ITEM 614 MAINTAINING TRAFFIC

614.01 Description. This work consists of maintaining and protecting vehicular and pedestrian traffic according to these provisions. For through traffic, the Special Provisions or the Plans will designate whether the highway will be closed with detours, roads and run-arounds provided or whether traffic will be maintained through all or portions of the project.

614.02 Traffic Facilities. Construct and maintain facilities for vehicular and pedestrian traffic of the highway, including all walks, roads, bridges, culverts, and traffic control devices. The City will maintain public highways used as a detour beyond the work limits of the contract.

A. For local traffic, provide and safely maintain drives, roads, run-arounds, walks, structures, and other facilities. Provide safe vehicular and pedestrian ingress and egress for all property adjacent to any improvement. Provide approaches and crossings of intersecting highways and maintain them in a safe condition. Maintenance includes snow and ice removal as needed.

B. When the roadway under construction is being used by through traffic, including periods of suspension of the Work, maintain it so that it is smooth, free from holes, ruts, ridges, bumps, and dust. For the portions of highway being used, provide the necessary outlets to allow free drainage. Maintain pipe trenches or other openings left in hard surface pavements with material of comparable quality. Contractor maintenance responsibilities, including pothole patching, begins for a section of highway when the Contractor begins the Work in that section and ends with the acceptance of the Work under 109.11 or 109.12. The two directions of a divided highway are considered separate highway sections and the start of Work on one direction does not begin maintenance responsibilities on the other direction.

C. Remove from the Project as necessary, abrasives and salt residues left by City or Local Government snow and ice control operations.

D. Ensure positive drainage into structures that have inlet windows without grates during pavement overlay operations when traffic will be maintained on a pavement course lower than the inlet window. Provide a minimum of 2 inch (50 mm) holes spaced at 2 feet (0.6 m) or a minimum of three 4 inch (100 mm) holes spaced at 4 feet (1.2 m) drilled into the vertical wall of the existing drainage structure below the inlet window. Place steel or iron plating of at least ¼ inch (6 mm) thickness that completely covers the drilled holes prior to construction of the finished pavement course.

614.03 Traffic Control - General. Conform to the requirements of the plan, Standard Drawings shown on the plans, and the OMUTCD, for the installation, maintenance, and operation of all traffic controls and traffic control devices. When the plans or standard drawings do not cover a specific traffic control situation, submit a Maintenance of Traffic Plan to the City for approval.

Do not begin construction until all traffic controls and traffic control devices are in place and approved by the Engineer. When performing the construction in phases, have the required traffic control for each phase in place and approved by the Engineer before construction of that phase begins.

Use portable changeable message signs pre-qualified according to current specifications.

Use drums, signs, sign supports, barricades, impact attenuators, and other traffic control devices that are certified to meet NCHRP 350 safe-crash standards or as modified by Contract Documents. Do not use heavy non-yielding devices or supports that do not conform to the current standards of NCHRP 350 unless allowed by Contract Documents.

Use Type H reflective sheeting complying with 730.192 for faces of orange construction signs, barricades, vertical panels, object markers, and Type G or Type H for stripes on glare screen panels and regulatory signs. Use fluorescent orange reflective sheeting for all orange construction signs, object markers, and stripes on glare screen paddles. Use standard orange or fluorescent orange reflective sheeting for the orange portions of drums, barricades and vertical panels.

Furnish drums with reboundable reflective sheeting conforming to 730.191. Ensure that owner identification markings on construction drums are no more than 1 inch (25 mm) in character height and are located at least 2 inches (50 mm) below the reflectorized bands or on the top or bottom horizontal surfaces of the drum. Ballast the drums according to the manufacturer's recommendations or as directed by the Engineer.

Furnish traffic cones, for daylight hours only, consisting of a highly visible orange predominant color. Ensure that the pavement markings for traffic maintenance conform to Item 614.11.

Furnish warning signs in advance of channelizing devices such as barricades, drums, vertical panels, and cones. Keep retroreflective materials clean and in good condition.

If equipment, vehicles, and material are stored or parked on highway rights-of-way, locate them not less than 6 feet (2 m) behind existing guardrail or not less than 30 feet (9 m) beyond the traveled way unless otherwise permitted by the Engineer. At night if any

such material or equipment is stored between the side ditches, or between lines 6 feet (2 m) behind any raised curbs, clearly outline them with dependable lighted devices that are approved by the Engineer.

All temporary traffic control devices shall conform to the Quality Standards for Temporary Traffic Control Devices available at the following address: http://www.dot.state.oh.us/Divisions/HighwayOps/Traffic/publications2/qualityguidelines/Pages/default.aspx

614.031 Permit. Apply for a permit at the City's Division of Planning and Operations a minimum of 5 working days prior to the closure of any portion of a street. Present a copy of the plans and a Maintenance of Traffic Plan, with phasing, at the time of application. The Transportation Division will then review the permit application and the City will issue a permit. Keep the original permit, signed in red ink, on the job at all times.

