Section 2528. Traffic Control

2528.01 DESCRIPTION.

A. General.

1. This section describes various materials, equipment, and procedures involved in traffic control during construction. The Contractor and the Contracting Authority have certain responsibilities, whether public traffic is allowed or is prohibited during construction. Apply Article 1107.09.

2. The contract may include an item for traffic control. In this case furnish, erect, operate, maintain, move, and remove all traffic control devices required by the contract documents.

3. The contract may indicate that traffic control is incidental. In this case the Contracting Authority will furnish all signs and traffic control devices, except pilot car and flaggers' signs, and all Type III barricades, and associated mounting devices. Furnish all other traffic control devices required. Erect, operate, maintain, move, and remove all traffic control devices. Signs and barricades to be furnished by the Contracting Authority will be made available at a nearby maintenance site. Return the signs and barricades when no longer needed.

4. The contract documents may specify orange mesh safety fence be used in conjunction with other traffic control devices as part of the project traffic control requirements. Use orange mesh safety fence meeting the requirements of Article 4188.03. Securely support the fence so it is in a vertical position without any sagging. Locate and place the safety fence supports so they are not a safety hazard.

5. Ensure all traffic control complies with the current edition of the MUTCD, Part 6 as adopted by the Department.

6. On Interstate and Primary Road projects, use crashworthy Category I and Category II traffic control signs and devices that meet NCHRP Report 350.

7. Upon request provide the following to the Engineer for the purpose of documenting the crashworthiness of Category I and Category II signs and traffic control devices:

- **a.** The vendor’s self-certification for Category I traffic control devices.
- **b.** FHWA NCHRP Report 350 approval memos for Category II signs and traffic control devices.

8. A list of approved Category II traffic control devices is found on the World Wide Web at the following URL: http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/wzd/.

9. Gender specific signs, such as FLAGMAN and MEN WORKING, will not be allowed. Use neutral gender signs, for example FLAGGER, or equivalent symbol signs.

10. Provide ten calendar days advance notification of a pedestrian path closure to the following:

- Iowa Department of the Blind: Program Administrator of Field Operations and Access Technology, telephone: 515.281.1361, website: www.blind.state.ia.us.
- National Federation of the Blind of Iowa: President, telephone: 515.771.8348, website: www.nfbi.org.
- Engineer

B. Monitoring With Incident Response.

1. Provide 24 hour per day continuous monitoring of traffic control devices and incident response for emergency situations on projects during complex traffic situations as defined in the contract documents. The contract documents will identify projects requiring monitoring with incident response. Ensure a vehicle and operator traverses the project throughout the entire traffic control zone at all times, except for refueling and short rest breaks no greater than 15 minutes in duration.

2. Furnish this work according to the contract documents any time that signs, barriers, barricades, or other traffic control devices are in place during complex traffic situations.

3. Provide a vehicle and operator for this work as follows:

a. Equipment.

1) Meet the following requirements:

a) 3/4 ton (or metric equivalent) pickup truck or another similar vehicle.

b) Contractor's insignia on the vehicle.

c) Adequate weight and power and suitably equipped to move stalled automobiles or pickup trucks.

d) Equipped with an amber revolving light or amber strobe light visible in all directions and a cellular telephone or similar type of mobile phone.

e) Capable of carrying traffic signs, tools, traffic control devices, and other necessary equipment.

2) When used on projects where more than one lane in one direction is maintained at all times, ensure this vehicle is also be equipped with a Type C arrow panel as described in Article 2528.03, G, mounted to be visible to traffic approaching from behind.

b. Operation.

1) Furnish an operator for the vehicle. Ensure the operator re-erects, repairs, or replaces defective devices immediately upon discovery.

2) Have the operator:

a) Be available to assist persons with vehicle problems and move automobiles, pickup trucks and other obstructions

so as to keep all travel lanes and shoulders available for public traffic.

b) Continue assistance to motorists and involvement with obstructions until they are no longer an impediment to traffic and further assistance can be provided safely by others.

c) Assist motorists or remove obstructions promptly and safely when a vehicle or anything else is obstructing a travel lane or shoulder intended to be clear.

d) Summon further assistance if needed.

e) Keep a report of any events that restrict the normal traffic flow during complex operations, including responses to emergency situations, on forms provided by the Engineer. Provide the Engineer with a copy of this report daily.

