

## 640 PAVEMENT MARKING

### ITEM 641 PAVEMENT MARKING—GENERAL

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**641.01 Description.** This specification gives general requirements for various kinds of retroreflective pavement markings. Deviations from these general requirements are covered in the specific requirements for each marking type.

Place all pavement markings according to the OMUTCD.

**641.02 Materials.** Use marking materials that are a formulation, identified by a manufacturer's code number, and certified by the Laboratory.

The Laboratory will require that the materials pass a service test according to ODOT Supplement 1047 before prequalifying them. Furnish prequalified materials conforming to ODOT Supplement 1047 and supplied by manufacturers conforming to City Supplement 1089.

Minimum material performance requirements and chemical and physical properties are stated in Item 740 and the Invitation for Samples for the service test performed according to ODOT Supplement 1047.

Materials and manufacturers will be listed on the City's Qualified Products List.

Remove materials delivered and applied without Laboratory approval. Remove Laboratory tested materials not meeting specifications from the project site.

Furnish an (MSDS) for each material, including resin, catalyst, primer, adhesive, activator, glass beads, and cleaning solvent, to be used on the project to the Engineer before material delivery. Inform workers of the location of all MSDS and allow workers an opportunity to review them.

Furnish the Engineer, prior to application, the pavement marking material manufacturer's printed application equipment requirements and application instructions.

**641.03 General.** Apply lines as solid, broken, or dotted lines, either singly or in combination, as shown on the plans. Apply broken lines in a 40-foot (12.0 m) cycle consisting of a 10-foot (3.0 m) dash and a 30-foot (9.0 m) gap between broken lines, unless otherwise shown on the plans. Use an accurate striping mechanism that is

capable of being easily adjusted to retrace existing broken markings or to apply new materials at the correct spacing. Begin broken lines that are to be applied over plainly visible existing broken lines within 6 inches (150 mm) of the beginning of the existing broken line, unless otherwise directed by the Engineer. Apply dotted lines in an 8-foot (2.4 m) cycle consisting of a 2-foot (0.6 m) dot and a 6-foot (1.8 m) gap between dots for line extensions and in a 12-foot (3.6 m) cycle consisting of a 3-foot (0.9 m) line segment and a 9-foot (2.7 m) gap for lane drop/add markings.

Fill gaps that were not marked as a result of template use for spray-applied auxiliary markings with marking material after the template is removed. If applying extruded thermoplastic, the Contractor may leave small gaps in arrows or letters resulting from template use unfilled.

Ensure that pavement markings are free of uneven edges, overspray, or other readily visible defects that detract from the appearance or function of the pavement markings.

Ensure that lines are sharp, well defined, and uniformly retroreflective. Apply the lines to the width specified  $\pm 1/4$  inch (6 mm). Fuzzy lines, excessive overspray, or non-uniform application are unacceptable. The Engineer will inspect lines at night to verify proper retroreflectivity. Correct pavement markings that are improperly applied, located, or reflectorized. Reapply lines applied with insufficient material quantities according to 641.11, 644.04, or 648.05. Remove improperly located lines according to 641.10, and apply new lines in the correct locations.

Reapply any lines applied with non-specification materials.

Obtain the Engineer's approval for methods and equipment used for pavement preparation, marking, and marking removal. Keep glass beads dry during storage and before use.

Furnish to the Engineer at least 3 days in advance of installation current copies of the manufacturer's instructions and recommendations for application of any marking material, including primer, activator, catalyst, and adhesive, shown on the plans. Schedule and perform other construction work, such as shoulder paving, seeding, and mulching in a manner to avoid damage to applied pavement markings.

Do not apply pavement marking materials to the reflector of a plowable raised pavement marker. Interrupt the application of the pavement marking line at each raised pavement marker where marking material would otherwise be applied to the marker's prismatic reflector. Provide a maximum gap in the marked line of 18 inches (0.5 m) at each marker. Remove pavement marking material applied to a prismatic reflector surface, or replace the reflector that same workday. If material must be removed from the reflector, restore the reflector's brightness to its prior condition.

**641.04 Equipment.** Equip long line pavement marking equipment for traffic paint, polyester, epoxy, thermoplastic and work zone marking Item 642 with a computerized Data Logging System (DLS), including a cab mounted display which shows the actual material application rate and film thickness. For center line, lane line and edge line markings, when the length of marking exceeds 0.5 miles (0.8 km) of continuous line equivalent, document the following with the DLS:

1. Measure and record application vehicle speed to nearest 0.1 MPH (0.16 km/h),
2. Measure and record weight and/or volume amount of material used by color,

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3. Measure and record weight of glass beads,
4. Measure and record pavement surface temperature,
5. Measure and record air temperature,
6. Measure and record dew point,
7. Measure and record humidity,
8. Calculate and record average material application rate and film thickness over the section painted.

