

1082 - COLD PLASTIC PAVEMENT MARKINGS

1082.1 DESCRIPTION

The Contractor shall furnish and install white and yellow permanent retro-reflectorized pavement marking materials at the locations shown on the plans, in conformance with the details, and the material specifications included herein.

The pavement markings shall be installed immediately after surface treatment unless prior approval is received by the Engineer or City Inspector. The installation of the yellow markings (as required) is the first priority. If the permanent markings cannot be installed and thus the roadway would be unmarked overnight, interim removable markings shall be installed and remain until the permanent markings can be installed. The contractor shall make every possible effort to remove the interim pavement markings and install permanent pavement markings within 48 hours. Only under extreme circumstances and at the approval of the pavement marking inspector or the engineer, will the duration of the interim pavement markings be extended. Under no circumstance should the interim pavement markings be in place for more than 2 weeks. The interim removable markings shall be removed prior to installation of the permanent markings. If permanent markings cannot be installed within the specified time then temporary markings shall be installed following the guide lines as set forth in the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) Part VI, Sections 6F.78 and 6G.02.

1082.2 MATERIALS

This specification covers a white and yellow pre-formed cold plastic reflectorized pavement marking material of a type that is applied to a road surface as temporary pavement markings by a pre-coated pressure sensitive adhesive that produces an adherent reflectorized stripe of specified thickness and width and is capable of resisting deformation. By definition, temporary cold plastic pavement markings, are markings that meet the full requirement of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) that will generally be in service for at least 6 months or longer. The application of the markings is intended to be such that they are removable without undue pavement scarring. The markings will be used when it is anticipated that they will be revised for future lane additions or lane use modifications between construction projects or construction seasons. The applied markings shall be very durable, oil and grease impervious and provide immediate and continuing retroreflectivity. The material for permanent pavement markings shall be in accordance with this specification.

a. Approved Materials List

All material for permanent pavement marking material used by the Contractor shall be from the City's approved list of vendors. It is important that users be completely knowledgeable of all application requirements and procedures prior to product application. It is the responsibility of the installer to contact the supplier of all permanent pavement marking materials if questions regarding application procedures or conditions arise. Manufacturers interested in pre-qualifying material under this specification shall submit a sample of the material along with a complete materials specification for each color of marking material to be considered. The sample will be reviewed for compliance with all requirements of this specification. No material shall be used unless the material has been pre-qualified. A complete list of pre-qualified materials is maintained by the Traffic Engineering Division of the Department of Public Works.

b. Characteristics

The material shall be manufactured without the use of lead-chromate pigments or other, similar, lead-containing chemicals.

Glass spheres shall be incorporated to provide immediate and continuing retroreflection. Ceramic skid particles shall be bonded to the top layer to provide a skid-resistant surface.

Preformed word and symbol markings shall conform to the applicable shapes and sizes as outlined in the MUTCD.

The preformed markings shall be capable of being adhered to Portland cement concrete pavements by an inlaid, pre-coated pressure sensitive adhesive. A surface preparation adhesive may be used to precondition the inlay pavement surface.

The preformed marking film shall mold itself to pavement contours by the action of traffic. Following proper inlay application and tamping, the markings shall be immediately ready for traffic.

c. Composition

The retroreflective pavement marking film shall consist of a mixture of high-quality polymeric materials, pigments and glass spheres distributed throughout its base cross-sectional area. A reflective layer of glass spheres and a layer of skid-resistant ceramic particles shall be bonded to the top urethane wearing surface. The urethane wear surface shall have a nominal thickness of 5 mil (0.005 inches). The film shall have a pre-coated, shear-resistant, pressure sensitive adhesive.

d. Color

The daytime color of the white film shall provide a minimum initial luminance factor, Y, of 80 and shall conform to the following chromaticity requirements:

WHITE		YELLOW	
X Values	Y Values	X Values	Y Values
0.290	0.315	0.474	0.455
0.0310	0.295	.491	0.435
0.330	0.360	0.512	0.486
0.350	0.340	0.536	0.463

The daytime color of the yellow film shall provide an initial luminance factor, Y, in a range of 36 to 59 and shall conform to the above chromaticity requirements.

Measurements shall be made in accordance with ASTM E 1349, using illuminant “C” and 0/45 (45/0) geometry. Calculations shall be in accordance with ASTM E308 for the 2-degree observer.

e. Reflectance

The white and yellow films shall have the following initial minimum reflectance values as measured in accordance with the testing procedures of ASTM D 4061. The photometric quantity to be measured shall be coefficient of retroreflected luminance (R_L) and shall be expressed as millicandelas per square meter per lux ($\text{mcd}\cdot\text{m}^{-2}\cdot\text{lux}^{-1}$) (millicandelas per square foot per foot-candle ($\text{mcd}\cdot\text{ft}^{-2}\cdot\text{fc}^{-1}$)).

