

SECTION 628

TRAFFIC STRIPING, PAVEMENT MARKINGS, AND CURB MARKINGS

DESCRIPTION

628.01.01 GENERAL

- A. The Contractor shall furnish and install all traffic striping, marking, and all other directional information on the surfaces of highways, streets, detour roads, medians, and curbing as shown on the plans and required by the contract documents.
- B. As defined in **Section 714, "Paint and Pavement Markings,"** Type 2 pavement marking materials shall be used for transverse markings such as crosswalks and stop bars as well as for symbols and legends.
- C. Type 1 markings are defined as longitudinal markings such as lane lines and edge lines.

MATERIAL

628.02.01 MATERIALS FOR TRAFFIC STRIPING, PAVEMENT MARKING AND CURB MARKING

- A. Materials for traffic striping and marking shall conform to **Section 714, "Paint and Pavement Markings."**
- B. All paint, epoxy, and polyurea paint traffic stripes (except black stripes) shall be beaded on the final finish coat in accordance with **Subsection 714.03.12, "Reflective Material."**
- C. The retroreflective preformed pavement markings shall conform to the applicable requirements of **Subsection 714.03.06, "Pavement Markings."**
 - 1. The retroreflective preformed pavement markings shall consist of plastic or thermoplastic material with pigments selected to conform to standard highway colors.
 - 2. Retroreflective beads shall be incorporated into the film to provide immediate and continuing retroreflection.
 - 3. Preformed words and symbols shall conform to the applicable shapes and sizes as outlined in the current edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD).
- D. The Contractor shall furnish all equipment, materials, labor, and supervision necessary for installing traffic lanes, directional arrows, guide lines, curbs, parking lines, crosswalks, and other designated markings in accordance with the contract plans, or for approved temporary detours essential for safe control of traffic through and around the construction site.
- E. The Contractor shall warranty the applied markings for a minimum of 1 year from the date of installation.
 - 1. If the manufacturer provides a longer warranty, the longer warranty shall apply.
 - 2. If, for any reason, the markings fail to perform as specified, the Contractor, under this warranty, shall completely remove the old markings and apply new markings at no additional cost to the Contracting Agency.

CONSTRUCTION

628.03.01 WEATHER CONDITIONS

- A. Pavement marking materials shall be applied only when the pavement surface is dry and clean, when the surface temperature is above 40 degrees F and rising, and when the weather is not windy, foggy, or humid.
- B. Epoxy paint, polyurea paint, and preformed marking material, plastic or thermoplastic, shall only be applied if surface temperature is a minimum of 40 degrees F and rising at the time of marking installation.
- C. If the manufacturer of the marking material requires a minimum surface temperature different than detailed above, the higher temperature shall be used.

628.03.02 EQUIPMENT

- A. All equipment required to perform the work shall be approved in advance by the Engineer, and shall include, but not be limited to, such apparatus as brushes, brooms, compressors, air blowers to properly clean the pavement surface, a mechanical marking machine, a suitable device for heating the paint to the specified temperatures, a bead dispensing device, auxiliary hand spray painting equipment, paint rollers, or other equipment as may be necessary to satisfactorily complete the work.
- B. For traffic paint applications, the striping machine shall be an approved spray-type marking machine suitable for applying traffic paint in accordance with **Section 714, "Paint and Pavement Markings,"** or as recommended by the paint manufacturer. The striping machine shall:
 - 1. Have sufficient paint capacity for each color with adequate air pressure to perform the work satisfactorily without excessive stopping.
 - 2. Produce a uniform film thickness and cross section at the required coverage.
 - 3. Produce markings with clean-cut edges without running or spattering.
 - 4. Be capable of being guided within the straightness tolerances set forth in these specifications.
 - 5. Have suitable adjustments for painting the line with width specified and when required.
 - 6. Be equipped with an automatic cycling device to produce intermittent (skip) lines.
 - 7. Be equipped to produce a variable skip pattern, including simultaneous painting of a broken line on 1 side and a solid line on the other side of the multiple strips. An acceptable tolerance in the skip pattern is plus or minus 6 inches.
 - 8. Be capable of 3-gun application consisting of 1 black and 2 yellow spray guns operating simultaneously or individually.
 - 9. Be capable of operating 2 white guns simultaneously.
 - 10. Have a wheel base of sufficient length to produce a straight line to meet the straightness tolerance specified in **Subsection 628.03.05, "Layout, Alignment, and Spotting."**
 - 11. Be capable of producing curved lines without abrupt breaks, in accordance with approved layouts.