3) The Engineer may request to operate project related Portable Changeable Message Signs (PCMS) according to Article 2528.03, B, for advance traffic notification and warning. Authority to operate PCMS units will be under the direction of the Engineer according to the contract documents. Only the Engineer may add or modify any preprogrammed messages. The Contractor may only operate the CMS to display one of the preprogrammed messages.

4) During anticipated peak traffic times, the Engineer may direct the Contractor to provide additional monitoring personnel for PCMS operation and other traffic monitoring functions.

C. Traffic Quality Control.

1. Maintain a Traffic Control Technician on staff, even though the traffic control portion of the contract may be subcontracted. The Traffic Control Technician is required to have attended and passed the exam in an ATSSA Traffic Control Technician, IMSA Work Zone Traffic Control, or Minnesota DOT Traffic Control Supervisor training class. This Traffic Control Technician is responsible for overall management of the Contractor's quality control program for traffic control.

2. On a daily basis as the project is constructed, perform the following quality control work associated with monitoring and documenting traffic control conditions:

a. Review all traffic control operations for compliance with contract documents and maintain a project traffic control daily diary in a format provided by the Contracting Authority. Submit this diary to the Engineer. It will become a part of the Contracting Authority's permanent project records. The Engineer may require submission of completed portions of the daily diary at routine intervals during construction of the project. In the diary include:

- Listing and station location of traffic control used each day referenced to the appropriate Standard Road Plan, project plan sheet, etc.,
- All reviews of traffic control devices and operations, whether satisfactory or unsatisfactory, and corrections made,
- Approved changes to the contract document’s traffic control,

- Incidentals affecting the efficiency and safety of traffic, and
- A daily list of trained flaggers used, including hours worked.

b. Monitor traffic operations and submit proposed Traffic Control Plan changes to the Engineer for approval.

c. Coordinate all changes to the Traffic Control Plan.

d. Coordinate all traffic control operations, including those of subcontractors and suppliers.

2528.02 MATERIALS.

Use materials meeting the requirements of Part 6 of the MUTCD and Division 41 for the respective traffic control signs and devices.

2528.03 SIGNS AND DEVICES.

A. Signs.

1. Furnish signs that are of the size and type shown in the contract documents and use retroreflective sheeting meeting the requirements of Article 4186.03.

2. For Interstate and Primary projects, furnish diamond shaped warning signs that are 48 inches (1200 mm) by 48 inches (1200 mm) unless specified otherwise in the contract documents.

3. For traffic control zones in duration for 4 calendar days or more, mount signs on fixed posts.

4. Signs for traffic control zones in duration for less than 4 calendar days may be mounted on moveable skids or fixed posts.

5. Meet the following requirements for fixed post mounted signs:

a. Sign sheeting applied to rigid wood or metal.

b. Mounted at a height of at least 7 feet (2.2 m), measured from the bottom of the sign to the near edge of the pavement. A secondary sign on the same post may be mounted 1 foot (0.3 m) lower than specified above.

c. A clear distance 2 feet (0.6 m) behind a curb or beyond the edge of the shoulder.

6. Meet the following requirements for moveable skid mounted signs:

a. Flexible roll-up sheeting or other skid mounted sign systems that meet NCHRP 350 requirements.

b. Mounted at a height of at least 1 foot (0.3 m) above the roadway.

7. Ensure mounting devices are not so substantial as to be a hazard to vehicles. Meet the following requirements for posts mounted in existing soil:

a. Wood sign supports meeting the materials requirements of Article 4164.04.

b. 3.0 pounds per foot (4.5 kg/m) U-shaped rail steel posts.

c. 2 1/4 or 2 1/2 inch (60 mm or 65 mm) square 12 gage perforated steel tubing.

8. Dual-post and triple-post configurations using these sign supports are acceptable provided that no more than two posts occupy any 8 foot (2.4 m) wide path. Bracing of these posts will not be permitted. Posts exceeding these requirements shall have breakaway features approved by the Engineer.

9. Ensure signs are in a condition so they are effective for the intended purposes when viewed from a vehicle. For nighttime installations, ensure the reflectance is adequate so that the message is clearly readable. Ensure signs are maintained in a near vertical position.

10. When indicated in the contract documents, use supplemental sign flags in conjunction with work zone signing. Use sign flags 16 inches (400 mm) square and sheeted with red Type III or Type IV retroreflective sheeting meeting requirements of Article 4186.03.

