traf Devices**.
4. Reflective conspicuity tape on vehicles and equipment will be included in **Minor Traf Devices**.
5. Payment for **Flag Control** includes providing the personnel, furnishing and operating the equipment and providing the traffic regulator training as specified in subsection 812.03.I.8 for regulating traffic.
6. The use of traffic regulators (flaggers) and installation of appropriate traffic control devices for work done at the Contractor's convenience is considered to be included in the payment for **Minor Traf Devices**.
7. Partial payments for **Minor Traf Devices** and **Flag Control** will be made according to the schedule below. No claim for additional compensation will be allowed for any inconvenience or delay caused because of routine maintenance operations performed by the Department.

Table 812 - 1 Partial Payment Schedule for Minor Traffic Devices and Flag Control

Percent of Original Contract Amount Earned	Total Percentage of Bid Price Paid
First Use	50
50	75
90	100

G. **Sign Covers.** The maximum number of units required, by sign size and shape, at one time during the life of the contract for permanent signs and temporary signs mounted on fixed posts will be measured for payment. **Sign Cover** includes furnishing, installing, removing, and relocating the sign covers as often as is required by the Engineer during the life of the contract. Only approved materials and hardware will be measured for payment.

Payment for **Sign Cover, Type I** includes all work required to fabricate, install and remove the covers as shown on the plans.

H. **Lighted Arrow, Type C, Standby.**

1. Payment for **Lighted Arrow, Type C, Standby** will be made only when the contract item is specified in the plans. Payment includes furnishing a fully operable unit and placing it on standby, readily available to replace a damaged unit.
2. Payment for the standby unit will only be made once during the life of the contract.
3. Using this standby unit to replace a unit taken out of service for maintenance is allowed. However, payment for replacing the standby unit will not be made.

I. **Sign, Portable, Changeable Message, Oper** includes programming and delineating the sign in addition to the work required to operate the sign as described in subsection 812.04.E.

J. **Plastic Drums, High Intensity, Lighted, Furn** includes furnishing and installing the drum, including supplemental weights and one Type A or Type C light on each drum.

K. **Barricade, Type III, High Intensity, Lighted, Furn** includes furnishing and installing the barricade, including supplemental weights and three Type C lights on the top rail.

L. **Concrete Barrier, Temporary.**

1. **Conc Barrier Temp, Furn** will be measured according to subsection 812.04.D. Payment includes furnishing and installing the concrete barrier in the initial location with barrier reflector markers attached.

The work of furnishing and installing, as indicated on Standard Plan R-126 Series, one Type B high intensity light on the approaching taper or tangent breakpoint of the concrete wall will be paid for separately.

2. **Conc Barrier, Temp, Oper** will be measured according to subsection 812.04.E. Payment includes operating, maintaining, and final removal of the concrete barrier from the project.

3. **Conc Barrier, Temp, Adjusted** includes moving the temporary concrete barrier laterally to a new alignment on the same roadbed, including tapers that may be outside the roadbed.
4. **Conc Barrier, Temp, Relocated** includes relocating the temporary concrete barrier longitudinally on the same roadbed, or to another roadbed; excluding moves measured and paid for as **Conc Barrier, Temp, Adjusted**. A relocation may involve removing, loading and hauling to a temporary storage site, storage, reloading, hauling, and installing at a location on the project.
5. **Conc Barrier Reflector Replacement** includes removing a damaged marker from a temporary concrete barrier section after initial placement, and furnishing and installing a new barrier reflector.

M. Temporary Pavement Markings

1. **Pavt Mrkg, Temp** is measured as the length of equivalent 4-inch line required to be placed; the skips in dashed lines are not included in the measurement. **Pavt Mrkg, Temp** includes furnishing and placing temporary pavement markings as specified. Payment for Type R markings also include the cost of removing the markings.
2. **Pavement Marker, Raised, Temp** includes furnishing, installing, and removing the unit.
3. Removing existing longitudinal markings will be paid for as **Pavt Mrkg, Longit, Rem** for width specified in the contract item. This contract item applies when existing longitudinal permanent markings or temporary Type NR markings are required to be removed. Skips in dashed lines are not included in the measurement

No payment will be made for markings required to be removed due to nonconformance with subsection 922.04 or which are removed as part of another pay item.