- C. For epoxy paint and polyurea paint applications, the striping equipment shall be a system capable of applying both yellow and white epoxy or polyurea paint to manufacturer's recommended proportions, producing striping of uniform dimension which comply with parameters for pavement markings set forth in **Section 714, "Paint and Pavement Markings."**
1. Equipment shall be capable of placing 2 lines of traffic striping simultaneously with either line in a solid or intermittent pattern and applying retroreflective beads and or reflective elements at the rate recommended by the manufacturer.
 2. The equipment shall also have a metering device able to register the accumulated footage of markings installed per day for each spray gun.
 3. A technical expert in equipment operations and epoxy or polyurea applications shall be present at all times during the installation of epoxy or polyurea paint markings.
- D. Equipment shall also be designed so that pressure gauges for each proportioning pump are constantly visible to the operator at all times during equipment operation so that any fluctuation and pressure difference can be monitored immediately. In addition, the striping equipment shall have a minimum of one 24-inch long minimum static mixer unit for the proper mixing of the 2 components of the epoxy paint material.
- E. Provision shall be made for a dispenser capable of applying glass beads at the required rate.
- F. Word markings, letters, numerals, and symbols shall be applied using suitable spray equipment together with stencils and templates.
- G. Equipment for the application of preformed thermoplastic or plastic pavement marking material shall be as recommended by the manufacturer and as approved by the Engineer. Thermoplastic markings require the use of a propane torch as recommended by the manufacturer to fuse markings to asphalt and Portland cement concrete pavements by means of heat.
- H. The Contractor shall provide a wet sandblasting machine with sufficient sand, water, and air capacity to completely remove all existing or temporary traffic striping or unneeded traffic markings.
1. This machine shall meet all requirements of the air pollution control district having jurisdiction.
 2. All sand used in wet sandblasting shall be removed from the pavement without delay as the sandblasting operation progresses.
 3. Removal of striping by high velocity water jet may be permitted when approved by the Engineer.

628.03.03 GEOMETRY, STRIPES, AND TRAFFIC LANES

- A. Permanent and temporary striping and marking shall be in accordance with the MUTCD and Volume I of the Standard Drawings.
- B. If the Contractor elects to alter the existing traffic stripes and markings, or to divert the flow of traffic on construction projects for Contractor's own convenience, and there are no specific pavement markings or lane delineations shown on the plans or in the Special Provisions, the Contractor shall, with the approval of the Engineer, provide the necessary temporary striping in accordance with the MUTCD at no additional cost to the Contracting Agency.

- C. When not otherwise shown on the plans, detour transitional traffic line striping shall have a minimum taper of 20:1 for temporary striping and 30:1 for permanent striping.
- D. Temporary traffic lanes shall be at least 10 feet wide and no lane shall encroach within 5 feet of an open excavation or within 2 feet of a longitudinal curb.

