Materials Management Department
901-B Texas Street
Denton, Texas 76209

SCOPE OF WORK
Exhibit 3

RFP 6358

PAVEMENT MARKERS INSTALLATION
FOR THE CITY OF DENTON
The scope of work shall be finalized upon the selection of the Firm. The respondent’s submission shall have accurately described your understanding of the objectives and scope of the requested products and services and provided an outline of your process to implement the requirements of the Scope of Work and Services. It is anticipated that the scope of work will include, at a minimum, the following:

A. TECHNICAL RESPONSIBILITIES AND REQUIREMENTS

General:
This item shall be for the supplying of adequate personnel and machinery/tools/equipment and the like as well as the supplying of, preparation for and installation of pavement markings and/or their removal, for the work required (as it relates to pavement markings) at locations shown on design plans provided to the Contractor and/or as directed by the City and in accordance with City of Denton’s current practices, policies, procedures, specifications and standards or related TxDOT requirements and/or specifications as provided in its most current Standard Specification for Construction of Highways, Streets and Bridges and related documents or its most current replacement(s) and as may apply when there are none for the City.

The Contractor shall carefully follow the manufacturer’s recommendations in the use of all materials used in the preparation, installing and/or removal of pavement markings within the City of Denton relative to and in accordance with the City’s current practices, policies, procedures, specifications and standards or related TxDOT requirements and/or specifications as provided in its most current Standard Specification for Construction of Highways, Streets and Bridges and related documents or its most current replacement(s) and as may apply when there are none for the City.

This document and all other associated documents required of the Contractor to correctly perform the work necessary to properly begin and complete the job shall be within easy access, at all times, of the Contractor’s on-site supervisor of the associated crew(s). If said document(s) are not within easy access of said on-site supervisor, the City can, at its discretion, halt any and all associated work.

Pre-marking guides (as they pertain to layout) shall be established to mark the location of the permanent pavement marking(s) in the location as shown on the construction plans and/or as directed by the City. The location shall be verified before the pavement marking(s)/marker(s) is placed. Said pre-marking guides shall not leave a permanent indication on the road surface.
Pavement marking(s)/marker(s) shall be placed in accordance with the design/ construction plans and/or as directed by the City. Said pavement marking(s)/marker(s) shall be in alignment when placed and not deviate by more than two (2) inches. Any pavement marking(s)/marker(s) placed and deemed unsatisfactory by the Engineer shall be removed by an acceptable method to the City and properly reinstalled by and at the Contractor’s expense, in accordance with the City’s requirement(s).

The Contractor’s on-site supervisor of the marking(s) crew(s), performing any work within the City of Denton, must be able to:

a) Understand:
   i) written English sufficient to fully understand any City and/or TxDOT written policies, procedures, specifications, standards and/or the like (as it relates to pavement markings, directly or indirectly) that are presented to him/her so as to begin and correctly complete the work to be performed and
   ii) design plan(s)/diagram(s)/schematic(s)/drawing(s) and the like (as it relates to pavement markings), in part or in whole that are presented to him/her so as to begin and correctly complete the work to be performed and
   iii) conversational English sufficient to take instruction(s) from City staff so as to begin and correctly complete the work to be performed and without further supervision by the City or the need for additional written or spoken guidance by the City
   iv) technical spoken English (as it relates to pavement markings as noted in items 1)a)i) and 1)a)ii)), directly or indirectly) sufficient to take instruction(s) from City staff so as to begin and correctly complete the work to be performed and without further supervision by the City or the need for additional written or spoken guidance by the City

b) provide a translator with the above noted capabilities, at no cost to the City. If said supervisor/translator is not provided, no pavement marking work shall be performed until said person is on the job’s site. Any work done while said person is not on the job’s site can be considered being non-compliant and thus, not acceptable to the City. If said work (in part or in whole) is rejected by the City as a result of said non-compliance, in any manner, the required pavement marking(s)/marker(s) will be removed by and at the Contractor’s expense (by a method acceptable to the City), and properly reinstalled by and at the Contractor’s expense, in accordance with the City’s requirement(s).

2) The Contractor’s personnel, performing any work within the City of Denton, shall be sufficiently skilled in the work of:

   a) providing pre-marking guide(s)/layout,
   b) installing;
   c) removing
      Pavement markings per City of Denton’s common practices, policies, procedures, specifications and/or standards and/or City supplied design plans
For City directed work, application of pavement markings shall be done on an as needed basis per project. The City shall notify the Contractor of each project required to be completed, in any order and at any time throughout the length of the contract. Each said project shall be completed by the Contractor in its entirety within the time limit(s) as noted on the applicable quantity sheet(s) and as contained within the bid document(s) for and accepted by the City as submitted by the Contractor or, if there is no such condition contained within the bid documents, as agreed upon, in writing by the City and the Contractor prior to any installation, with allowance(s) for inclement weather, as noticed by the City in writing to the Contractor. The Contractor shall make arrangements and meet with appropriate City staff prior to beginning each project to determine the scope and quantities required of said project. The Contractor shall come to the meeting, prepared with estimates of all pavement markings required of each project to be discussed. Estimated quantities greater than 10% of the difference between the City and Contractor for each type of pavement marking shall be resolved by a meeting in the field with a representative of the City and the Contractor and field verifying those items for which there are noted differences. The City has the prerogative to change quantities after the meeting and prior to acceptance of the project, as provided in writing by the City. Said quantity changes by the City shall be done by Contractor only upon written authorization from the City. The Contractor shall be required to complete said written changes prior to final written acceptance by the City.

Contactor (or responsible representative) shall immediately contact the City upon each occupation of the site.

If for any reason Contractor will not occupy the site during a scheduled project’s work time (from established start day to end day), the Contractor shall notice the City as to the reason why the site will not be occupied and establish the next date certain of the intended site’s occupation.

All personnel as well as materials and machinery needed to complete the day’s work shall be on site and/or in the Contractor’s possession upon the Contractor’s (or any representative thereof) arrival at the project’s site.

City Notice

Unless specifically noted otherwise for a particular item, City shall mean the current Traffic Operations Manager or his/her designate.

Noise Ordinance:

The Contractor shall be aware that the City of Denton has a noise ordinance in effect between the hours of 10:00 PM and 7:00 AM and shall perform the applicable work required to complete the job accordingly.
Failure to Comply

Any failure by the Contractor and/or any representative thereof to meet or exceed the requirements as contained herein shall be sufficient for the City of Denton to cancel any and/or all contract(s) with said Contractor upon written notice of such by the City.

Traffic Control

Traffic control shall be the responsibility of the Contractor. Traffic control shall comply with the most current North Texas Council of Governments “Standard Specifications for Public Work Construction” latest edition Item 8.1 “Barriers and Warnings and/or Detour Signs” inclusive or current replacement or, where none apply, the most current Texas Manual on Traffic Control Devices (MUTCD), Chapter 6 and/or any State, District and/or Area supplement(s) thereof or current replacement(s) or, where none apply, as directed by the City.