Minimum Initial Reflectance, Dry		
Color	White	Yellow
Entrance Angle	88.76°	88.76°
Observation Angle	1.05°	1.05°
Retroreflected Luminance RL ($\text{mcd}\cdot\text{ft}^{-2}\cdot\text{fc}^{-1}$)	400	175

f. Skid Resistance

The surface of the retroreflective films shall provide an initial minimum skid resistance value of 55 BPN as measured by the British Portable Skid Tester in accordance with ASTM E303.

The surface of the retroreflective film shall retain an average skid resistance value of 45 BPN, when tested in accordance with ASTM E303, for a period of one year when installed in non-snow removal areas. The 45 BPN minimum value shall be an average of several readings taken in both the wheel track and non-wheel track areas

g. Tensile Strength and Elongation

The film shall have a minimum tensile strength of 7.18 kilopascals (150 lbs. per square inch) of cross-section when measured in the direction of the length of the roll and tested in accordance to ASTM

D638-76, except that a sample 150 mm x 25 mm (6" x 1") shall be tested at a temperature between 21.1 degrees and 26.7 degrees C (70 degrees F and 80 degrees F) using a jaw speed of 10 to 12 inches per minute. The sample shall have a maximum elongation of 50% at break when tested by this method.

h. Reflectivity Retention

The glass spheres must be strongly bonded and not be easily removed by traffic wear. Using a Taber Abraser with an H-18 wheel and a 125 g (4.4-ounce) load, the sample shall be inspected at 200 cycles, under a microscope, to observe the extent and type of sphere failure. No more than 15% of the spheres shall be lost due to popout and the predominant mode of failure shall be "wear down" of the spheres.

i. Glass Spheres

The size, quality and refractive index of the glass spheres shall be such that the performance requirements for the markings shall be met. The sphere adhesion shall be such that spheres are not easily removed when the material surface is scratched.

The film shall have glass sphere retention qualities such that when a 50 mm x 150 mm (2" x 6") sample is bent over a 12.7 mm (½") diameter mandrel, with the 50 mm (2") dimension perpendicular to the mandrel axis, microscopic examination of the area on the mandrel shall show no more than 10% of the spheres with entrapment by the binder of less than 40%.

j. Thickness

The film, without adhesive, shall have a minimum thickness of 60 mil.

1082.3 CONSTRUCTION REQUIREMENTS

The proposed permanent markings shall be laid out by the contractor in advance of the marking installation. Markings shall not be applied until the layout and conditions of the surface have been approved by the City Inspector. If a paint line is used for layout purposes (in lieu of a chalk line or string line) the paint line shall not be wider than ½ inch) in width. If wider, the paint shall be removed following the application of the final permanent marking. New markings shall match existing markings as applicable in areas abutting existing road surfaces. The surface shall be dry and all dust, debris, oil, grease, dirt, temporary markings, existing markings, and other foreign matter shall be removed from the road surface prior to the application of the permanent marking material.

The Contractor shall be responsible for keeping traffic off freshly applied markings until they have set sufficiently to bear traffic. Traffic control is the responsibility of the Contractor and shall conform to the City of Overland Park Traffic Control Handbook. Failure to comply with traffic control guidelines will result in the Pavement Marking Contractor being directed to stop operations and leave the site until proper and approved traffic control has arrived and put in place on site.

a. Procedure

The Contractor shall furnish and install white and yellow permanent retro-reflectorized cold preformed plastic pavement marking material at the location shown on the plans, in conformance with the details and material specifications included herein.

The cold plastic markings shall consist of a homogeneous, extruded, prefabricated material of specified thickness and width which shall contain reflective glass spheres uniformly distributed throughout the cross-section, and shall be applied only to pavement surfaces as temporary markings between construction projects or an interim basis when lane assignments are anticipated in the near future.

Apply the tape according to manufacturer's instruction with pre-coated adhesive and pressure.

b. Road Conditions

It is recommended that the tape be installed as soon as practical following tape manufacturer instructions.