Record as a separate DLS report line entry the above information for each route section painted, when the length of center line, lane line and edge line marking exceeds 0.5 miles (0.8 km) of continuous line equivalent. A route section is defined as one direction of a contiguous section of highway (without breaks) with the same route number designation. DLS documentation is not required for center line, lane line and edge line markings of 0.5 miles (0.8 km) or less, and for channelizing lines of any length.

If the DLS equipment fails, finish that day's work only and resume when the DLS equipment is working.

The City will provide a standard DLS spreadsheet, which prescribes the correct DLS report format and content prior to beginning of work.

On the first working day following application of markings requiring documentation with the DLS or upon demand, furnish the Engineer a copy of the DLS report in ODOT standard DLS report format. The DLS report can be provided in one of the following methods, which should be agreed upon at the preconstruction meeting:

1. hand delivery of paper report
2. fax delivery of paper report
3. e-mail of Excel spreadsheet file
4. disk or flash drive transfer of Excel spreadsheet file

Within two weeks of the date of application of markings requiring documentation with the DLS, furnish the Engineer the Excel spreadsheet file of the DLS report in ODOT standard DLS report format by e-mail at the e-mail address provided at the preconstruction meeting.

At the end of the project, furnish the Engineer all Excel spreadsheet files in ODOT standard DLS report format.

Ensure that each DLS has an annual calibration of all mechanical and electrical components and its software function and output confirmed by the DLS manufacturer or their designated representative. Provide evidence of the annual calibration by affixing a signed and dated stamp or seal to the inside of the driver's door of each strip.

**641.05 Pavement Preparation.** Clean all visible loose or foreign material from the surface to be marked. Equip the pavement marking equipment with an air jet to remove all debris from the pavement in advance of the applicator gun. Operate the air jet when marking material is being applied, and synchronize it with marking material application.

Power-broom clean all surfaces where gore markings or edge lines are to be applied. If required by the Engineer, also power-broom clean other surfaces. Do not apply marking to portland cement concrete until the concrete in the areas to be marked is clean of membrane curing material and is dry.

**641.06 Layout and Premarking.** Lay out the locations of all lines, words, and other symbols to ensure their proper placement. Do not start marking operations until the Engineer or the Engineer's representative has approved the layout and premarking lines. If applying longitudinal or transverse lines, use existing lines, construction joints, or premarking to guide this marking equipment.

On projects where resurfacing or other operations will result in obliteration of the existing pavement markings, establish reference points to ensure proper placement of restored markings. If existing markings are to be retraced, verify any adjustment in the location with the Engineer.

Establish "T" marking of no-passing zones according to the plans or a no-passing zone log provided by the Engineer.

Locate premarking from survey data or reference points, and offset it so as to parallel the theoretical edge of the marking lines at a maximum distance of 1 inch (25 mm). Use templates for the layout of arrows, words, and other symbols. Place premarking for longitudinal lines at 40-foot (12 m) intervals, and do not exceed 2 inches (50 mm) in width or 12 inches (300 mm) in length. Locate premarking for auxiliary markings from the plans or schematic forms provided by the Engineer.

**641.07 Line Placement Tolerance.** Ensure that pavement marking lines are straight or smoothly curved, true to the alignment of the pavement, and do not deviate laterally from the proper location at a rate of more than 2 inches in 100 feet (50 mm in 30 m). The Engineer will not allow any deviation greater than 3 inches (75 mm). Remove improperly located lines according to 641.10 and apply new lines in the correct locations.

**641.08 Marking Types.** Apply marking materials at the rate or thickness specified in 642.04, 643.04, 644.04, 645.03, 646.05, 647.04 or 648.05 and, except for parking lot stall markings, ensure that they are uniformly retroreflective. However, ensure that portions of parking stalls that are adjacent to street traffic are retroreflective. Pavement markings consist of the following types:

**A. Edge Lines.** Place edge lines as continuous 5-inch (127 mm) wide stripes. Locate the center of the stripe 6 inches (150 mm) from the edge of the pavement or as approved by Engineer.

**B. Lane Lines.** Place lane lines as 5-inch (127 mm) wide, white stripes between contiguous lanes of pavement carrying traffic in the same direction. Place them as broken lines unless specified solid. Offset lane lines to the left of the longitudinal joint, if present, or the theoretical line lying between contiguous lanes, if a joint is not present. Ensure that the nearer edge of the stripe is 2 inches (50 mm) to the left of the joint or line. Do not place lane lines through intersections.