Failure to comply with the provisions of this permit, including, but not limited to, working outside the permitted hours of work and/or the failure to properly install the required traffic control, is a violation of City Code 903 and will result in the revocation of this permit and a fine of up to $1,000.00 and up to 6 months in jail. No work will be allowed in the City right-of-way without a valid permit.

The Contractor may restore a revoked permit with the written permission of the Division of Planning and Operations, and the Division of Police.

614.032 Notification. Notify the Engineer, the Construction Coordinator and Paving The Way, in writing, of all traffic restrictions and upcoming maintenance of traffic changes on a weekly basis. When detours are planned, provide this notification at the preconstruction meeting or 10 working days in advance of construction. When lane and ramp closures for 2 or more weeks are planned, provide this notification at least 2 weeks in advance of such closures. When lane and ramp closures are planned for less than 2 weeks, provide this notification at least 3 working days in advance of such closures.

Information shall include but not be limited to all construction activities that impact traffic at present and in the next 30 days. Prepare the report in a format approved by the Engineer. Designate an individual who will be responsible to prepare this report at the preconstruction meeting.

Report any unforeseen impacts to traffic to the Engineer as soon as possible.

614.04 Work Zone Marking Signs. Furnish, install, maintain, and subsequently remove work zone marking signs and their supports within the work limits according to the following requirements:

A. Erect a NO EDGE LINES sign in advance of any section of roadway lacking OMUTCD standard edge line markings. Ensure these signs are in place before opening the roadway to traffic. Erect these signs on each entrance ramp, at intersections of through roads to warn entering or turning traffic of the conditions, and at least once every 1 mile (1.6 km) along the roadway. Remove these signs when they no longer apply.

B. Erect a DO NOT PASS sign at the beginning and a PASS WITH CARE sign at the end of each no passing zone lacking OMUTCD standard center line markings.

C. Provide Type C steady burning lights for all channelizing devices used during hours of darkness. Provide Type A flashing lights for all advance warning signs and additional lights as directed by Engineer.

614.05 Road Closed. When the highway is closed to traffic, furnish, erect, maintain, and subsequently remove advanced warning signs and supports, ten (10) foot Type III barricades with 2 ROAD CLOSED signs and a DO NOT ENTER sign on the barricades, and Type B yellow flashing lights at the total closure point. Dual mount portable six (6) foot Type III Barricades with ROAD CLOSED LOCAL TRAFFIC ONLY, NO OUTLET, and Detour signing at the intersection prior to the total closure point and as directed by Engineer. .

Throughout construction, furnish, erect, maintain, and subsequently remove all signs, lights, barricades and other traffic control devices required by the OMUTCD, plans, or Standard Drawings for the maintenance of local traffic.

614.055 Surface Condition Signs. Erect a GROOVED PAVEMENT sign 100 feet (30 m) in advance of any section of roadway where traffic must travel on a planed surface. Ensure these signs are in place before opening the roadway to traffic. Erect these signs on each entrance ramp and at intersections of through roads to warn entering or turning traffic of the conditions. Payment for these signs to be included in Item 614 Maintaining Traffic.

614.06 Detour Signing. When the Contract Documents provide a pay item for Detour Signing and the plans provide a detour-signing plan, furnish, maintain, and subsequently remove all required detour signing and supports according to the detour signing plan and/or as directed by the Engineer.

614.07 Traffic Maintained. Where the highway under construction is being used by through traffic, including periods of suspension of the work, furnish and maintain pavement markings, lights, construction signs, barricades, guardrail, sign supports, and such other traffic control devices. Maintain pre-existing roadside safety hardware at an equivalent or better level than existed prior to project implementation. Also, provide law enforcement officers, watchmen, and flaggers as necessary to maintain safe traffic conditions within the work limits as directed by the Engineer.

The Engineer will approve the erection and removal of any regulatory signs not shown on the plans.

Keep existing signs and traffic control devices in use within the work limits during the construction period unless otherwise indicated on the plans. If existing signs and other traffic control devices must be relocated or modified as a consequence of the work, provide suitable supports and modify the devices with prior approval of the Engineer and the concurrence of the maintaining agency. Keep existing STOP, YIELD, ONE WAY, or DO NOT ENTER signs functioning at all times. The Contractor may adjust the position of these signs with the Engineer's approval. Relocate existing signs that must be adjusted laterally according to the OMUTCD. Restore relocated or modified signs to the position and condition that existed before construction as directed by the Engineer. When signs are to be covered, provide an opaque covering that covers the entire message, symbol and all of the sign within the border. Do not use fastenings that damage the sign or reflective face; however, the Contractor may use rivets to attach rigid overlay panels. Do not apply adhesive tapes directly to the face of the sign.