Elimination of Existing Pavement Marking(s)/Marker(s)

In areas where the pavement marking(s)/marker(s) are to be removed, the Contractor shall use one of the methods as outlined in item 677 of the TxDOT Standard Specifications for the Construction and Maintenance of Highways, Streets and Bridges and approved by the City.

The Contractor will be responsible for proper disposal of all the material as a result of the removal process.

Pavement markings removed by the Contractor shall be replaced by the Contractor with City approved temporary pavement markings (such as tabs) and/or traffic control devices, as directed by the City, when the installation of the permanent pavement marking(s) replacement will not be installed within 4 hours of said removal. If the Contractor does not comply within the 4 hour requirement, the City has the prerogative to occupy the site and cause the site to be adequate for use by the public. The Contractor shall be charged by the City for the cost of all staff time, materials, machinery, traffic control devices and incidentals required of the City.

An existing adhesive installed pavement marking shall be removed in its entirety prior to any application of a Type I or Type II pavement marking in its place.
Liquidation Damages

Liquidation damages in the amount of $500 per day beyond the 4 hours as noted for pavement markings removed by the Contractor can be assessed by the City for failure to either install the permanent pavement markings or ensure temporary pavement markings (such as tabs) and/or traffic control devices, as agreed upon by the City. If temporary pavement markings (such as tabs) and/or traffic control devices are placed, the Contractor will notice the City prior to any placement thereof with a date certain as to when the site will be occupied by the Contractor so as to remove the temporary pavement markings (such as tabs) and/or traffic control devices and install the applicable and proper permanent pavement markings.

Contractor shall have a maximum of two (2) business days beyond the established start day to be on site to begin pavement marking(s) project(s). Liquidation damages in the amount of $500 per day beyond the two (2) business days can be assessed by the City for failure to mobilize crews in the specific time. Contractor shall have a maximum of zero (0) business days beyond the established end day (at midnight) to complete the project(s) and to be entirely off the site(s). Liquidation damages in the amount of $500 per day beyond the zero (0) business days can be assessed by the City for failure to complete the project in the agreed upon time.

1. The City will notice the Contractor of a proposed project(s) prior to the City’s issuance of a purchase order in order to describe the project’s needs and establish an agreed upon (with the City) tentative begin date of the project. Under no circumstances is the Contractor to begin a project(s) until the completion of item #2 which, is as follows

2. Upon issuance of a purchase order, the City will notice the Contractor so as to determine the date certain of the start day of said project(s) and relative to the previously established tentative begin date. Contractor shall also determine a reasonable end day of said project(s) and agreed upon by the City. Contractor shall then provide the City, within two calendar days, in writing (e-mail), of the project(s) name, start day and end day as previously established and agreed upon with the City.

3. Upon written request by the Contractor and with detailed explanation (typically an event and/or happening beyond the Contractor’s control), the City may, upon its own discretion, agree to a different start day or a different end day. The City will notice the Contractor of its decision to or not to allow the change of the requested start/end day and can do so without prejudice and/or explanation.
Protection of Pavement Marking(s)/Marker(s)

Newly installed pavement markings shall be protected from traffic until fully cured.

Existing pavement markings to remain within the project’s limits, plus those within a radius of 300 feet of the project’s limits shall not be damaged as a result of the work performed by the Contractor.

Any existing to remain or newly installed pavement marking that is damaged because of a lack of protection (as determined by the City at the time of the acceptance inspection of the work performed) shall be properly removed (by a method acceptable to the City) and replaced by the Contractor in accordance with the City’s direction and at no expense to the City and prior to acceptance by the City of the work performed by the Contractor.

The method of protection shall not constitute a hazard to the traveling public.

Equipment Use

All equipment used for pavement marking/marker installation and removal shall be specifically designed for that purpose by a company experienced in the design and manufacture of such equipment.

Have the production capability placement rate of a minimum of 40,000 linear feet of a four-inch wide solid pavement marking, per average 8 hours of work, for any average workday.

Be considered as being in satisfactory operating condition if the placement rate is over any five (5) consecutive working days.

Have production capabilities (like the four-inch wide marking equipment) so as to be capable of placing linear pavement markings that are six inches wide as well as eight-inches wide in a single pass.

Have the production capability placement rate of a minimum of 40,000 linear feet of a four-inch wide solid pavement marking, per average 8 hours of work, for any average workday.

Be capable of placing broken or solid continuous white line from both sides of the pavement marking installation equipment.

Equipment must be maintained in satisfactory condition so as to not delay scheduled work.
Surface Preparation

The surface to which the pavement marking/marker material is to be applied shall be completely dry and free of dirt, oil, grease, debris and other foreign objects. Necessary for the application to and/or adherence of the pavement marking/marker to the pavement’s surface. The Contractor shall be responsible for the proper preparation of the pavement surface accordingly. Any pavement marking/marker failure as a result of improper pavement surface preparation shall not constitute a hazard to the traveling public and shall be replaced by the Contractor at the Contractor’s expense upon removal of all said pavement marking(s)/marker(s), by the Contractor and at the Contractor’s expense, associated with the failure and upon the proper preparation of the surface prior to and the reapplication of the pavement marking/marker, for acceptance of the work by the City.

Warranty

All pavement marking(s), glass beads, pavement marker(s), appurtenance(s), ancillary item(s) and/or any material(s) used in conjunction with them for whatever purpose(s), as well as any material(s) used for the application of and/or the attachment of these items to each other and/or the pavement’s surface (including but not limited to: sealer(s) and epoxy adhesive(s)) shall be warranted by the Contractor as noted on the applicable quantity sheet(s) and as contained within the bid document(s) for and accepted by the City as submitted by the Contractor or, if there is no such condition contained within the bid documents, for a total of 30 days after acceptance of the work by the City. The warranty shall apply to those items as a result of improper: pavement surface preparation; method(s) of application; material(s) used; or the like, in which the item has; is; or is beginning to separate from the pavement surface or between two or more components of an item that has; is; or is beginning to separate from each other. The City shall determine the extent of the impropriety of the each said item and the Contractor shall, for said extent remove the existing item (and any component thereof); prepare the surface; and install the item (being new) in the appropriate location and under the condition(s) as set forth in this document. The warranty period for any such item so installed shall begin anew upon acceptance by the City and such requirement(s) shall continue until at such time as the warranty period has been successfully completed. The City reserves the right to withhold up to 50% of the cost(s) of the Contractor’s billings of any item installed until at such time as the warranty period has been successfully completed.
Coordination with City Engineer

The City Engineer and/or his appointed representative will identify for the Contractor the roadways upon which the work will be performed and serve as a liaison between the City and the Contractor.

Pavement marking(s)/marker(s) of the type specified shall be applied at the location(s) as determined by the Engineer and/or his appointed representative and shall be in accordance with the current Manual on Uniform Traffic Control Devices.

I PAVEMENT MARKING(S)

General: This item shall govern the installation of pavement marking(s) of the types, colors, shapes, sizes, thickness and widths as shown.