628.03.04 PREPARATION OF EXISTING SURFACES

- A. Existing markings and striping, either permanent or temporary, that are to be abandoned or obliterated shall be removed by wet sandblasting or other approved methods.
 - 1. Dry sandblasting may be used in selected areas only with the permission of the Engineer and with approval of the air pollution control authority having jurisdiction over the area in which the work will be performed.
 - 2. Alternate methods of marking removal require prior approval of the Engineer.
 - 3. Obliteration of traffic striping with black paint or light emulsion oil shall be done only with the prior approval of the Engineer.
- B. Before applying pavement markings, the existing pavement surface shall be cleaned by washing, sweeping, blowing, vacuuming, or other methods recommended by the marking manufacturer, as necessary to remove moisture, dirt, grease, oils, acids, laitance, curing compound of Portland cement concrete, or other foreign matter that would reduce the bond between the pavement marking material and the pavement.
- C. After cleaning, the surface shall be dried before applying pavement markings.

628.03.05 LAYOUT, ALIGNMENT, AND SPOTTING

- A. When necessary, the Engineer will furnish the needed control points for required pavement striping and markings.
- B. The Contractor shall establish pilot lining between these points by stringline or other method to provide striping that will vary less than 1/2 inch in 50 feet from the specified alignment.
- C. The Contractor shall stripe or otherwise delineate the traffic lanes in accordance with the Standard Drawings and the MUTCD in the new roadway, portion of roadway, or detour before opening it to traffic if so required by the Contract Documents.
- D. The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the markings.

628.03.06 APPLICATION OF PAINT, EPOXY PAINT, AND POLYUREA PAINT

- A. Traffic striping and marking shall be applied at locations and to the dimensions and spacing indicated on the approved plans in accordance with this specification and **Section 714, "Paint and Pavement Markings,"** or as provided in the Special Provisions.
- B. Where temporary traffic striping or marking is required, it shall not be applied until the layouts, alignments, sequencing, and condition of the existing surface have been approved.
- C. Pavement marking material shall be mixed in accordance with the manufacturer's instructions. The material shall be mixed thoroughly and applied to the surface at the proper temperature, at its original consistency, and without the addition of paint thinner or other materials.

- D. If traffic paint is applied in 2 coats, comply with the following:
1. Retroreflective beads will be required only in the second coat.
 2. The first coat shall be thoroughly dry before the second coat is applied.
 3. On open-graded surfaces, the second coat shall follow no sooner than 10 calendar days after initial application.
- E. Application of retroreflective beads and or reflective elements shall be applied using the double drop method and in accordance with manufacturer's recommendations.
1. Application rate of beads shall be as required by the manufacturer to meet retroreflectivity requirements specified in ***Subsection [714.03.06](#), "Pavement Markings."***
 2. In addition, retroreflective beads shall be applied to traffic markings in accordance with ***Subsection [714.03.12](#), "Reflective Material."***
- F. Ten days shall elapse between the application of a bituminous seal coat and the permanent traffic marking material.
1. The traffic paint, epoxy paint, or polyurea paint shall not bleed, curl, or discolor when applied to bituminous surfaces.
 2. If bleeding or discoloring occurs, the unsatisfactory areas shall be corrected as directed by the Engineer.
- G. Straight stripes deviating more than 1/2 inch in 50 feet shall be obliterated by sandblasting or other approved method and the markings corrected.
1. The width of markings shall be as designed, within a tolerance of 4 percent.
 2. When existing striping and markings are to be repainted, they shall be repainted to completely cover the old markings within 1/4 inch.
 3. Stripe repainting shall be retraced within a longitudinal tolerance of 6 inches plus or minus at the end of each stripe.
 4. Abrupt breaks in striping alignment will not be allowed.
 5. The striping shall be a continuous operation except where crossovers are required to complete painted medians.
 6. Restriping operations involving epoxy paint and polyurea paint shall be performed in accordance with manufacturer's recommendations.
- H. The application of pavement markings and striping using traffic paint, epoxy paint, or polyurea paint shall be performed by competent equipment operators and painters using proper equipment, tools, stencils, templates, and shields in a workmanlike manner.
- I. Difficulties experienced in cool weather may be minimized by heating the pavement marking material in accordance with manufacturer's recommendations to provide for a uniform flow of material.
- J. Temporary striping and marking shall be renewed when the stripes and markings have lost 50 percent of their original visual effectiveness.
- K. The Contractor shall furnish a notarized certificate signed by either an authorized employee of the manufacturer or testing laboratory stating that the pavement marking material conforms to the specified requirements and is in accordance with ***Subsection [714.02.01](#), "Certificates."***