When an existing signal operation must be interrupted for a period of time, provide a traffic control method approved by the Engineer.

Whenever it is necessary to divert the flow of traffic from its normal channel into another channel, clearly mark the channel for such diverted traffic with cones, drums, barricades, vertical panels, pavement markings, or flashing arrow panels. Also use this method of marking where working adjacent to the part of the highway in use by the public.

Obtain the approval of the Engineer before closing a traffic lane or establishing a one-way traffic operation.

614.071 Existing Parking Meters. If the Contractor needs to take an existing parking meter out of service, the City will charge a daily fee, equal to the hourly rate on the meter times the number of hours the meter is enforced. In addition, if meter heads must be removed, the City will charge a fee for removal of each meter. The City will collect these charges in advance from the Contractor when the City issues a sidewalk/street excavation/occupancy permit.

Notify the City a minimum of 48 hours prior to the beginning of work; Saturday and Sunday do not count in the notification time whenever a meter needs to be removed. The City will remove the meter and will pre-mark the meters for re-installation. The City will provide meter posts to the Contractor for re-installation. Ensure the posts are plumb to 1/4 inch (6.4 mm). Notify the Parking Meter Supervisor at least 48 hours prior to the beginning of the re-installation; Saturday and Sunday do not count in the notification time.

614.08 Flaggers. Whenever one-way traffic is established, use at least two flaggers unless the Engineer authorizes otherwise, and erect signs, cones, barricades, and other traffic control devices according to the OMUTCD. Reflectorize traffic control devices as previously noted. Maintain positive and quick means of communication between the flaggers at the opposite ends of the restricted area.

Equip flaggers according to the standards for flagging traffic contained in the OMUTCD. During a flagging operation, other than an intersection or a spot location best controlled by a single flagger, ensure that each flagger uses a STOP/SLOW paddle conforming to the OMUTCD. Mount the paddle on top of a 6 1/2-foot (2 m) handle. Ensure that each face of the paddle is made of Type G reflective sheeting meeting the requirements of 730.19. Do not allow flaggers to perform other work activities while they are flagging. The Contractor may, instead of using flaggers, or supplemental to them, furnish, install, and operate a traffic signal or signals, for the purpose of regulating traffic according to a written agreement approved by the Engineer.

Use a flashing arrow panel in the closure of any through lane of traffic, except in a two-way, one-lane or shifting of lanes traffic pattern.

During hours of darkness, fully illuminate flagger stations with portable lighting separate from the lighting for the work area. Ensure that all devices meet nighttime requirements per the OMUTCD and all OSHA standards.

614.09 Law Enforcement Officer. When shown on the plans, furnish the services of a law enforcement officer and, if specified, a patrol car equipped with flashing lights.

614.10 Work Zone Traffic Signals. If shown on the plans, furnish, erect, maintain, and subsequently remove signal equipment conforming to Items 632 and 732, and signal controller equipment of a proper type and capacity to provide the required operation. Subject to the Engineer's approval, the Contractor may use new equipment that is to be installed later on the project, or may install used equipment in good condition provided such used equipment meets current City specifications. The performance test in 632.28 and the working drawing requirements of 632.04 are waived. Recondition used equipment as necessary to ensure proper operation. Operate work zone traffic signals conforming to the requirements of the OMUTCD and subject to the approval of the Engineer.

Procure and pay for electric power for work zone traffic signals. Do not alter the operation of an approved work zone traffic signal without the Engineer's approval. Correct any malfunctions or failures without delay. Cover or remove work zone traffic signals not in use.

614.11 Work Zone Pavement Markings. Furnish, install, maintain, and, when necessary, remove work zone retroreflective pavement markings on existing, reconstructed, resurfaced or temporary roads within the work limits, according to the following requirements.

A. Acceptability and Expected Duration. The Engineer will evaluate the markings according to the three performance parameters contained in ODOT Supplement 1047. Repair or replace the markings when the numerical rating is seven or lower for durability, visual effectiveness and night visibility. Repair or replace unsatisfactory markings immediately and at no additional cost to the City, if the markings were in place for 120 calendar days or less. The City will compensate under the applicable contract pay item for work zone pavement marking for the ordered replacement of worn markings after 120 calendar days under traffic.

B. Work Zone Marking Specifications. Equip traffic paint striping equipment for Class I and Class III markings with a computerized Data Logging System (DLS) conforming to 641.04 when the length of marking exceeds 0.5 miles (0.8 km) of continuous line equivalent. Furnish the Engineer daily, biweekly and final DLS reports as per 641.04.