Materials

Materials used shall be classified in accordance with the most current TxDOT Standard Specifications for Construction and Maintenance of Highway, Streets and Bridges item 666 or its replacement:

Type I Materials

Type I are thermoplastic materials that require heating to elevate the temperatures for applications. Type I materials shall conform to TxDOT Departmental Materials Specifications D-9-8220 or its current replacement. Each container of Type I material shall be clearly marked to indicate the color, mass, type of material, manufacturer’s name and the lot/batch number.

Type II Materials

Type II materials are paint-type that are applied at ambient or slightly elevated temperatures. Type II materials shall conform to the most current TxDOT Departmental Materials Specifications D-9-8200, YPT-10 and/or WPT 10 and D-9-8290 or most current replacement.
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General Construction

Pavement surface preparation shall be done in accordance with Item 678 of the TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges or its current replacement.

Shall essentially have a uniform cross-section. The density and quality shall be uniform throughout the thickness. The application shall have no more than five percent, by area, of holes or voids and shall be free of blisters.

Each edge of each pavement marking shall be well defined and without any splatter, spill-over, splash, spray or the like adjacent to the pavement marking’s edge.

In place or on the roadway, shall be reflectorized both internally and externally.

Glass beads shall be applied to the material at a uniform rate (sufficient to achieve uniform and distinctive retroreflective characteristics when observed) and by an automatic bead dispenser attached to the pavement marking equipment in such a manner that the beads are dispersed almost instantly upon the pavement marking as the pavement marking is being applied to the road surface. Glass beads shall be a minimum of Type I gradation, in accordance with TxDOT specification DMS 8290 or its current replacement.

Application of Type I

Application of a pavement sealer shall be required for a location that does not have exiting marking(s) on all Portland cement concrete surfaces and any asphalt surface that is 3 years or older. The pavement sealer may be a Type II pavement marking, an acrylic sealer or an epoxy sealer. The manufacturer’s directions for application of acrylic or an epoxy sealer shall be followed. If the thermoplastic manufacturer does not recommend that a sealer be used, then the Contractor will not be required to furnish one.

Shall be applied within temperature limits of the product as well as ambient air and roadway’s surface as recommended by the material’s manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway. If the product’s manufacturer does not provide such information, then the pavement’s surface temperature shall be above 50 F/ 10 C. Pavement temperature shall be measured in accordance with Test Method Tex-829-B or its current replacement.

When Type I markings are to be placed, the Contractor shall have a hand-held thermometer on the project. The thermometer shall be capable of measuring the temperature of the pavement marking material to be placed.
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When applied by spray and operation ceases for five minutes or more, the spray head shall be flushed by spraying the material into a pan or similar container until that which is being sprayed is at the proper temperature for application.

Shall be a minimum thickness of 0.090 inches (2.3 millimeters) when measured in accordance with Test Method Tex-854-B or its current replacement. The maximum thickness shall be 0.180 inches (4.5 millimeters).

Shall be of uniform thickness throughout the length and width.

In excess of 0.090 inches shall be paid as 0.090 inches.

Pre-formed shall be applied in the manner recommended by the manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway.

Shall not be placed in inclement weather.

**Application of Type II**

Shall be applied within temperature limits of the product, ambient air and roadway’s surface as recommended by the material’s manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway. If the product’s manufacturer does not provide such information, then the pavement’s surface temperature shall be above 50 F/10 C. If applicable, pavement temperature shall be measured in accordance with the current TxDOT requirement.

The application rate shall be: between 15 and 20 gallons per mile of solid four inch wide line or its equivalent ratio for line widths greater and/or not solid except that, for new surface treatment projects the application rate shall be between 25 and 30 gallons per mile of solid four inch line and between 40 and 50 gallons per mile for solid eight inch line or its equivalent ratio for lines other than four and eight inches wide and/or not solid.

For new surface treatment projects, shall be applied in two applications for each approximately one-half the application rate. The first application shall not contain glass beads. The interval between the first and second application shall be a minimum of one hour or until dry, whichever is greater.

Shall not be placed in inclement weather.

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Methods of Measurement and for Payment

For City Contracts:

A double solid line shall be measured as one line and shall be calculated based upon two (2) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A single line (including: edge line, barrier line, bike lane, diagonal marking, stop bar and standard parking stall line) shall be measured as one line and shall be calculated based upon one (1) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A broken, dotted or lane drop line shall be measured as one line, including gaps between line segments. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified.

1. A broken line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.
2. Dotted line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.
3. Lane drop line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.

Payment shall be based upon the amount calculated for each.

A two-way left turn pocket shall be measured as one line along one of the solid pavement markings. The total for the entire marking shall be equal to 2.50 times said measurement (of each length as provided herein). Said 2.5 multiplier is determined by the combination of that solid line measurement plus the accompanying broken line’s segment to gap ratio of 0.25 times said solid line’s measurement, thus equaling 1.25 for each said line combination. Then the 1.25 line combination shall be multiplied by 2 for to obtain the 2.5 multiplier for the two combination lines that equal a two-way left turn pocket. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A yield line shall be measured per triangle type pavement marking and calculated based upon the total number of the measurement. Payment shall be based upon the amount calculated.
A word shall be measured per letter per category and shall be calculated based upon the total number of letters measured for each category. Word pavement markings shall be divided into two categories:

1. Large- those words required of a vehicle lane.
2. Small- those words required of a bicycle lane.

Payment shall be based upon the amount calculated for each letter for each category.

A symbol shall be measured per symbol per category and shall be calculated based upon the total number of symbols measured for each category. Symbols shall be divided into three categories:

1. Large- item(s) shall include: rail-road crossing marking, entire and complete in accordance with MUTCD requirements.
2. Medium- item(s) shall include: right arrow(s), left arrow(s) and through arrow(s) (note: any combination [any two or all three] of right, left and/or through arrows shall be measured as two (2) markings); wrong way arrow(s); and lane transition arrow(s).
3. Small- item(s) shall include: each symbol type as it relates to a bicycle path.

Payment shall be based upon the amount calculated for each symbol for each category.

A cross-walk shall be measured per each pavement marking and shall be calculated based upon one (1) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A standard parking stall shall be measured, calculated and payment shall be in accordance with and as a single line.

An ADA compliant parking stall shall be measured per item per category and shall be calculated based upon the total number of items measured for each category. ADA compliant parking stalls shall be divided into three categories

1. Standard: A standard accessible handicap parking stall and access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for both a standard width access aisle (5ft), and the associated single parking stall (including, but not limited to: the single line and the symbol) per the City’s standard detail.
2. Van: A van accessible handicap parking stall and access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for both a van width access aisle (8ft), and the associated single parking stall (including, but not limited to: the single line and the symbol) per the City’s standard detail.
3. Stall: Any parking stall not associated with an access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for the associated single parking stall (including, but not limited to: the single line and the symbol) per the City’s standard detail.
Payment shall be based upon the amount calculated for each item for each category.