11. On projects where two new lanes are being constructed adjacent to an existing two lane highway, place TWO WAY TRAFFIC (W6-3) signs. Place them off the right shoulder of mainline: 1) after each public side road for each direction of travel for traffic that may enter from all intersecting side roads; or 2) at 1/2 mile (0.8 km) intervals, whichever is less. Install these signs when grading activities start and leave in place until the entire four lane divided highway is opened to traffic. If the pavement is constructed under a separate contract, leave these signs in place after the grading contract is completed. They become the property of the Contracting Authority. The paving contractor then takes over these signs and removes them when the four lane divided highway is opened to traffic. Payment will be according to Article 2528.05, A.

12. When directed by the Engineer, cover or remove permanent signing that conveys a message contrary to the message of the temporary signing and not applicable to the working conditions.

13. The END ROAD WORK (G20-2) sign may be eliminated for mobile or short duration (less than 1 hour) temporary traffic control zones.

B. Portable Changeable Message Signs

Furnish, place, operate, and maintain PCMS at the locations shown on the plans. The Contractor maintains possession of the PCMS upon completion of the project.

1. Sign Design.

a. Trailer mounted signs. Message panel mounted at a height of at least 7 feet (2.2 m), measured from the bottom of the sign to the near edge of the pavement. Sign presents a level appearance. Sign is capable of displaying three lines of up to eight characters at one time. Character height is 18 inches (450 mm) and configured using a 7 pixel tall by 5 pixel wide font.

b. Message panel visible from 1/2 mile (800 m) under both day and night conditions. Letters legible from 750 ft (225 m). Message sign shall include automatic dimming for nighttime operation and a

power supply capable of providing continuous 7 days (24 hours per day) service.

c. Message panel consisting of a line matrix or full matrix design controlled by an onboard computer capable of:
- Storing a minimum of 99 programmed messages for instant recall.
- Being programmed to accept messages created by the operator via an alpha-numeric keyboard.
- Being programmed by remote.

d. Physical access to the onboard computer protected by a padlock (using a key). Electronic access to the onboard computer protected by a username and password.

2. Operation of Signs.

a. Provide preventive maintenance efforts necessary to achieve uninterrupted service. If service is interrupted and not restored within 24 hours, the Engineer will cause such work to be performed as may be necessary to provide this service, at no additional cost to the Contracting Authority.

b. The Engineer may request the Contractor to operate PCMS for advance traffic notification and warning. Authority to operate PCMS will be under the direction of the Engineer. The Contractor may only operate the PCMS to display messages authorized by the Engineer.

c. Promptly program and/or reprogram the computer to provide the messages as directed by the Engineer.

d. Provide the Engineer with the username and password and two keys.

3. Internet Operation for Long Term Duration.

a. This section describes Internet operations for use of PCMS for long term duration. PCMS hardware and software that are required for Internet operation under this article will be considered extra work according to Article 1109.03, B.

b. Communication equipment at the sign, a web server at a central communications hub, and communications from the sign to the Internet are required.

c. Make an Internet web page available as the method for the Engineer to control the sign from the office. Choose software to control the signs that is not required to be installed on the Engineer's computer. Ensure the Internet web page performs the following functions:
- Displays the name of the sign.
- Shows the current display on the message board.
- Puts up a message using free text.
- Puts up a message by calling the onboard library of stored messages.
- Removes the current message.
- Displays the current voltage of the sign's batteries (if solar).

C. Channelizing Devices.

1. Use Channelizing Devices that are of the type shown in the contract documents. Use reflective sheeting meeting the requirements of Article 4186.03.

a. Barricades.

1) A 2 foot (0.6 m) minimum length barricade may be used when Type I or Type II Barricades are furnished as one of the options for channelizing devices in lieu of vertical panels, 42 inch (1050 mm) channelizers, cones, or drums.

2) Ensure Type III barricades have a minimum length of rail of 6 feet (1.8 m). When traffic is permitted in each direction around a Type III Barricade, ensure the Type III Barricade used has fully reflectorized faces on both sides of the rails.

3) Erect barricades in essentially a horizontal position perpendicular to the direction of approaching traffic. Ballast them so as not to cover any striped rail.

b. Cones, Vertical Panels, 42 Inch (1050 mm) Channelizers, Drums, and Tubular Markers.

1) Ensure cones, vertical panels, 42 inch (1050 mm) channelizers, drums, and tubular markers meet the current requirements of the MUTCD, and Section 4188.

2) When used to separate two way traffic, separate temporary no passing lines approximately 16 inches (400 mm), with the marker to be installed between these lines.