Unless otherwise shown on the plans, the Contractor may use 740.02 Type 1 paint or 740.06 Type I or Type II preformed material for work zone pavement markings. Furnish painted markings according to Item 642 except that:

1. For Class I or Class II work zone pavement markings, use the specified application rate from Table 614.11-1.

TABLE 614.11-1			
	Gallons per Mile of Line Width of Line (inches)		
Type of Pavement Marking	**4**	**8**	**12**
Solid Line	22	44	66
10-foot Dashed Line	5.5	--	--
4-foot Dashed Line	2.2	--	--
Dotted Line	7.3	--	--
Arrows, Symbols, and Words	1.4 gallons per 100 square feet		
Glass Beads: 740.09, Type A	15 pounds per 100 square feet		

TABLE 614.11-1M			
	Liters per Kilometer of Line Width of Line (mm)		
Type of Pavement Marking	**100**	**200**	**300**
Solid Line	52	105	157
3.0 m Dashed Line	13	--	--
1.2 m Dashed Line	5.2	--	--
Dotted Line	17.3	--	--
Arrows, Symbols, and Words	0.6 liters per square meter		
Glass Beads: 740.09, Type A	7.3 kg per square meter		

2. For Class III work zone markings, use the specified application rate from Table 614.11-2.

TABLE 614.11-2			
	Gallons per Mile of Line Width of Line (inches)		
Type of Pavement Marking	**4**	**8**	**12**
Solid Line	12	24	36
10 foot Dashed Line	3	--	--
Dotted Line	4	--	--
Arrows, Symbols, and Words	0.75 gallons per 100 square feet		
Glass Beads: 740.09, Type A	7.5 pounds per 100 square feet		

TABLE 614.11-2M			
	Liters per Kilometer of Line Width of Line (mm)		
Type of Pavement Marking	**100**	**200**	**300**
Solid Line	28	56	84
3.0 m Dashed Line	7	--	--
Dotted Line	9.4	--	--
Arrows, Symbols, and Words	0.3 liters per square meter		
Glass Beads: 740.09, Type A	3.7 kg per square meter		

Ensure that Type I and II preformed material conform to 740.06, except do not place any preformed material containing metal on any surface unless it will be removed later. Remove work zone pavement markings of 740.06 preformed material before placement of 642 or 644 surface course markings at that location. Ensure that preformed material conforms to Item 645.

C. Work Sequence. Ensure that work zone markings are complete and in place on all pavement, including ramps, before exposing the pavement to traffic. When work zone markings conflict with the traffic pattern, remove them according to 641.10.

D. Layout and Premarking. Layout and Premark all Class I and Class III Markings according to 641.06. Obtain the Engineer's approval of the layout and premarking lines before marking operations are started.

E. Tolerances. Place lines for final surfaces according to the tolerances of 641.07. On surfaces other than final, the City will allow tolerances twice that in 641.07.

F. Classes of Work Zone Pavement Markings.

1. Class I Markings (Full Pattern, Full Rate). Use Class I Markings on all surfaces exposed to traffic for more than 14 days prior to application of final markings and to over-winter the project, with the following exception: Do not use Class I Markings on a surface course if thermoplastic or epoxy final markings are to be applied to the surface course. If thermoplastic or epoxy final markings are to be applied to the surface course, use Class III Markings on that course.

Apply Class I work zone markings to the standard dimensions as defined in Item 641.

2. Class II Markings (Abbreviated, Full Rate). Use Class II Markings for short-term use when traffic is to be maintained in parallel lanes nominally in the same location as permanent lanes and where tapers or transitions are not required or other features will not likely divert traffic from the intended path. Class II Markings are limited to center lines, lane lines and gore markings defined as follows:

a. Center Lines. Class II center lines consist of single, yellow 4-inch (100 mm) wide by a minimum of 4 feet (1.2 m) long dashes spaced at a maximum of 40 feet (12.0 m) intervals. No Passing Zones must be marked with Class I or Class III Markings or final markings within 3 calendar days per 614.11. H. 1. Passing Zones must be marked with Class I or Class III Markings or final markings within 14 calendar days per 614.11. H. 2.

b. Lane Lines. Class II lane lines consist of white 4-inch (100 mm) wide by a minimum of 4 feet (1.2 m) long dashes spaced at a maximum of 40 feet (12.0 m) intervals. Class II Lane Line Markings must be marked with Class I or Class III Markings or final markings within 14 calendar days per 614.11. H. 3.

c. Gore Markings. Class II gore markings are continuous, white 4-inch (100 mm) wide lines normally 50 to 100 feet in length placed at the theoretical gore of an exit ramp or diverging roadways. Class II Gore Markings must be marked with Class I or Class III Markings or final markings within 14 calendar days per 614.11. H. 3.