**C. Center Lines.** Place center lines as single or double yellow stripes between contiguous lanes of pavement carrying traffic in opposite directions. Center line

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marking includes two-way left-turn lane striping and the outline of left-turn islands. Make each stripe 5 inches (127 mm) wide, solid or broken as specified.

**D. Channelizing Lines.** Place channelizing lines as continuous 10-inch (254 mm) wide white stripes.

**E. Stop and Crosswalk Lines.** Place stop lines as solid 20-inch (508 mm) wide white stripes. Place Type II crosswalk lines as solid 24 inch (600 mm) wide white lines within the Type I crosswalk lines. See Standard Drawing for details.

**F. Transverse/Diagonal Lines.** Place transverse/diagonal lines as solid 20-inch (508 mm) wide stripes, of the color specified, and at an angle to the direction of travel.

**G. Curb and Island Marking.** Prepare exposed surfaces and curbs and paved islands according to 641.05. In addition, remove and dispose of all visible loose or foreign material, including vegetation, on and immediately contiguous to surfaces to be marked.

**H. Symbol Markings.** Place all railroad, school, and handicap symbol markings using white markings. A railroad marking includes the 16-inch (400 mm) crossbuck, two 72-inch (1.8 m) "R"s, two 24-inch (600 mm) transverse lines, and a stop line. A school marking includes the word "SCHOOL" and two 20-inch (508 mm) transverse lines.

**I. Parking Lot Stall Marking.** Place parking lot stall marking lines as continuous 5-inch (127 mm) wide white stripes.

**J. Lane Arrows.** Place lane arrows using white markings.

**K. Words on Pavement.** Place words on pavement using white markings.

**L. Dotted Lines.** Place dotted lines using the width and color specified.

**M. Bike Markings.** Place bike lane markings using white markings.

**N. Speed Hump Markings.** Place speed hump markings using white markings.

The term long lines, when used in Items 642 through 648 includes edge lines, lane lines, center lines, and channelizing lines over 200 feet (60 m) long. The term auxiliary markings, when used in Items 642 through 648 includes channelizing lines 200 feet (60 m) or shorter, stop lines, crosswalk lines, transverse lines, diagonal lines, curb markings, island markings, symbol markings, parking lot stall markings, lane arrows, and dotted lines.

**641.09 Two-Way Radio Communications.** If two-way radio equipment is required, furnish and maintain radio equipment necessary for the voice communication between the striper and the inspector's vehicle at all times during the pavement marking operation. Use equipment capable of transmitting and receiving normal voice communications to at least 4 miles (6 km).

**641.10 Removal of Pavement Markings.** If specified as a pay item, remove pavement markings as described in 614.11.G. Take care during marking removal not to scar, discolor, or otherwise damage the pavement surface. Do not overpaint or use other methods of covering markings instead of removal.

**641.11 Deduction for Deficiency.** For traffic paint, polyester and epoxy, the Engineer will compute each day the amount of marking material (including all components) and glass beads applied for each route section on the DLS report for determining unsatisfactory sections. The City will reduce the contract price for each route section in direct proportion to the percent of deficiency of marking material or glass beads as specified in 642.04, 643.04, 646.05 and 648.05, up to 20 percent for each material deficiency. The City will only use the greater deficiency of marking material or glass beads to compute the deduction.

If the deficiency of marking material or glass beads is 20 percent or more, the City will consider the work unsatisfactory. In addition, the Engineer will consider as unsatisfactory materials applied outside the temperature or application requirements in Items 642, 643, 646 and 648 without written approval of the Engineer. Replace pavement markings and glass beads in all sections determined to be unsatisfactory by retracing over the unsatisfactory markings at the full thickness specified in Items 642, 643, 646 and 648.

**641.12 Method of Measurement.** The City will measure pavement markings complete in place in the units designated. The City will measure line quantities as the length of completed marking, including the gaps, intersections, and other sections of pavement not normally marked. The City will measure the removal of pavement markings using the same method of measurement as completed markings in the units designated.

**641.13 Basis of Payment.** The City will pay for accepted quantities of work performed under Items 642, 643, 644, 645, 646, 647, and 648.

The City will not pay for costs associated with correcting improperly located lines, replacing reflectors coated with pavement marking material, or replacing unsatisfactory pavement markings.

The City will not pay for lines placed using non-specification materials.

The City will not pay for non-specification lines determined through field measurement.

The City will pay for Two-Way Radio Equipment at the lump sum bid price.