3) Ensure tubular markers meet the following:

a) Between 28 inches (710 mm) and 34 inches (865 mm) in height.

b) Diameter facing traffic at least 2 inches (50 mm) in width.

c) Completely faced with reflectorized white and orange sheeting that is in two bands 4 inches (100 m) wide with 6 inches (150 mm) between bands, with the top band no more than 2 inches (50 mm) from the top of the tubular marker.

4) Cones may be used as channelizing devices in tapers and along lane lines during daylight hours only.

5) 42 inch (1050 mm) channelizers may be used in place of drums in work areas remaining in place for up to three days. Spacing of channelizers shall be half the spacing required for drums or double the number of drums required.

2. Channelizing devices may be placed up to 2 feet (0.6 m) beyond centerline or lane line at specific locations where actual work activity is taking place. Return channelizing devices to the original position when the work activity has passed.

3. Individual channelizing devices may be omitted during working hours in areas where placement interferes with the work. Channelizing devices on tapers are required at all times.

4. Do not intermix channelizing devices of different types.

5. For pedestrian path closures, use Type III Barricades to block the full width of the pedestrian path. Mount a SIDEWALK CLOSED (R9-9) sign to at least one of the Type III barricades at each closure.

D. Pilot Cars.

1. Pickup trucks or automobiles displaying the Contractor's company insignia, equipped with G20-4 signs reading: PILOT CAR - FOLLOW ME. Ensure two signs are mounted on the vehicle so as to be clearly visible from both directions of traffic. Mount the signs so the bottoms are at least 1 foot (0.3 m) above the top of the vehicle's roof.

2. Operate pilot cars such that they maintain a uniform speed through the work area, no greater than 40 miles per hour (65 km/hr).

E. Temporary Barrier Rail.

Use temporary barrier rail as shown in the contract documents. Unless shown otherwise, use precast concrete units. Tie the units together as specified or as approved by the Engineer.

F. Modular Glare Screens.

1. When specified in the contract documents furnish, install, and maintain a modular glare screen system on the top of concrete barrier rail according to the contract documents and the modular glare screen system manufacturer's instructions. Furnish a system consisting of modular base units attached to the top of concrete barrier rail with blades evenly spaced and securely mounted to the base units. Ensure the following:
   - Modular base units and glare screen blades are compatible so the base unit and blades can be securely attached to each other.
   - Base units and blades supplied are manufactured by the same manufacturer.
   - The length of individual modular base units is no longer than the nominal length of individual temporary concrete barrier rail sections.
   - The width of the modular base units is no wider than the top width of the concrete barrier rail.
   - Glare screen blades are FHWA highway green in color and made of impact resistant non-metallic high density plastic material.
   - Blade height is from 24 inches to 30 inches (600 mm to 750 mm) and width is from 6 inches to 9 inches (150 mm to 225 mm).
   - The same uniform sized blades are used throughout the work.
   - The modular glare screen system is manufactured by a company on the approved manufacturer’s list in Materials I.M. 486.06, Appendix A.

2. Install the modular glare screen system according to the manufacturer's instructions and the approval of the Engineer. Install the system so that:
   - It is centered along the longitudinal axis length of the top of the concrete barrier rail.

- The overhang of the base units, blades, and associated assembly over the edges of the top of the concrete barrier rail is kept to a minimum.
- The modular base units are flush with the top of the concrete barrier rail and they do not extend over the joints between concrete barrier rail sections.

3. Install glare screen blades so the combination of blade width and spacing provide for a minimum 22 degree sight cut-off angle.

4. At 10 foot (3 m) intervals along the glare screen installation, apply (appropriate to the direction of traffic) 3 inch by 6 inch (75 mm by 150 mm) yellow or white strips of Type III or IV retroreflective sheeting meeting the requirements of Section 4186 to the appropriate glare screen blades. Apply each strip at the vertical midpoint of the glare screen blade and to the side of the blade nearest to traffic. Apply the strip with the longer dimension vertical.

5. Maintain the modular glare screen throughout the work. Replace or repair damaged parts of the modular glare screen system, as soon as practical, at no additional cost to the Contracting Authority.

6. When moving temporary barrier rail with a modular glare screen system, the Contractor may temporarily remove base units and glare screen blades, if necessary, to assist in the moving. Reinstall the removed base units and glare screen blades as soon as the temporary concrete barrier rail has been moved to its new location.

7. Perform final removal of the modular glare screens from the concrete barrier rail when directed by the Engineer. Upon removal, ensure there are no protrusions on the top of the concrete barrier rail.