Computerized Data Logging Systems (DLS) are not required for Class II Markings.

3. Class III Markings (Full Pattern, Low Rate) Use Class III Markings on surface courses that are expected to receive thermoplastic or epoxy final markings within 30 days. Class III Markings use a lower application rate which reduces the surface preparation needed prior to application of thermoplastic or epoxy final markings. If Class III Markings have been applied and weather conditions are expected to prevent thermoplastic or epoxy final markings application for 30 days or more, re-apply Class III Markings if thermoplastic or epoxy final markings application is expected to occur within 30 days or apply Class I Markings as necessary to carry the project through the season or over the winter.

Apply Class III work zone markings to the standard dimensions as defined in Item 641.

G. Conflicting Markings. Before placing work zone markings, remove or cover all conflicting existing markings visible to the traveling public.

1. Removal and Covering of Markings.

a. Removal Methods. Remove the markings so that less than 5% of the line remains visible. Repair damage to the pavement that results in the removal of more than 1/8 inch (3 mm) of pavement thickness. Remove the markings by using methods specified in the below table:

Type of Pavement		Removal Method	
		grinder[1]	sand, shot or water blast
Existing Asphalt	Temporary	Y	Y
	Permanent	N	Y
New Asphalt	Temporary	Y	Y
	Intermediate	Y	Y
	Permanent	N	Y
Existing Concrete	Temporary	Y	Y
	Permanent	N	Y
New Concrete	Temporary	Y	Y
	Permanent	N	Y
Y - method is permitted to be used			
N - method is not permitted to be used			
[1] when a drum is mounted to a skid steer loader, the drum must be able to accommodate a minimum of 150 teeth			

b. Covering Conflicting Markings. With the Engineer's approval, use removable, non-reflective, preformed blackout tape according to ODOT Supplement 1187 to cover conflicting markings. Remove or replace the blackout tape within 15 days of installation. Furnish products according to the City's Qualified Products List (QPL).

2. Raised Pavement Markers. Remove the prismatic retro-reflector within any raised pavement marker that is in conflict with the work zone pavement markings. When the work zone pavement markings are removed and the raised pavement marker is no longer in conflict, thoroughly clean the recessed reflector attachment area of the casting and install a new prismatic retro-reflector of the same kind and color. The cost for this work is incidental to the various pay items.

H. Allowable Duration of Work Zone Markings.

1. No Passing Zones. When existing permanent no-passing-zone markings are removed or obliterated as the result of a construction operation (pavement grinding, asphalt concrete pavement overlays, etc.) and the section of pavement continues to be used by the traveling public, place Class I Center Line Markings or final center line markings as specified by the plan within 3 Calendar Days unless thermoplastic or epoxy final markings are to be applied on the surface course. If thermoplastic or epoxy final markings are to be applied on the surface course, place Class III Center Line Markings or final center line markings as specified in the plan within 3 Calendar Days.

a. Subsequent Work in No Passing Zones. If, after the original markings are removed or obliterated, the Contractor returns to the subject no passing zone and places a plan-specified pavement course within the 3-Calendar Day limit, or performs work in preparation for a subsequent pavement course, the Contractor shall have temporarily satisfied the conditions of the previous paragraph. In this event, the 3-Calendar Day limit will begin again.

b. Liquidated Damages. For each Calendar Day beyond 3 days that this work remains incomplete, the City will assess liquidated damages in the amount of $1000 per Calendar Day. The City will treat the time for the completion of no-passing-zone markings as an interim Completion Date.

2. Passing Zones. Sections of pavement where passing is permitted in both directions must be marked with Class I Center Line Markings or final center line markings as specified by the plan within 14 Calendar Days unless thermoplastic or epoxy final markings are to be applied on the surface course. If thermoplastic or epoxy final markings are to be applied on the surface course, place Class III Center Line Markings or final center line markings as specified in the plan within 14 Calendar Days.

3. Allowable Duration of Class II Lane Lines and Gore Markings and Absence of Edge Lines. Any time existing permanent lane lines, gore markings, or edge lines have been removed or obliterated as the result of a construction operation (pavement grinding, asphalt pavement overlays, pavement widening, etc.) and the section of pavement continues to be used by the traveling public, place Class I Markings or final markings as specified by the plan within 14 Calendar Days unless thermoplastic or epoxy final markings are to be applied on the surface course. If thermoplastic or epoxy final markings are to be applied on the surface course, place Class III Markings or final markings as specified in the plan within 14 Calendar Days.

a. Subsequent Work. If, after the original markings are removed or obliterated, the Contractor returns to the subject section of pavement and places a plan-specified pavement course within the 14-Calendar Day limit, or performs specified work that requires a lane closure (except routine maintenance required by 614.02), the Contractor shall have temporarily satisfied the conditions of the previous paragraph. In this event, the 14-Calendar Day limit will begin again.

b. Liquidated Damages. For each Calendar Day beyond 14 days that this work remains incomplete, the City will assess liquidated damages in the amount of $1000 per Calendar Day. The City will treat time for the completion of these markings as an interim Completion Date.