A speed hump shall be measured, calculated and payment shall be in accordance with and as single line for each pavement marking (typical total of four markings) installed per speed hump.

The requirements for any pavement marking not provided herein will be established by the City prior to beginning of the work to be performed by the Contractor.

Any repair work ordered by the Engineer shall not be measured.

Any work done by a Contractor not under contract by the City, will account for the work done in accordance with the requirement(s) of the entity under which the contract for work to be performed was issued.

**Methods of Construction**

A. Longitudinal lines placed on tangent roadways segments shall be straight and true unless noted otherwise by the City.

B. Longitudinal lines placed on curves shall be continuous smoothly curved lines consistent with roadway alignment unless noted otherwise by the City.

C. Lateral lines shall be straight and true in accordance with City requirements unless noted otherwise by the City

D. Symbol and word pavement markings shall be centered in the lane and without overlap (except for each of the various arrows when used in combination) or conflict with any other or as directed by the City

E. Vehicle tracking as a result of vehicle movement through a non-dried marking shall be repaired (including, but not limited to: the replacement of the damaged pavement marking(s) and the removal of all tracked pavement marking(s)) by the Contractor to the satisfaction of the City and at the Contractors expense.
Pavement Marking(s) Description

The following applies to the City’s M&S series schematics. The numbers provided in the pavement markings description are in direct relation to the number(s) provided on schematics. Any conflicts will be resolved by the City with appropriate verbal direction and/or in writing prior to application.

The M&S series schematics are an attempt to show various types of pavement marking(s)/marker(s) and their relation to and in combination with each other and are not an endorsement of acceptable geometric design(s). In addition, because each location’s circumstance(s) is different, the Engineer of Record shall apply the information provided by the City to any design with proper engineering consideration and understanding of the specific needs necessary for the local.

The identification code for the typical subsets of a particular line pavement marking, where such type of marking(s) has multiple applications (width and/or color) is indicated by:

**TYPE**

I = 4 inches wide,

II = 6 inches wide

III = 8 inches wide,

IV = 12 inches wide

V = 24 inches wide

A = white,

B = yellow

C = blue

A 4, 6, 8, and 12 inch wide line shall be applied as one single width. A 24 inch wide line may be applied with two 12 inch wide lines, provided the final width of the pavement marking is a true 24 inches wide.
THE FOLLOWING NUMBERS/ITEMS, HIGHLIGHTED IN YELLOW, REFERENCE THE CITY OF DENTON’S M&S 005 SERIES DRAWINGS

1. Double
   a. TYPE IA – Two parallel lines with a 4 inch parallel space between; each line is 4 inches in width; each line is solid; each line is white – typical use: separates traffic in the same direction on a multilane roadway where conditions are such that a vehicle in either lane is not allowed to change to the other lane.
   b. TYPE IB – Two parallel lines with a 4 inch parallel space between; each line is 4 inches in width; each line is solid; each line is yellow – typical use: separates opposing direction traffic on a multilane roadway or where there is a horizontal and/or vertical curve that restricts passing sight distance. Note: see Broken line, Type 1B for alternate type.

2. Edgeline
   a. TYPE IA - One line; 4 inches in width; solid; white – typical use on right edge of a roadway without curb/gutter (in direction of travel) or to define an urban shoulder.
   b. TYPE IB - One line; 4 inches in width; solid; yellow – typical use on the left side of a one-way street to transition from an on street no parking area to an on street parking area (or vice versa) or adjacent to a median of a two-way street that is without the curb/gutter.

3. Barrier Line
   a. TYPE IA- One line; 4 inches in width; solid; white – typical use; extension of a broken line immediately upstream of a stop or yield condition or where the changing of a lane is discouraged. Minimum of 120 feet, lengths in excess of 120 feet shall be in 40 foot increments.
   b. TYPE IIA - One line; 6 inches in width; solid; white – typical use; Bike Lane
   c. TYPE IIIA - One line; 8 inches in width; solid; white - typical use; left or right turn pockets or where the changing of a lane is highly discouraged.

4. Reserved for future use.

5. Broken line (can also be called a Skip line)
   a. TYPE IA – One line; 4 inches in width; line segment pavement marking - 10 feet in length with a gap - 30 feet in length; white – typical use; separation of through traffic lanes traveling in the same direction.
   b. TYPE IB – (Alternate type centerline) One line; 4 inches in width; line segment pavement marking - 10 feet in length with a gap - 30 feet in length; yellow – typical use; separation of traffic traveling in the opposite direction on a two-lane roadway where there is no horizontal and/or vertical curve that restricts passing sight distance.
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6. **Dotted Line**
   a. **TYPE IA** - One line, 4 inches in width; line segment pavement marking - 2 feet in length, white - typical use; transition through an intersection for traffic traveling in the same direction (the intersection being defined as being within the tangents of the applicable outer most defined [through the use of an edgeline or curb line] edge of the outer most through lane):
      i. outside the limits of the intersection the gap shall be 6 feet in length,
      ii. within the intersection, the marking shall be placed on the lane line, on the center of the travel lane and on the limit(s) of the intersection with the gap being variable.

   b. **TYPE IB** - One line, 4 inches in width; line segment pavement marking - 2 feet in length, yellow - typical use; transition through an intersection for traffic traveling in the opposite direction (the intersection being defined as being within the tangents of the applicable outer most defined [through the use of an edgeline or curb line] edge of the outer most through lane):
      i. outside the limits of the intersection the gap shall be 6 feet in length,
      ii. within the intersection, the marking shall be placed on the lane line, on the center of the travel lane and on the limit(s) of the intersection with the gap being variable.

   c. **TYPE IIA** - One line, 6 inches in width; line segment pavement marking - 2 feet in length and a gap - 6 feet in length, white – typical use; for a bike lane, defines the vehicle/bike conflict/transitional area just upstream of an intersection, minimum of 24ft.

   d. **TYPE IIIA** – One line, 8 inches in width; line segment pavement marking - 2 feet in length and a gap - 6 feet in length, white – typical use; prior to the beginning of a left or right turn pocket, typically within the limits of the transition.

7. **Diagonal Marking**
   a. **TYPE VA** - one line, 24 inches in width, solid; white, if more than one is used, then 20 foot spacing, on center between each, minimum length is 5 feet, generally 45degrees to direction of travel - typical use;
      i. to better define the edge of the roadway or a location along the edge of the roadway where vehicle travel is restricted from using and therefore, the line is linear/straight or
      ii. better define a painted median that separates vehicles traveling in the same direction and therefore is “V” shaped

   b. **TYPE VB** - one line, 24 inches in width, solid; yellow, if more than one is used, then 20 foot spacing, on center, between each, minimum length is 5 feet , generally 45degrees to direction of travel - typical use; to better define the edge of the roadway or a location along the edge of the roadway where vehicle travel is restricted from using and therefore, the line is linear/straight or in a painted median that separation of opposing traffic separation of traffic traveling in the opposite direction
THE FOLLOWING NUMBERS/ITEMS, HIGHLIGHTED IN YELLOW, REFERENCE THE
CITY OF DENTON’S M&S 005 SERIES DRAWINGS

8. Two-Way Left Turn Pocket, TYPE IB
   2 sets of 4 inch yellow lines with a 4inch parallel space between; one set shall consist of
two lines: the first being a single continuous solid line on the outside and the second being
a broken line (see item #5) on the inside. Each set shall be separated (defining the lane’s
width) as determined by the City Engineer.