8. Upon completion of the work, the Contractor retains ownership of the modular glare screen system.

G. Lighting Devices.

1. Furnish lighting devices as required by the contract documents. Type A barricade warning lights will normally be required for nighttime installations. Type B warning lights will normally be required for 24 hour operation.

2. Use barricade warning lights that comply with the ITE Standard for Flashing and Steady Burn Barricade Warning Lights and are identified as such. In addition, use Type A barricade warning lights that:
- Operate on a 12 volt battery system, unless the ITE identification specifically indicates that the rating is based on a different system, and
- Are visible to both directions of traffic.

3. When arrow displays are used, furnish Type C arrow displays described in the current edition of the MUTCD, Part 6, and operate them in a sequential chevron mode when indicating a lane change.

H. Temporary Traffic Signals.

1. General.

a. Set up and operate temporary traffic signals as shown in the contract documents. Ensure the temporary traffic signal system meets the physical display and operational requirements of conventional traffic signals as specified in Part 4 of the MUTCD. Unless stated otherwise in the contract documents, either a span wire or trailer mounted temporary traffic signal system may be provided.

b. In the event any part of the temporary traffic signal system malfunctions or a continuous red flash mode is encountered, furnish flaggers on a 24 hour/7 day a week basis until repairs are made and the signals are fully functional. For temporary traffic signals at intersections, install stop signs on all approaches until the signals are fully operational, at no additional cost to the Contracting Authority.

2. Equipment.

a. Trailer or Span Wire Mounted Systems.

1) Furnish actuated signal controllers complying with NEMA and ITE standards. Ensure the temporary traffic signal system complies with the following:

a) Includes a solid state digital traffic signal controller capable of operating the signals according to MUTCD requirements and NEMA Standard TS1. A copy of the manufacturer's certificate of compliance is to be posted in the control cabinet (in a weatherproof folder) and made available to the Engineer upon request.

b) Has conflict monitoring complying with NEMA Standard TS1 and the following:

- Detects the presence of conflicting signal indications, absence of proper voltages, and proper operation of the controller.
- Upon detection of a conflict or loss of communication, all signals enter into flashing red mode.

2) Apply Article 2525.03, E, 4, with the following exceptions for one lane two way traffic control:

a) Green Revert.

If during an All Red clearance interval a call occurs on the phase losing the right-of-way prior to a call on any other traffic phase, the right-of-way reverts to the previous traffic phase, initiating the initial green interval. The transfer is to be immediate without completing the All Red clearance interval.

b) Rest in Absence of Actuation.

In the absence of detector actuation of assertion or recall switch(es), the right-of-way indication dwells in All Red.

3) Comply with the following:
   a) Clearance for overhead wiring is a minimum of 18 feet (5.5 m).
   b) A detection area is located near the stop line with the downstream edge positioned 6 feet (2 m) from the stop line. A second detection area is located 100 to 150 feet (30 to 45 m) in advance of the stop line. The size of detection areas is 6 feet by 10 feet (2 m by 3 m). A single above-ground detector may be used to provide detection for both areas.
   c) Signal heads have 12 inch (300 mm) lenses and comply with ITE Specification "Vehicle Traffic Control Signal Heads". All signal heads are equipped with visors and back plates. The backplate provides a minimum of 5 inches (125 mm) black field around the signal assembly and has a dull black finish.
   d) A minimum of two traffic signal heads per approach. All signal heads mounted over the road surface are mounted a minimum of 15 feet (4.6 m) from the bottom of the signal head to the top of the road surface. One signal head mounted over the center of the travel lane. All far right signal heads mounted a minimum of 8 feet (2.45 m) from the bottom of the signal head to the top of the ground surface. Required signal heads for through traffic on any one approach located no less than 8 feet (2.4 m) apart measured horizontally perpendicular to the approach between the centers of the signal faces.

b. **Trailer Mounted Systems.**
   Provide a system consisting of two or more self-contained trailer mounted units each containing two signal heads.

c. **Span-Wire Mounted Systems.**
   Ensure posts meet the requirements of Article 2528.03, A.

3. **Operational Requirements.**
   a. Locate signals, stop bars, and signs exactly as identified in the contract documents. Secure and level temporary traffic signal installations in a manner approved by the Engineer.
   b. Program all temporary traffic signals for red flash upon startup, conflict, or power failure. Program the temporary traffic signal system to dwell in All Red.
   c. For one lane two way traffic control operations, when an additional phase is used for a side road movement, only one long all red interval is to be used between active phases on each side of the work area.
   d. Set signal timing as identified in the contract documents.