(1) Continuous Project. If a section of pavement is in a continuous part of the project, then a new 14-day limit for renewed work on a section applies to all sections in that part.

(2) Project in Sections. If the project is in parts and the traveling public could not discern the parts as one continuous project, then a new 14-day limit in one part will not apply to the other parts.

(3) Freeways and Divided Highways. Treat the two directional sides of a freeway as separate parts. Work on one side of a freeway does not create a new 14-day limit for the other side.

I. Removal of Work Zone Markings. Remove work zone retroreflective pavement markings when necessary using the removal methods specified in 614.11G.1.a for removal of existing markings.

614.115 Work Zone Raised Pavement Markers. Furnish, install, maintain and subsequently remove work zone raised pavement markers (WZRPMs). Work zone raised pavement markers may serve as a substitute for, or supplement to, work zone

pavement markings. They are provided in both yellow and white versions to match the appropriate pavement marking color.

White units provide reflectorization in one direction while yellow units may provide reflectorization in either one direction or two. They are available as units which are readily visible both night and day as a result of retroreflectors and brightly colored (white or yellow) housing (Type A) or visible only at night due to their retroreflectors (Type B).

A. Materials. Prequalify work zone raised pavement markers according to ODOT Supplement 1056.

Only use adhesives that are recommended by the reflector manufacturer and are not epoxy.

Provide markers of sufficient strength and properly shaped so as not to be dislodged or broken by impacts from vehicle tires, including those of high pressure truck tires loaded to 4500 pounds (2040 kilograms).

Provide reflectors having an area of 0.35 square inches (225 square millimeters) for Type A or 3.0 square inches (1935 square millimeters) for Type B with brightness or specific intensity (when tested at 0.2 degree angle of observation and the following angles of incidence) that meets or exceeds the following:

	WZRPM SPECIFIC INTENSITY		
TYPE	INCIDENCE ANGLE	WHITE	YELLOW
A	0	1.0	0.6
A	20	0.4	0.24
B	0	3.0	1.8
B	20	1.2	0.72
B	45	0.3	0.2

Angle of incidence: Formed by a ray from a light source to the marker and the normal to the leading edge of the marker face (also horizontal entrance angle)

Angle of observation: Formed by a ray from a light source to the marker and the returned ray from the marker to the measuring receptor

Specific intensity: The mean candlepower of the reflected light (at given incidence and divergence angles) for each foot-candle (10.7 lux) at the reflector (on a plane perpendicular to the incident light)

Type A markers, when viewed from above, have a visible area of not less than 14 square inches (9030 square millimeters). When viewed from the front, parallel to the pavement, as from approaching traffic, Type A markers have a width of approximately 4 inches (100 mm) and a visible area of not less than 1.5 square inches (970 square millimeters).

B. Patterns. The patterns of WZRPMs required for the various types of pavement markings are shown in Table 614.115-1.

TABLE 614.115-1		
SUPPLEMENTAL DELINEATION (TYPE A OR B)		
TYPE OF LINE	COLOR	SPACING
Edge Line	1-way white or yellow	20' (6.0 m) c/c
Lane Line	1-way white	40'(12.0 m) c/c or at center of gap
Dashed Center Line	2-way yellow	40'(12.0 m) c/c or at center of gap
Double Center Line	2-way yellow	2 units; 20' (6.1 m) c/c
Channelizing Line	1-way white	10'(3.0 m) or 20'(6.0 m) c/c
Exit Gore(Outline)	1-way white	10'(3.0 m) c/c
SIMULATED DELINEATION (TYPE A ONLY)		
TYPE OF LINE	COLOR	SPACING
Edge Line	1-way white or yellow	10'(3.0 m) c/c
Edge Line on 1-Lane, 2-Way	1-way white & 1-way yellow	white & yellow units back-to-back** 10' (3.0 m)
Lane Line	1-way white	3 units at 5'(1.5 m) c/c;30'(9.0 m) gap
Dashed Center Line	2-way yellow	3 units at 5'(1.5 m) c/c;30'(9.0 m) gap
Double Center Line	2-way yellow	2 units*;10' (3.0 m)c/c
Channelizing Line	1-way white	5'(1.5 m)c/c
Exit Gore(Outline)	1-way white	5'(1.5 m)c/c

*Place units side by side about 4 inches (100 mm) apart.
**Face the proper color and reflector to the oncoming traffic. Place the units back to back about one quarter inch (6.0 mm) apart.