9. Lane Drop, TYPE IIIA
   One line, 8 inches in width; 3 foot line segment pavement marking and a 9 foot gap, white
   – typical use; prior to a barrier line for a through lane that turns into a mandatory left or
   right turn lane/pocket. Minimum of 120 feet, lengths in excess of 120 feet shall be in 40
   foot increments

10. Stop Bar, TYPE VA
    One line; 24 inches in width, solid, white; length to be from the curb-line/edge of pavement
to the marked centerline/nearest edge of the median of a roadway. Typically 18 feet from
tangent of cross-street unless otherwise directed by the City.

11. Yield Line
    Solid, white, alternating marking with 12 inch spacing, as measured along the top of the
   marking; the marking is in the shape of a triangle with it being 12inches wide, as measured
   along the top edge of the marking and 18inches deep, as measured at a 90 degree angle and
   away from the top edge. See Pedestrian crosswalk for further information.

12. Word
    White, a letter or any combination thereof used to convey a message and typically is used
to supplement a sign, per TxDOT standards and as directed and approved by the City.

13. Symbol
    Typically white, a diagrammatic representation of a word, typically designates a desired
direction of travel, per TxDOT standards and as directed and approved by the City.
THE FOLLOWING NUMBERS/ITEMS, HIGHLIGHTED IN YELLOW, REFERENCE THE CITY OF DENTON’S M&S 005 SERIES DRAWINGS

14. **Pedestrian Crosswalk, TYPE VA**
   Multiple line segments and gaps; each line segment pavement marking is 24 inches in width, minimum 6 feet in length; solid; white.
   
   a. One line segment on the lane line (for an outside lane greater than 12 feet in width, place marking 12 feet from the adjacent vehicle’s lane marking, install any additional line segment(s) beyond the 12 feet as directed by engineering design plans or the City),
   b. one line segment on the centerline of a vehicle travel lane
   c. one line segment at:
      i. the gutter-line/edge of pavement if on a tangent or
      ii. the projection of the gutter line/edge of pavement’s tangent if within the curve of an intersection of two streets.
   
   The gap’s width is variable, but at no time shall it be less than 2 feet.

   At a median, patterns of line segments and gaps will be installed so as to meet the line segment and gap requirements so noted.

   Crosswalk shall be installed so as to fully include projection of applicable ADA ramps/pedestrian way.

   The pedestrian crosswalk marking shall be aligned and parallel with the direction of travel of the vehicle.

   Where not controlled by a stop bar at an intersection, a yield line will be installed upstream of the pedestrian crosswalk, unless otherwise directed by the City.

15. **Standard Parking Stall, TYPE IA**
   One line; 4 inches in width; solid; white

16. **ADA parking stall**
   Shall meet the Americans with Disabilities requirements in accordance with City schematic M&S 100 or current replacement

17. **Speed Hump, TYPE IIIA**
   Shall meet the requirements of the 2003 revised MUTCD Section 3B-26 and Figure 3B29, Option C or its current replacement.

18. **Misc.**
   Other pavement markings than those noted above may be required to be installed by the City. Specific criteria will be verbally provided by the City at the time of installation or design plans indicating the criteria will be provided prior to installation.
RFP # 6358
Scope of Work/Technical Specifications
EXHIBIT 3

II PAVEMENT MARKER(S)

Pavement markers shall be of the following classes and types as specified in the most current TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Item 672.2 or its most current replacement:

Classes


Types

Reflectorized:

Type I-A. Shall contain one (1) face that reflects amber light. The body, other than the reflective face, shall be yellow.

Type I-C. Shall contain one (1) face that reflects white light. The body, other than the reflective face, shall be white.

Type I-R. Shall contain one (1) face that reflects red light. The body, other than the reflective face, shall be white.

Type II-A/A. Shall contain two (2) reflective faces oriented 180 degrees to each other, each of which shall reflect amber light. The body, other than the reflective faces, shall be yellow.

Type II-C/R. Shall contain two (2) reflective faces oriented 180 degrees to each other, one (1) of which shall reflect white light and one (1) of which shall reflect red light. The body, other than the reflective faces, shall be white.

Type II-B/B. Shall contain two (2) reflective faces oriented 180 degrees to each other, each of which shall reflect blue light. The body, other than the reflective faces, shall be blue. This item shall be placed in the center of the adjacent through lane closest to the fire hydrant and in the direction the fire hydrant is facing, with one reflective face of the RPM facing in the direction of travel.
None Reflectorized traffic buttons shall be of the following types:

Type W. Type W shall have a white body and no reflective faces.

Type Y. Type Y shall have a yellow body and no reflective faces.

Unless specified in the construction plans or the special contract definitions of these specifications, use with same-directional lines shall be Type II-C-R, use with opposing-directional lines shall be Type II A-A.

If non reflectorized traffic buttons are specified (as approved in writing by the City), lane lines shall be type W and centerlines shall be Type Y.

**Appearance Requirements**

The outer surface of the pavement marker shall be smooth except for the molding or stamping of the manufacture’s unique model imprint. All corners and edges exposed to traffic shall be rounded. The interface between the reflective face(s) and the body of the marker shall be solid.

The bottom surface of the pavement marker shall have a minimum roughness comparable to that of fine sandpaper, but shall not be of such roughness or grooved such that air will be entrapped when pressed into the adhesive.

**Epoxy Adhesive**

Shall meet the minimum requirements of TxDOT Standard Specifications for Construction and maintenance of Highways, Streets and Bridges Item 575 and TxDOT Departmental Material Specification D-9-6100 or the current replacement. Epoxy shall be machine mixed.

Those that are acceptable are as follows:

Types I and I-M: Rapid setting for use when a very fast set is required or if markers must be placed when pavement temperature is below 50F/10C.

Types II, II-M and II-MA: Medium setting.

Types III and III-M: Standard setting

Types IV and IV-M: Slow setting for use when setting time is not a consideration.

Those designated as Types I and IV are intended for hot mixing and application.
On projects where the adhesive is to be handled by automatic metering, mixing and application equipment, Types I-M through IV-M which are designated specifically for machine application, shall be used. Type II-MA adhesive is designated for placement of all-weather markers. For all types, the resin component shall be pigmented white and the hardener component black.

The type of adhesive to be used for placing ceramic or plastic markers on a specific project shall be based upon the setting time required under the prevailing weather and traffic conditions and approved by the Engineer.

Prior to use, each component shall be stirred to re-disperse any settling or separation of the fillers and liquid portions until a uniform color and appearance obtained. No addition of solvents shall be allowed unless indicated by the manufacturer or approved by the Engineer.