4. **Equipment Crossings.**
   a. For equipment crossings, use a signal operator to control the signal system. Position this operator with good sight distance for both the mainline and haul road.

b. Program the signal system with fixed yellow and all red time periods so the operator can only activate the beginning of the yellow interval for mainline traffic.

c. When the equipment crossing is not in use, set the signal to yellow flash mode. If hauling operations are suspended for more than one week, cover the signal heads, or if portable trailer units are used, remove the trailers.

I. Temporary Floodlighting.

1. General.

a. Set up and operate either pole mounted or portable, mobile self contained LED temporary floodlights at locations shown in contract documents.

b. Ensure floodlighting is installed and in service before commencing work requiring nighttime traffic control according to the traffic control plan.

c. Exercise reasonable care to avoid interruptions during hours of darkness, promptly repair damage to system, and replace burned out lamps promptly.

2. Equipment.

a. Pole Mounted Floodlights.

1) Pole-mounted luminaire.

2) Mounting height of luminaires is no less than 35 feet (11 m) above the roadway and as shown in the contract documents. Pole length determined by field measurement to obtain specified mounting height.

3) Place poles outside normal shoulder line at approximate locations shown on the contract documents.

4) Meet the following requirements for floodlighting luminaires:

- Standard roadway types with totally enclosed refractors.
- IES glare control rating of "cut off".
- Lamps with initial output rating at least 19,000 lumens.
- Photoelectric controlled for dusk to dawn operation.
- Approval of the Engineer.

5) Ensure clearance for overhead wiring at least 18 feet (5.5 m). Auxiliary poles used to furnish power to floodlighting offset 30 feet (9 m) from traveled way unless there are right-of-way restrictions.

6) Above ground lighting circuits are aluminum or A.C.S.R. triplex.

7) Underground lighting circuits are type U.S.E. or U.F.

b. Portable, Mobile Self Contained LED Floodlights.

1) Mounted on portable trailers containing solar cell array and storage battery system to power LED luminaire. Ensure system meets NCHRP 350 Category IV crash testing.

2) Ensure mounting height of LED luminaires is no less than 17 feet (5.2 m) above roadway, or as shown in the contract documents.

3) Locate portable trailers so LED luminaire is centered over outside edge of pavement and trailer is on shoulder offset as far as possible from traveled way

4) Meet materials requirements of Article 4188.05 for LED Floodlighting Luminaires.

J. Temporary Crash Cushions.
Apply Section 2551.

K. Flaggers.

1. Prior to flagging operations, ensure the flaggers are trained in safe flagging operations that comply with Iowa DOT Flagger's Handbook, Part 6 of the MUTCD, and the Standard Specifications. Ensure training of flaggers includes the following:
- **a.** Issuing and reviewing the current Iowa DOT Flagger's Handbook,
- **b.** Presentation of the current Iowa Professional Flagging Video,
- **c.** Issuing flagger training cards including the information below. Ensure the flaggers carry their flagger training card at all times and show it upon request.
  - **1)** Employee name,
  - **2)** Date of training,
  - **3)** Name of Instructor, and
  - **4)** Expiration date of December 31 of the year following the training date.

2. Maintain a list of the flaggers trained and the date of the training.

3. Training is not required for short time, emergency, or relief assignment of employees to flagging operations. Payment will not be made in accordance with Article 2528.05, I.

4. Ensure flagger operations, equipment, and apparel comply with the current Iowa DOT Flagger's Handbook.

5. When nighttime flagging is required, provide auxiliary lighting to illuminate the flagging stations according to the current Iowa DOT Flagger's Handbook. Set up this lighting in such a manner to minimize glare to motorists. The cost of furnishing nighttime flagging stations is included in the lump sum price bid for Traffic Control.

L. Limitations.

1. Use sandbags to anchor all traffic control devices subject to movement by wind.

2. When a two way road is open to public traffic during contract work, do not control one way traffic through the work area by means of a carry through flag or other token, except during equipment failure or emergency. Use other means when voice or signal communication between flaggers at control points is difficult or not effective because of distance, sight, or noise. Other means may be two way radio, pilot cars, or traffic signals.

3. Use pilot cars when the normal work area exceeds 1/4 mile (0.4 km) on Primary projects. Where necessary for short durations, the distance may be extended to 1/2 mile (0.8 km) for better sight distance or to clear intersections or other safety considerations with approval of the Engineer, provided a two way radio is used for communication between flaggers.