628.03.07 PROTECTION OF WORK, WORKMEN, AND THE PUBLIC

- A. The Contractor shall use proper and sufficient directional signs, warning devices, barricades, pedestals, lights, traffic cones, flagmen, or such other devices as necessary to protect the work, workmen, and the public.
- B. Markings and striping shall be protected from injury and damage of any kind until the material is ready for traffic.
- C. Adjacent surfaces shall be protected from disfiguration by spatter, splashes, spillage, and dripping of paint, adhesives, primer, or other material.
- D. In areas of high traffic volume, the Contractor shall schedule work to install traffic lines and markings in off-peak traffic hours.

628.03.08 DEFECTIVE WORKMANSHIP OR MATERIAL

- A. Any work or materials not conforming to the plans and specifications shall be unacceptable and shall be redone, removed, replaced, or made satisfactory to the Engineer at no additional cost to the Contracting Agency.

628.03.09 INSTALLATION OF RETROREFLECTIVE PREFORMED PAVEMENT MARKINGS

- A. Traffic striping and marking shall be applied at locations and to the dimensions and spacing indicated on the approved plans in accordance with this specification and **Section 714, "Paint and Pavement Markings,"** or as provided in the Special Provisions.
- B. The retroreflective preformed pavement marking materials shall not be applied within 2 weeks after laying and rolling asphalt concrete wearing courses unless otherwise specified in the Special Provisions.
 - 1. The preformed markings shall conform to the pavement contours by the action of traffic.
 - 2. After application, the markings shall be immediately ready for traffic.
- C. The preformed retroreflective pavement markings shall be applied in accordance with the manufacturer's recommendations, a copy of which the Contractor shall supply the Contracting Agency prior to installing the pavement marking material.
- D. Joints in the initial installation of new pavement markings will be allowed only on lane lines and change of direction.
- E. The longitudinal bars in crosswalks, if used, shall be 1 piece.
- F. Pavement marking failures shall be removed and replaced a minimum of 6 inches each side of the failure and the patch shall be a minimum of 24 inches in length.

MEASUREMENT**628.04.01 MEASUREMENT**

- A. The quantity of traffic striping and marking shall be measured by 1 or more of the following methods: linear footage, the area in square feet, or 1 lump sum item complete in place, as shown on the plans or indicated in the Special Provisions.
- B. The quantity of Type 2 pavement marking materials for symbols and legends measured for payment shall be per each, complete and in place.

- C. The quantity of Type 2 pavement marking materials for crosswalks and stop bars measured for payment shall be the number of square feet, complete and in place.
- D. The quantity of Type 1 pavement marking materials for longitudinal lines measured for payment shall be per linear foot, complete and in place.

BASIS OF PAYMENT

628.05.01 BASIS OF PAYMENT

- A. The lump sum or unit prices in the Proposal shall include full compensation for furnishing all labor, materials, tools, and equipment and for doing all work involved in, or appurtenant to, the installation of all traffic striping or markings, including removal of existing conflicting markings and preparation of surface for new markings, as shown on the plans or indicated in the Special Provisions.
- B. All costs for temporary pavement painting for the convenience of the Contractor, including costs for removal of existing lines and markings, shall be at no additional cost to the Contracting Agency.
- C. Payment shall be made under:

PAY ITEM	PAY UNIT
Type 2 "ONLY" Marking.....	Each
Type 2 (Arrow) Marking	Each
Type 2 Marking for Crosswalks and Stop Bars	Square Foot
Type 1 White 4-inch Marking	Linear Foot
Type 1 Yellow 4-inch Marking	Linear Foot