**Bituminous Adhesive**

Shall meet the minimum requirements of TxDOT Departmental Material Specification D-9-6130 or its current replacement.

The adhesive shall be suitable for bonding ceramic and plastic markers to and applicable when road surface and pavement marker temperatures are in the approximate range of 4 to 71 C (40 to 160 F). The composition of the adhesive must be such that its properties will not deteriorate when heated to and applied at temperatures up to 218 C(425 F) using either air or oil-jacketed melters.

**Construction**

Pavement surface preparation shall be done in accordance with Item 678 of the TxDOT Standard Specifications for Construction and Maintenance of highways, Streets, and Bridges or its current replacement.

Each class shall come from the same manufacturer.

The Contractor shall use bituminous adhesive for Class A, B, C, and D on a bituminous type surface.

The Contractor shall use epoxy adhesive for Class A, B, C, and D on a Portland concrete cement surface.

The Contractor shall only use epoxy adhesive for Class E, for both bituminous or Portland concrete cement surfaces.
The epoxy shall be applied in sufficient quantity such that 100% of the bonding area of the raised pavement marker shall be in contact with the adhesive and such that the pavement marker is seated on a continuous layer of adhesive and not in contact with the pavement surface, except for Class E.

Adhesive shall be applied in accordance with manufacturer’s specifications except where different in these specifications.

Where bituminous adhesive is required, the pavement and pavement marker shall be at least 40 F/5 C. The bituminous adhesive shall not be heated above 400 F/ 205 C. The bituminous adhesive shall be agitated intermittently to ensure even heat distribution.

Shall be placed immediately after adhesive is applied and shall be firmly bonded to the pavement. The surfaces, especially the reflective surfaces, shall be free of adhesive.

**Methods of Measurement and for Payment**

For City Contracts:

Measurement and payment shall be per unit class/type, as may apply, installed.

The requirements for any pavement marker not provided herein will be established by the City prior to finalization of the work to be performed by the Contractor.

Any repair work ordered by the Engineer shall not be measured.

Any work done by a Contractor not under contract by the City, will account for the work done in accordance with the requirement(s) of the entity under which the contract for work to be performed was issued.

**Raised Pavement Marker(s) (RPMs) Description**

Unless approved otherwise by the City in writing, only Type II shall be used.

The following applies to the City’s M&S 004 series schematics. The numbers provided herein are in direct relation to the number(s) provided in the Pavement Markings Description section of this document. Any conflicts will be resolved by the City with appropriate verbal direction and/or written notes prior to application.
The following RPMs shall be installed in association with the associated pavement marking:

**THE FOLLOWING NUMBERS/ITEMS, HIGHLIGHTED IN YELLOW, REFERENCE THE CITY OF DENTON’S M&S 005 SERIES DRAWINGS**

1. **Double**
   a. **TYPE IA** – C/R RPM shall be installed in a repeating set of 3, set of 2 and set of 2 RPMs pattern with 40 foot spacing between each set for the entire length of pavement marking. The 3-RPM set shall be located such that all said 3 RPMs are located laterally on center and across from each other and such that that one RPM is on the outside edge of each of the 2 pavement markings (total: 2 of the 3) and the third shall be centered between said 2 pavement markings. The 2-RPM set shall be located such that all said 2 RPMs are located laterally on center and across from each other and such that one RPM is on the outside edge of each of the 2 pavement markings. The clear portion shall face oncoming traffic.

   b. **TYPE IB** - A/A RPM shall be installed in the same repeating set of 3, set of 2 and set of 2 RPMs pattern as for the Double Type IA noted immediately above.

2. **Edgeline**
   a. **TYPE IA** – Unless directed by the City, no RPM installed with the associated pavement marking.

   b. **TYPE IB** - Unless directed by the City, no RPM installed with the associated pavement marking.

3. **Barrier Line**
   a. **TYPE IA** – C/R RPM, 10 feet on center for the entire length of the pavement marking. Starting with the most inside through lane (#1 lane, through lane closest to the centerline of the roadway). Located on the outside edge of said through lanes pavement marking

   b. **TYPE IIA** - Unless directed by the City, no RPM installed with the associated pavement marking.

   c. **TYPE IIIA** – C/R, 10 feet on center for the entire length of the pavement marking. Located on the inside edge of said lane’s pavement marking.

4. **Reserved for future use.**

5. **Broken line (may also be called a Skip line)**
   a. **TYPE IA** – C/R RPM shall be installed such that it is centered on the gap between each line for the entire length of the pavement marking.

   b. **TYPE IB** – A/A RPM shall be installed such that it is centered on the gap between each line for the entire length of the pavement marking.
6. **Dotted Line**
   a. **TYPE IA** - Unless directed by the City, no RPM installed with the associated pavement marking.
   b. **TYPE IIA** - Unless directed by the City, no RPM installed with the associated pavement marking.
   c. **TYPE IIIA** - Unless directed by the City, no RPM installed with the associated pavement marking.

7. **Diagonal Markings**
   a. **TYPE IIIA** – one C/R RPM shall be installed immediately upstream of the intersection of the Edgeline Type 1A and the diagonal Type 3A pavement markings.
   b. **TYPE IIIB** - one A/A RPM shall be installed immediately upstream of the intersection of the Edgeline Type 1B and the diagonal Type 3B pavement markings.

8. **Two-Way Left Turn Pocket, TYPE IB**
   a. For the broken line: A/A RPM shall be installed such that it is centered on the gap between each line.
   b. For the solid line: Unless directed by the City, no RPM(s) installed with the associated pavement marking.

9. **Lane Drop, TYPE IIIA**
   Unless directed by the City, no RPM installed with the associated pavement marking.

10. **Stop Bar, TYPE VA**
    Unless directed by the City, no RPM installed with the associated pavement marking.

11. **Yield Line**
    Unless directed by the City, no RPM installed with the associated pavement marking.

12. **Word**
    Unless directed by the City, no RPM installed with the associated pavement marking.

13. **Symbol**
    Unless directed by the City, no RPM installed with the associated pavement marking.

14. **Pedestrian Crosswalk, TYPE VA**
    Unless directed by the City, no RPM installed with the associated pavement marking.
THE FOLLOWING NUMBERS/ITEMS, HIGHLIGHTED IN YELLOW, REFERENCE THE CITY OF DENTON’S M&S 005 SERIES DRAWINGS

15. **ADA parking stall, TYPE IA**
   Unless directed by the City, no RPM installed with the associated pavement marking.

16. **Speed Hump**
   Unless directed by the City, no RPM installed with the associated pavement marking.

17. **Misc.**
   Other pavement markers than those noted above may be required to be installed by the City. Specific criteria will be verbally provided by the City at the time of installation or de
Drawings referenced in the
Scope of Work
Located on (pages 28-55)
SIGN POSTS, PAVEMENT MARKINGS, THEIR APPURTENANCES AND ANCILLARY ARTICLES

GENERAL NOTES:

1. Agency – as used herein and for the purposes of these notes shall be: that entity that has maintenance control of said item(s). It should be noted that in some instances, City maintained item(s) can be within TxDOT ROW (such as, but not limited to: stop signs and/or street name blades installed for a City street that intersects a TxDOT highway) or vice-versa.