4. During non-working hours, remove, cover, or turn down traffic control devices intended for working hours only, unless a drop-off or physical obstruction remains within 15 feet (4.5 m) of a lane open to traffic. Signs or barricades are not required for work beyond 15 feet (4.5 m) of a lane open to traffic. When traffic control devices are no longer needed, remove them.

5. All personnel in the highway right-of-way are required to wear ANSI 107 Class 2 apparel at all times when exposed to traffic or construction equipment.

6. The Engineer may require traffic control devices to be recleaned by washing. Use a brush and water, and detergent or solvent as necessary. Include the entire target area or sign face, supplemental or auxiliary signs, if any, all reflectors, and faces of warning lights which are part of that device.

7. Ensure entry to and exit from work areas is in the direction of public traffic and does not cross open traffic lanes at other than designated locations.

8. During hours of darkness, operate equipment in the traffic control zone facing in the direction of traffic flow unless specified otherwise in the Traffic Control Plan. Darkness will include the period from sunset to sunrise and other times when conditions such as fog, snow, sleet or rain provide insufficient lighting to clearly identify persons and vehicles on the highway at a distance of 500 feet (150 m) ahead.

9. Unless stated otherwise in the traffic control plan, provide for a minimum of 2 miles (3 km) between traffic control zones on rural roadways. The Engineer will determine minimum distances between traffic control zones on urban roadways.

10. Submit Traffic Control Plan modifications to the Engineer for review and approval prior to any changes being made. The Engineer may modify sign spacing to meet existing field conditions or to prevent obstruction of the motorist's view of permanent signing.

11. Ensure vehicles (except ready mix trucks) hauling soil, aggregate, and paving material to or from work area display a minimum 16 inch by 48 inch (400 mm by 1200 mm) sign with the legend "DO NOT FOLLOW - INTO WORK AREA" as shown in the contract documents. Comply with the following requirements for the sign:

- Orange with black lettering using Type VII (Iowa) sheeting.
- Keep clean to maintain its visibility.

12. For lanes closed to traffic, place two drums meeting the requirements of Article 2528.03, C, every 1000 feet (300 m). For full depth excavations in a closed lane, place two drums in front of each location. Additional drums need not be placed for full depth excavations spaced closer than 150 feet (45 m).

13. When milled or scarified surfaces exist, sign approaches to scarified areas using ROUGH ROAD (W8-8) signs. Place signs at least 250 feet (75 m) in advance of milled or scarified areas. Repeat signs for traffic that may enter within the scarified area from intersecting public roads. At locations where milled or scarified areas end at project limits, bridges, or end of day's work; place BUMP (W8-1) signs within 50 feet (15 m) in advance of each location. Erect, move, and maintain these signs until milled or scarified areas have been covered with new HMA or PCC pavement.

2528.04 METHOD OF MEASUREMENT.

Measurement will be as follows:

A. Traffic Control.
Lump sum.

B. Portable Changeable Message Signs.
The Engineer will count the number of days each PCMS is required to be in a location to display potential messages to the traveling public.

C. Temporary Barrier Rail.
The Engineer will calculate the length of temporary barrier rail used based on count and the nominal length of each unit. The length of temporary barrier rail measured will be the length required per setup. Measurement will also be made for temporary barrier rail moved within, or added to, an existing setup when required by the contract documents. Measurement of temporary barrier rail, after its initial placement, will not be made unless it is required by the contract documents to be moved.

D. Modular Glare Screen.
Measurement for Modular Glare Screen System will be in liner feet (meters).

E. Temporary Crash Cushions.
Article 2551.04 applies.

F. Temporary Traffic Signals.
By count for each group installation of temporary traffic signals operated by a common control unit. A group installation is normally four signal heads at the same traffic conflict area.

G. Temporary Floodlighting Luminaire.
By count.

H. Pilot Cars.

1. By count for the number of pilot cars used during each work shift. A shift is a scheduled period of work for the Contractor's operations.

2. For a pilot car to be counted:
- **a.** Use of the pilot car is necessary and it is used as part of preplanned work that is started that shift and is intended to proceed for a major part of the shift. If used less than 4 hours during a shift, one half pilot car will be counted.
- **b.** Use of other pilot cars is necessary and they are used for at least 1 hour during the shift, perhaps intermittently, and this shall be the primary duty of the employee. If used less than 4 hours in a shift, one-half pilot car will be counted.