Clean the surface of the road using a broom and/or high-pressure air blower. If either of these methods fail to clean the road surface, then high-pressure water wash shall be used. Road surface must be dry and all dust, dirt, debris, oil, grease and foreign material removed before applying tape. If using water-cooling to groove, the groove must be completely dry prior to tape application.

c. Tape Application

If there is a crack in the pavement, or if the tape is to be applied over a bridge expansion joint, manhole or utility box, lay the tape over the crack joint or fitting, then cut the tape one inch away from the crack or joint on each side. Apply the required surface preparation adhesive and allow to dry completely (5-10 minutes at 70 degrees F), but not over 30 minutes. Butt splices must be used; do not overlap tape ends.

d. Tamping

Tamp the tape thoroughly with a tamping cart with a minimum 200 pound load, three times back and forth (six passes) over each part of the tape. Start in the center of the marking and work out to the edges removing any trapped air. Do not twist or turn the tamper cart on the tape. Make six passes (three passes back and forth) over each part of the tape (tamping is very important). Make sure all edges are firmly adhered.

e. Application Conditions

The air temperature shall be 60 degrees F and rising with a surface temperature of 70 degrees F and rising. The overnight air temperature shall not have been below 40 degrees F the night before tape application. The pavement surface must be clean and dry. No rainfall should occur within 24 hours prior to application. Traffic must be kept off of pavement surfaces coated with a surface preparation adhesive prior to tape application (follow manufacturer's instruction regarding the use of surface preparation adhesive).

f. Surface Moisture

Cold preformed plastic tapes will not adhere if moisture is present. Therefore, road surfaces must be dry and above the minimum required temperature for application of all tapes. If rainfall occurs within 24 hours prior to application, a surface moisture test (plastic wrap or roofing paper method as approved by the inspector) must be performed and approval obtained from the inspector. The groove must be visibly dry for a minimum of two hours prior to application. A moisture test shall be completed after the two-hour drying time to ensure no presence of moisture.

1082.4 INSTALLATION PERFORMANCE MEASURES

To ensure total understanding of what is expected in the application of any permanent pavement marking material on new pavement surfaces in the City of Overland Park, the following guidelines shall be followed. On streets receiving a thin surface treatment only, such as micro-surfacing or slurry seal, some of the performance measures may be waived by the inspector.

Applied material must be from an approved manufacturer, of proper dimensions and composition. Material must be applied per manufacturer's instructions. No substitutions of materials will be allowed without prior approval of the Engineer. Manufacturer-approved adhesive must be used and applied per instructions. No substitutions of materials will be allowed without prior approval of the Engineer.

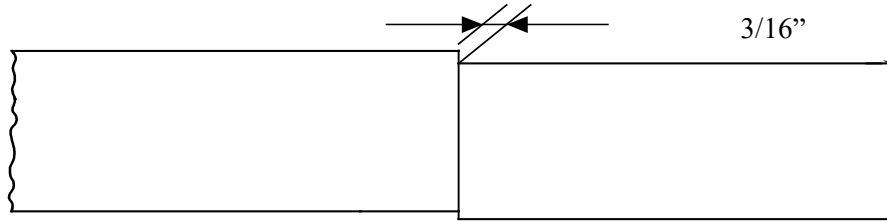
Contractor is responsible for accurate layout and measurement. Cold plastic to be used only where specified or with approval of the Engineer.

Applied material must adhere fully and completely to road surface, with straight edges and squared ends; lay smooth on surface with no warps, folds, creases, waves, bubbles or rips. Color and beading must be uniform and consistent.

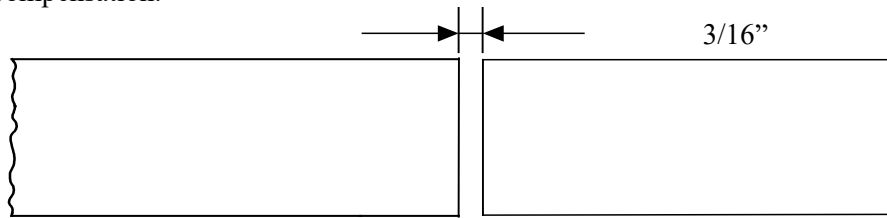
No overlap of materials. Ends or sides matched to existing markings must not exceed 1/8" in separation. Applied material to be in alignment with existing markings and of consistent size.

Lack of adhesion: The full unit price bid per foot shall be withheld for one foot for each occurrence if found more than three (3) times per 1 mile, or project if less than 1 mile in length.

Line Deviation: A line that in the judgment of the Engineer deviates from the specified layout by an unreasonable amount shall be replaced. The Contractor shall be responsible for removal of the deviated marking material/repair of the pavement as designated by, and to the satisfaction of, the Engineer at no additional compensation.