C. Installation. Attach work zone raised pavement markers to clean, dry and sound pavement. Remove all loose gravel, sand and dirt from the area of the line. The minimum pavement temperature for installation is 50 °F (10 °C). When markers are being attached to new concrete pavement with curing compound remaining, remove the curing compound membrane by sandblasting or other mechanical cleaning method. Install markers in accordance with the manufacturer's recommendations.

Work zone raised pavement markers are not suitable for use from October 15 to April 1. If the Contractor elects to start or continue work zone pavement markers during this period, and they fail or are subsequently removed or destroyed by snow and ice control activities, immediately, at his expense, provide a substitute traffic guidance system which is effective during day and night and which is acceptable to the Engineer. Other than for replacement of failed WZRPMs, new installations of WZRPMs are not permitted from October 1 to April 1.

Place markers accurately to depict straight or uniformly curving lines. The longitudinal location of WZRPMs are described in Table 614.115-1 except that the

spacing of an individual WZRPM may be varied by as much as 2 feet (0.6 m) or 10 percent of the nominal spacing in order to avoid poor pavement conditions, but the average spacing remains unchanged. Poor pavement conditions include separated joints, cracks, deteriorated pavement, usually uneven pavement or where pavement marking material will interfere with the bond.

The lateral location of WZRPMs follows:

1. Edge Lines: Install the WZRPM 12 inches (300 mm) outside the work zone pavement marking, if any, or the theoretical edge of the lane. This offset may vary +6 inches (150 mm) as necessary to avoid poor pavement conditions.

2. Lane lines and dashed center lines: Install the WZRPM in the center of the gap between pavement marking dashes, if any. If a pavement joint exists, locate the marker approximately 2 inches (50 mm) clear from the joint (and to the left of it for lane lines). Otherwise, center the WZRPM on the theoretical edge of the lane.

3. Double center line: Install each WZRPM of the pair in line with the appropriate pavement marking stripe, if any. If the edge of lane is demarcated by a crack or joint, the pair of WZRPMs straddle the joint and install each approximately 2 inches (50 mm) clear from the joint. Otherwise center the pair on the theoretical edge of lane.

4. Channelizing Line: Install the WZRPM in line with the pavement marking stripe or immediately adjacent to the line, except when used at exit gore outlines where the WZRPM is installed within the painted gore vee and approximately 12 inches (300 mm) from the pavement marking stripe. Do not install WZRPMs directly on a painted line.

D. Replacement. Maintain WZRPMs in good condition. A marker will be considered to have failed when the marker is broken, the marker is worn to the extent that daytime visibility is significantly diminished or of an unacceptable color (type B only), the reflector is broken or detached, the marker is detached from the adhesive, the adhesive is detached from the pavement or the marker or reflector is covered by tar or paint.

Individual replacement of each failed marker as it occurs is not recommended due to increased exposure of workers to traffic. However, maintain the following minimum levels of marker effectiveness:

1. For a given line, no more than 20 percent of the WZRPM units failed in any manner;

2. For a segment of any line, the number of failed units does not exceed the maximums permitted in Table 614.115-2.

TABLE 614.115-2				
Line Type	**Normal Spacing Feet (Meter)**	**Segment Length Feet (Meter)**	**Normal No. Contained In Segment**	**Maximum No. Permitted To Fail**
Edge	10(3.0) 20(6.0)	5(1.5) 100(30.0)	6	3
Center, Double/Solid	20(6.0) 10(3.0)	100(30.0) 50(15.0)	12	6
Lane or Dashed Center	40(12.0) 5(1.5)	200(60.0) 1-Stripe	6	3
Channelizing	20(6.0) 10(3.0) 5(1.5)	100(30.0) 50(15.0) 25(7.5)	6	3

Replace all failed units within any line or segment before conditions deteriorate below the minimums established in Table 614.115-2. Replace all failed units within the line or segment within 24 hours after notification by the Engineer.

E. Removal. Accomplish removal of work zone raised pavement markers in such a manner that no adhesive remains on the pavement. Do not cause permanent pavement surfaces to be scarred, broken or significantly roughened.

614.12 Pavement Marking Operations. Perform moving marking operations with a truck equipped with necessary flashers, signs, crash attenuator, flashing arrow panel, and protect the operations with a similarly equipped vehicle or vehicles separated a sufficient distance to provide adequate advance warning. Use the extreme left or right lane for the marking operation when possible. Where three or more lanes exist in one direction, perform the marking operation so that traffic passes on one side only.