3. Short time, emergency, or relief assignment of employees to pilot car operations will not be counted separately.

I. Flaggers.

1. By count for the number of flaggers used during each work shift. A shift is a scheduled period of work for the Contractor's operations.

2. For flaggers to be counted:
- **a.** Use of the flaggers is necessary and they are used as part of preplanned work that is started that shift and is intended to proceed for a major part of the shift. If used less than 4 during a shift, one-half flagger will be counted.
- **b.** Use of other flaggers is necessary and they are used for at least 1 hour during the shift, perhaps intermittently, and this shall be the primary duty of the employee. If used less than 4 hours in a shift, one-half flagger will be counted.

3. Short time, emergency, or relief assignment of employees to flagging operations will not be counted separately.

J. Monitoring with Incident Response.
Calendar days based on the contract quantity. Additional personnel required by the Engineer to provide additional traffic monitoring of CMS operation will be measured in calendar days per person needed.

2528.05 BASIS OF PAYMENT.
Payment will be at the contract unit price as described below. When the Engineer requires recleaning of reflectorized surfaces of traffic control devices, payment will be made as extra work according to Article 1109.03, B. All traffic control devices furnished by the Contractor remain the Contractor's property at the completion of the work and are to be removed from the site when no longer needed.

A. Traffic Control.

1. Lump sum when there is a contract item for Traffic Control.

2. Payment is full compensation for:

- Erecting, maintaining, moving, and removing all traffic control devices required by the contract documents, including warning lights,
- Furnishing all materials, labor, and equipment, and
- Traffic quality control.

B. Portable Changeable Message Signs.

1. Payment will be the contract unit price per calendar day for each PCMS that is required to be in a location to display potential messages to the traveling public.

2. Payment is full compensation for furnishing, placing, operation, and maintenance of PCMS. Payment includes the cost of communication, software, hardware, and power supply.

C. Temporary Barrier Rail.

1. Linear feet (meters) of Temporary Barrier Rail measured.

2. Maintenance of temporary barrier rail is incidental to Temporary Barrier Rail.

D. Modular Glare Screen.

1. Per foot (meter) of Modular Glare Screen System measured.

2. Payment is full compensation for:

- Material,equipment, and labor to furnish and install the system on the top of the temporary concrete barrier rail,
- Furnishing and applying retroreflective strips,
- Maintenance of the system,
- Repairing or replacing damaged parts of the system,
- Removing and reinstalling the system if necessary when moving the concrete barrier rail, and
- Final removal of the system from the top of the concrete barrier rail.

E. Temporary Crash Cushions.
Article 2551.05, A, applies.

F. Temporary Traffic Signals.

1. Each, for individual group installations operated by a common control unit, normally four signal heads at the same traffic control area.

2. Payment is full compensation for furnishing, installing, maintaining and servicing the controller, signal heads, traffic detection system, signal operator, costs for electrical energy, and the cost of removing temporary traffic signal materials from the construction site. The Contractor shall supply their own breaker box and power meter and shall not connect to

existing Contracting Authority owned circuits to supply power for temporary traffic signals.

G. Temporary Floodlighting Luminaire.

1. Each.

2. Payment is full compensation for:

- Furnishing, installing, maintaining and servicing the temporary floodlighting units,
- All costs for electrical energy,
- The cost of removing all lighting materials from the construction site, and
- The Contractor shall supply their own breaker box and power meter and shall not connect to existing Contracting Authority owned circuits to supply power for temporary floodlighting.

H. Pilot Cars.

Predetermined contract unit price per each for the number of shifts each pilot car was operated.

I. Flaggers.

1. Predetermined contract unit price per each for the number of shifts each flagger was used.

2. Payment is full compensation for providing trained flaggers according to Article 2528.03, K.

J. Monitoring with Incident Response.

1. Per calendar day for the number of calendar days used.

2. This payment is full compensation for:

- Furnishing the necessary vehicle (including operation, maintenance, and supplies),
- Furnishing the operator,
- Documentation of any events that restrict the normal flow of traffic including responses to an emergency situation,
- Re-erecting, repairing, or replacing traffic control devices,
- Providing assistance to persons with vehicle problems,
- Moving stalled vehicles, and
- Summoning further assistance when needed.

3. Payment for the number of calendar days that additional personnel, such as for CMS operation required by the Engineer, will be the contract unit price per calendar day. Payment is full compensation for furnishing the required personnel and necessary support vehicles.