2. City – as used herein and for the purposes of these notes shall be: the City of Denton, Texas.

3. Comply/compliant/compliance – as used herein and for the purposes of these notes shall be an item(s) which:
   3.1. meets (or can exceed upon approval) the principles of the agency and
   3.2. is new. For the “REMOVAL AND REINSTALLATION OF ITEM(S)” note herein, the existing item(s) can be other than new, but the intent of the criteria for an item(s) that is not acceptable should be used by the agency as a basis for a reasonable determination of compliance and
   3.3. is correctly utilized by the contractor and
   3.4. is properly located at the assigned place by the contractor and
   3.5. is completed in the required time by the contractor,
   as provided for in a set of sealed project design plan(s) that is agreed upon by the agency and/or as directed by the agency. The priority of compliance of an item(s) in which there may be a conflict shall be the following and in order of:
   3.6. the agency, but if none, then
   3.7. as provided by another authoritative entity, as agreed upon by the agency, but if none, then
   3.8. as provided by the manufacturer, as agreed upon by the agency, but if none, then
   3.9. as provided by a set of sealed project design plan(s) that is agreed upon by the agency and/or the engineer of record.

4. Contractor – as used herein and for the purposes of these notes shall include the: primary contractor and/or subcontractor(s) and/or representative(s) and/or agent(s) thereof and/or person(s) acting on the behalf thereof.

5. Inspect/inspected/inspection – as used herein and for the purposes of these notes shall be: a review and determination as to whether an item(s) is compliant or not acceptable as the result of an action by the contractor, in part or in whole. An inspection may be done for an item(s) during the time from the start date of construction until the expiration of the warranty period of bond coverage for workmanship and materials and that is:
   5.0. not provided for in a set of sealed project design plan(s) that is agreed upon by the agency
   5.0.1. but is within the limits of construction and/or is within 600 feet of any point thereof.
   5.1. utilized by the contractor as provided for in a set of sealed project design plan(s) that is agreed upon by the agency and/or as directed by the agency.

6. Item(s) – as used herein and for the purposes of these notes shall apply to: any sign and/or sign-post and/or pavement marking and/or associated appurtenance(s) and/or ancillary item(s), in part or in whole, as it relates to the context used and as is necessary for the compliant acceptance thereof.

7. May – as used herein and for the purposes of these notes shall be: a decision by the agency to act or not to act at any time. Said decision can change at any time, for any cause, and at the agency’s discretion.

8. New – as used herein and for the purposes of these notes shall be: an item(s) without prior usage and/or has not been rejected, for any cause, by any entity.

9. Not acceptable – as used herein and for the purposes of these notes shall be an item(s) that: does not comply/is not compliant/is not in compliance with, in part or in whole. A determination of an item(s) being not acceptable can include, but is not limited to the result of:
   9.0. any vandalism (including, but not limited to any: marring, defacement, disfigurement and the like);
   9.1. natural wear;
   9.2. any damage;
   9.3. a blemish;
   9.4. a defect;
   9.5. a different type of: shape and/or size than the principles;
   9.6. a different type of: wording and/or font size and/or font type than the principles;
   9.7. improper manufacturing;
   9.8. inadequate reflectivity;
   9.9. a different type of reflective sheeting than the principles; and/or
   9.10. any other, as may be applied by the agency.

An item(s) rejected by any entity for any cause is deemed not acceptable to the agency.
An item(s) that is not acceptable shall not be utilized by the contractor at any location within the agency’s jurisdiction unless the cause of said item(s) being not acceptable is fully disclosed and provided in writing (by the contractor) and deemed compliant, in writing, for utilization under specific circumstances.

If an item(s) is not approved for utilization, the contractor shall take possession of said item(s) and said item(s) shall be rendered unusable for the intended purpose by the contractor, under the supervision of the agency and properly disposed of by the contractor in such a manner as to be acceptable to all Federal, State and City principles as may pertain to the disposal of such item(s).

If an item(s) is deemed not acceptable, the contractor shall replace it with a compliant item(s). The inspection of any such item(s) may continue as many times as necessary until at such time as the contractor causes said item(s) to be compliant.

10. Principles— as used herein and for the purposes of these notes shall include, but not be limited to current practices; policies; procedures; specifications; and/or standards of the agency and/or as directed by the agency.

11. Utilize/utilize/utilization— as used herein and for the purposes of these notes shall be: the installation, reinstallation, replacement, modification and/or removal, in part or in whole, as it relates to the described context of the required action and as is necessary for the proper utilization and compliant acceptance thereof. Unless specifically noted otherwise, any reference to any utilization of an item(s) by the contractor shall be at the contractor’s expense. Any item(s) utilized by the contractor shall be compliant.

12. As used herein and for the purposes of these notes and unless specifically noted herein, any reference to inspection and/or approval and/or noticing and/or a time requirement and/or quality assurance and/or a determination (including, but not limited to the terms: deem/deemed) and/or acceptance is implicit to be the result and/or cause and/or requirement of the agency or an agent thereof and at the agency’s or said agent’s discretion.

13. The contractor shall contact 1-800 DIGTESS prior to any sign-pole utilization, as directed by the agency.

14. Item(s) utilized by the contractor and maintained by the City shall comply with the City’s principles and may be inspected.

As provided for in a set of sealed project design plan(s) that is agreed upon by the agency and/or as directed by the agency, the contractor may enter into an agreement with the City, for the City to:

a. manufacture or have manufactured, in part or in whole, and utilize sign(s) and applicable appurtenance(s), for a fee and/or

b. manufacture or have manufactured, in part or in whole, for a fee, and provide sign(s) and applicable appurtenance(s) to the contractor for utilization and/or

c. utilize, in part or in whole, for a fee, after receiving and inspecting, compliant only contractor supplied sign(s) and applicable appurtenances and/or

d. receive, in part or in whole, and inspect contractor supplied sign(s) and applicable appurtenances and return said item(s) to the contractor to utilize compliant only item(s) and/or

e. provide, in part or in whole, and utilize accordingly sign-post(s) and applicable appurtenance(s), for a fee and/or

f. provide, in part or in whole, sign-post(s) and applicable appurtenance(s), for a fee to the contractor for utilization and/or

g. utilize, in part or in whole, for a fee, after receiving and inspection, compliant only contractor supplied sign-post(s) and applicable appurtenances and/or

h. receive, in part or in whole, and inspect contractor supplied sign-post(s) and applicable appurtenances and return said item(s) to the contractor to utilize compliant only item(s) and/or

i. provide, in part or in whole, and utilize accordingly pavement marking(s) and applicable appurtenance(s), for a fee and/or

j. provide, in part or in whole, pavement marking(s) and applicable appurtenance(s), for a fee to the contractor for utilization and/or

k. utilize, in part or in whole, for a fee, after receiving and inspection, compliant only contractor supplied pavement marking(s) and applicable appurtenances and/or

l. receive, in part or in whole, and inspect contractor supplied pavement marking(s) and applicable appurtenances and return said item(s) to the contractor to utilize compliant only item(s).