Protect stationary marking operations in intersections, school zones, gores and other areas with traffic control devices such as advance warning signs, flashing arrow panels, and cones.

For stationary operations such as loading material and cleaning equipment, make every effort to have all equipment completely off the traveled way. When equipment cannot be removed from the traveled way, operate all traffic control devices on the vehicles and station flaggers and vehicles to protect the worksite and the traveling public while maintaining two-way traffic.

614.13 Asphalt Concrete for Maintaining Traffic. The Contractor may use either a surface course or intermediate course mix of Item 448 asphalt concrete PG 64-22, or an asphalt concrete surface course the Engineer approves. Place surface course materials as and where the Engineer directs for maintenance of the existing pavement, shoulders, or structures.

Where materials are placed in small quantities or under adverse conditions, the Engineer may waive specification requirements for placing and finishing if, in the judgment of the Engineer, it is determined that the Contractor can obtain satisfactory results in providing a smooth and durable pavement surface.

614.14 Performance. If, in the opinion of the Engineer, the Contractor is not furnishing proper maintenance of traffic facilities and proper provisions for traffic control, the City may take the necessary steps to have them placed in proper condition, including hiring a third-party, and the City will deduct the cost of such services from any money that may be due or become due the Contractor.

614.15 Method of Measurement. The City will measure Work Zone Marking Signs as the number of sign installations, including the sign, necessary supports, and all attachment hardware. The City will include all other work zone signs under Maintaining Traffic unless separately itemized.

The City will measure Work Zone Pavement Markings complete in place, by class and material, in the units designated.

The City will measure line quantities as the length of the completed stripe, including gaps, intersections, and other sections of pavement not normally marked.

614.16 Basis of Payment. The City will make partial payments according to 109.09.

Unless separately itemized, the lump sum price bid for Maintaining Traffic shall include the cost of removal or covering of conflicting pavement markings, layout, application and removal of pavement markings when required, maintaining the existing highway in a safe condition for public use, removing abrasive and salt residue remaining from snow and ice control performed by Local Governments, providing flaggers and their equipment, and furnishing, maintaining in an acceptable condition, and subsequently removing the following work zone traffic control items as required by the Contract Documents:

A. Signs, supports, flags and warning lights.

B. Drums, cones, gates, barricades, and vertical panels.

C. Flashing arrow panels.

D. Work zone traffic signals.

E. Lighting for work zone signals, law enforcement officers, and flaggers.

The lump sum price bid for Detour Signing includes the cost of the Contractor furnishing, installing, maintaining, and removing the detour signing as shown on the plans, or as directed by the Engineer, and their necessary supports.

The City will pay for the following items under their associated item numbers: 502 Structure for Maintaining Traffic, 615 Roads and Pavement, 622 Portable Concrete Barrier. The City will pay for aggregate and calcium chloride authorized by the Engineer and used for Maintaining Traffic under Items 410 and 616.

The City will pay for accepted quantities at the contract prices as follows:

Item	Unit	Description
614	Lump Sum	Maintaining Traffic
614	Lump Sum	Detour Signing
614	Each	Replacement Drum
614	Each	Replacement Sign
614	Each	Object Marker, ___ - Way

614	Each, Mile, Foot (Kilometer, Meter)	Work Zone Pavement Markings
614	Each	Work Zone Raised Pavement Marker
614	Day	Portable Changeable Message Sign
614	Each	Work Zone Speed Limit Sign
614	Each	Work Zone Marking Sign
614	Hour	Law Enforcement Officer without Patrol Car
614	Hour	Law Enforcement Officer with Patrol Car
614	Each	Barrier Reflector
614	Each	Work Zone Crossover Lighting System
614	Each	Work Zone Impact Attenuator
614	Mile (Kilometer)	Work Zone Lane Line, Class ___, ___*
614	Mile (Kilometer)	Work Zone Center Line, Class ___, ___*
614	Foot (Meter)	Work Zone Channelizing Line, Class I, ___*
614	Mile (Kilometer)	Work Zone Edgeline, Class I, ___*
614	Foot (Meter)	Work Zone Gore Marking, Class II, ___*
614	Foot (Meter)	Work Zone Stop Line, Class I, ___*
614	Foot (Meter)	Work Zone Arrow, Class I, ___*
614	Foot (Meter)	Work Zone Crosswalk Line, Class I, ___*
614	Foot (Meter)	Work Zone Dotted Line, Class I, ___*
614	Cubic Yard (Cubic Meter)	Asphalt Concrete for Maintaining Traffic

* Type material (642 paint; 740.06, Type I or Type II; or left blank to allow any of the three).