- N. **Part Width Intersection Construction**. This work will be measured and paid by the number intersection units specified in the contract documents. The area defined as **Part Width Intersection Construction** includes the legs of the cross road intersecting the mainline roadway, measured from the spring-points of intersection radii, which are required to be constructed part-width while traffic is maintained through the intersection. An intersection will be considered as one unit regardless of either the number of legs comprising the intersection or the number of construction stages.

Part Width Intersection Construction includes all work associated with providing measures and operations specified for this type of construction except that the contract items listed for earth excavation, temporary traffic control devices, surfacing materials, and dust palliatives used in the construction and maintenance of the temporary roadway will be paid for separately. Other contract items not identified in the preceding are not included in **Part Width Intersection Construction**.

O. Dust Palliative

1. **Dust Palliative, Applied** will be measured and paid by weight of calcium chloride, based on the concentration of solids or solution delivered, as indicated on the delivery report or as determined by testing.
2. Additives combined with the gravel prior to, or at the time of, placing the gravel surface will not be measured for payment as **Dust Palliative, Applied**.

P. **Culv, Temp** includes the construction, maintenance, and removal of the unit before project completion.

Q. **Traffic Signal, Span Wire**

1. **Traf Signal, Span Wire Type** __ includes furnishing, installing, and removing span wire, signal heads, lamps, fittings, wiring, line hardware, guys, anchors, cable to controller, lashing rod, and all other material required to provide a complete and operating unit.
2. Removal of the signal and associated equipment is also included in **Traf Signal, Span Wire Type** __ . The Contractor will retain all removed equipment.

R. **Traf Signal System, Temp, Oper**, includes operating, (including signal timing changes as directed by the Engineer), inspecting, maintaining, disconnecting, and covering the temporary traffic signals and street lighting required for the duration of the contract as **Traf Signal System, Temp, Oper**. The type of traffic signal controller called for on the plans is the preferred equipment. If the Contractor requests the use of alternate traffic signal control equipment, the Engineer at no additional cost may make this change upon approval to the Department. The Contractor will provide all necessary traffic signal timing changes to provide proper operation of the temporary traffic signals.

S. **Ltg for Night Work** includes furnishing, installing and maintaining lighting for the entire project and the required lighting plan. There will be no adjustments in the lump sum price regardless of the number or type of lighting systems required to complete all night work on the project as described in subsection 812.03.J and as directed by the Engineer.

T. **Price Adjustments for Authorized Extensions of Time**. No price adjustments will be made for temporary traffic control devices during authorized extensions of time when liquidated damages are assessed. If no liquidated damages as described in Subsections 108.08 and 108.09 are assessed, the unit price will be adjusted for the following.

1. **Traf Signal System, Temp, Oper**
2. Items designated as furnished, operated or standby
3. Items measured as lump sum, if they are used or required on the work site during the authorized extension of time.
4. **Signal, Span Wire Type** __ will not be adjusted for authorized extensions of time.

Adjustments in the contract unit price of traffic control items will be based on the original contract time and the number of additional calendar or working days the item was in use or required to be on standby during the authorized extension of time. The equation shown below will be used to calculate the adjustments. When calculating the adjustment, either calendar or working days will be used for both original contract time and additional days,.

$$\text{Unit price adjustment} = A/B \times C$$

Where:

- A = Additional days the item was in use or required to be on standby during the authorized extension of time
- B = Original contract time
- C = Original contract unit price

If an authorized extension of time extends a work day project into the next construction season, including seasonal shutdown periods, during which the item is on standby or in actual use, the following extension will apply. For seasonal shutdown periods, the original contract time will be the calendar days between the first actual work day and the expiration of the original contract completion. The number of additional days the item is used or required will also be determined in calendar days.