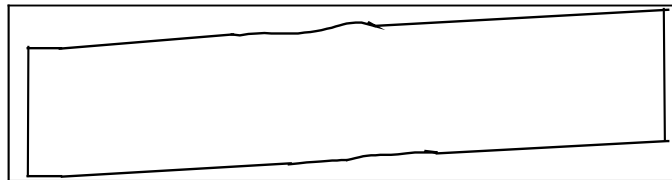


Gaps Between Successive Lines: Successively placed lines that contain gaps as specified by an unreasonable amount shall be replaced. The Contractor shall be responsible for removal of the deviated marking material/repair of the pavement as designated by, and to the satisfaction of, the Engineer at no additional compensation.



Inlaid Groove Quality: The full unit price bid per foot shall be withheld for the entire length of line that does not meet the requirements for depth of the inlaid material or for a groove that displays a coarse tooth pattern bottom that is not conducive to complete adhesion of the marking material. Penalty shall be imposed from the first occurrence.

Wavy or Misaligned Line: The full unit price bid per foot shall be withheld for the entire length of waviness caused by poor operation by the driver/operator of the grooving/installation equipment or for any misalignment in the material installed within the inlaid groove. Penalty shall be imposed from the first occurrence.



Work Outside the Scope/Limits of Project: Payment for all pavement marking work performed shall be withheld in full until the Contractor (a) removes all pavement marking material placed outside the scope/limits of the project, and (b) repairs the pavement surface as directed by and to the satisfaction of the Engineer and the local entity, if different from the Engineer.

Timeliness: All cold plastic, durable pre-formed patterned cold plastic, or durable pre-formed contrast patterned cold plastic material shall be completely installed within two (2) calendar weeks of the road surface material being laid. Failure to install markings on schedule shall result in liquidated damages of \$1500 per day, separate from the project liquidated damages as stated elsewhere in the Contract Documents, until pavement markings are installed on schedule, or completion of the markings completes the project. These liquidated damages shall be imposed each time the Contractor fails to install pavement markings within the two-week window as described above.

1082.5 MEASUREMENT AND PAYMENT

a. Lump Sum

The Engineer will measure the pavement markings, as indicated on the plans, complete- in-place and accepted, as a unit lump sum quantity for all work necessary.

Payment for “Permanent Pavement Markings” at the contract lump sum price bid is full compensation for the specified work, which shall include all materials, labor, equipment and incidentals necessary to complete the work. The removal of existing pavement markings prior to installing new markings in the same location shall be considered subsidiary to the bid item “Permanent Pavement Markings”.

b. Unit Bid Prices

Measurement for Cold Plastic Pavement Markings shall be as listed in the bid proposal, which includes all labor, materials, tools and equipment necessary to fully complete the installation according to the plans and specifications. No measurement will be made for the removal of existing pavement markings prior to installing new markings in the same location.

The Engineer will measure the various widths, type and color of pavement marking material along the marking centerline by the linear foot complete in place. Each line of double median approach lines, double centerlines, solid and broken centerline or other parallel lines will be measured separately. Crosshatch lines, chevron lines, crosswalk lines, solid lane lines, stop lines and edge lines, etc. will be measured by the linear foot, measured along the centerline of all markings for each length of the various widths, type and color of material complete in place.

The Engineer will measure broken lines, composed of short line segments separated by a specified gap, by the linear foot of the various widths, type of material and color for the actual marked line only complete in place.

The Engineer will measure each symbol marking, consisting of left and right turn arrows, “ONLY” markings, handicap parking symbols, etc. Each isosceles triangle within a yield line will be measured separately. The “X” and “RR” symbols of a railroad crossing markings will be measured as one combined railroad crossing symbol. Parking space markings will be measured per each whether they consist of the full “+” symbols or “T” symbols used at the outer ends of an on-street parking section. No distinction will be made whether it is a full “+” or whether it is a “T”. Bicycle lane symbol markings, comprised of a bicycle lane rider symbol and a bicycle lane arrow, will be measured per each for each bicycle lane rider symbol and per each for each bicycle lane arrow. Shared bicycle lane markings (sharrows), comprised of a bicycle lane rider symbol and two chevrons, will be measured per each for each bicycle lane rider symbol and per each for the pair of chevrons.

Payment for “Cold Plastic Pavement Markings” as listed in the proposal, at the contract unit price bid is full compensation for the specified work.

All traffic control necessary for installation of the Cold Plastic Pavement Markings shall be subsidiary to other bid items. The removal of existing pavement markings prior to installing new markings in the same location shall be considered subsidiary to other bid items.