Said agreement(s) shall be negotiated with the City and confirmed in writing prior to the applicable preconstruction meeting. Time deadlines will be established in the agreement for any fee(s) and/or item(s) to be provided to the City by the contractor such that the completion of any task required of the City can be finished in advance of and be a part of any field inspection’s “punch list” and/or acceptance associated with the completion of the project’s construction. The City is not responsible for any delays as a result of any time deadlines not achieved by the contractor per the agreement and/or the result of an item(s) being deemed not acceptable.
15. Item(s) utilized by the contractor and maintained by TxDOT shall comply with TxDOT's principles and may be inspected accordingly. Said item(s) will be obtained from a source other than the City and utilized by the contractor accordingly.

16. Item(s) utilized by the contractor and not maintained by the City or TxDOT (typically for private property) shall comply with existing principles of and in the following priority:

16.0. the City;
16.1. as provided by another authoritative entity, as agreed upon by the City;
16.2. as provided by the manufacturer, as agreed upon by the City and/or;
16.3. as provided for in a set of sealed project design plan(s) that is agreed upon by the agency and/or as directed by the agency.

Said item(s) will be obtained from a source other than the City, utilized by the contractor and may be inspected by the City.

17. The location of each item(s) to be utilized by the contractor shall be temporarily marked by the contractor and may be inspected prior to the contractor's utilization.

18. Pavement markings utilized by the contractor for a City street shall be as provided for in Section 3B-15 of the Texas Manual on Uniform Traffic Control Devices for Streets and Highways (or the most current replacement or its intent) and applicable TxDOT standard details (or the most current replacement or its intent), except for part #2, where spacing shall be "N".

18.0. RPMs utilized by the contractor for a City street shall be of the two way type (yellow/yellow or clear/red, as may apply) unless specifically directed otherwise.

18.1. Non-raised pavement markings utilized by the contractor for a City street shall be thermoplastic, a minimum of 90 mils (0.090 inches) unless specifically directed otherwise.

19. Street sign(s) (other than street name blades) utilized by the contractor shall comply with the principles.

Signs will be mounted such that the bottom edge of the lowest sign on a sign-post is at least 7 feet but not greater than 7.5 feet above the immediate average surrounding ground, unless specifically directed by the City.

For the City, sign sheeting shall be:

19.0. Type III (high intensity or applicable approved equivalent) with graffiti overlay for any mounted sign for which the bottom edge of said sign is less than 10 feet above the immediate average surrounding ground and

19.1. Type IV (prismatic or applicable approved equivalent) with graffiti overlay for a sign in which the bottom edge of said sign is 10 feet or greater above the immediate average surrounding ground.

20. Street name blade(s) utilized by the contractor shall comply with the principles.

Street name blades shall contain both the applicable street name and block number on both sides.

Mounting shall be such that the bottom of the lowest street name blade, on the sign-post, is at least 10 feet but not greater than 12 feet above the immediate average surrounding ground, unless specifically directed by the City.

Sign sheeting shall be Type II (engineering grade or applicable approved equivalent).

When a street is a single access point:

20.0. with an ending (either permanently or temporarily, as a result of a cul-de-sac, hammer head, a future extension with barricade, a looped single named street or the like) such that no other differently named street(s) intersects said street between the access point and the termination of said street, the developer shall provide a City modified street name blade with a black on yellow portion with the words "DEAD END" at the nearest applicable intersection,

20.1. that provides a way to differently named street(s), the developer shall provide a City modified street name blade with a black on yellow portion with the words "NO OUTLET" at the nearest applicable intersection, or as directed by the agency.

21. Sign-post(s), see appropriate City standard detail(s).

22. REMOVAL AND REINSTALLATION OF ITEM(S): for any item(s) to be removed and then reinstalled by the contractor,

22.0. the contractor shall:

22.0.0. remove said item(s) from its location, when appropriate,

22.0.1. transport and store said item(s) at a protected location,

22.0.2. clean said item(s) in a reasonable manner, satisfactory to the agency, just prior to reinstallation and
22.0.3. transport and reinstall said item(s) at the proper location, when appropriate such that each noted action required of the contractor shall be done in a manner so as to cause the least damage to the item(s) as is reasonably possible. Once reinstalled, said item(s) may be inspected or

22.1. the contractor, at his/her discretion and in lieu of reinstalling said item(s), can properly dispose of said removed item(s) and replace said item(s) with a compliant item(s). When installed, said item(s) may be inspected.

23. REMOVAL AND NONREINSTALLATION OF ITEM(S): for any item(s) to be removed by the contractor and not reinstalled, said item(s) shall be deemed not acceptable at the time of removal by the contractor.

24. TEMPORARY ITEM(S) REQUIRED AS A RESULT OF REMOVAL: For any item(s) that is removed by the contractor and it is deemed necessary for the safety and well being of the public during construction, the contractor shall provide a temporary, compliant item(s) of the same type (or alternate acceptable to the agency), in a manner, time and location acceptable to the agency, until at such time as the agency determines said item(s) is no longer necessary, whereupon the contractor shall remove said item(s).
NOTE:
1. DOTTED GORE WHITE 8 INCH WIDE, PAVEMENT MARKING 2 FT DASH, 6 FT GAP
2. THE ENGINEER OF RECORD MAY BE REQUIRED TO CALCULATE THE MINIMUM BARRIER STRIPE LENGTH. CALCULATIONS SHALL INCLUDE VOLUMES AND RANDOM ARRIVAL RATES WHICH MAY REQUIRE GREATER LENGTHS.
3. WHEN LOCAL CONDITIONS CAUSE MINIMUM AND/OR TYPICAL BARRIER STRIPE AND/OR OPENING LENGTHS TO NOT BE MET, WITH THE APPROVAL OF THE CITY TRAFFIC ENGINEER, THE FOLLOWING MAY BE USED:
   A. TWO WAY LEFT TURN LANES
   B. PREFERRED MINIMUM LENGTHS MAY BE REDUCED
   C. A COMBINATION OF "A" AND "B"
4. FOR LEFT TURN POCKETS INSTALL R3-7L SIGN/POST AS CLOSE TO THE BEGINNING OF THE TRANSITION AS POSSIBLE AND FOR A RIGHT TURN DECELERATION LANE INSTALL R3-7R SIGN/POST AS CLOSE TO THE MIDDLE OF THE TRANSITION AS POSSIBLE. R3-7R TO BE INSTALLED UNLESS DETERMINED OTHERWISE BY THE ENGINEER OF RECORD AND BASED UPON A LOCAL CONDITIONS STUDY. IN RESIDENTIAL AREAS PREFERENCE IS TO INSTALL SIGN/POST ON A PROPERTY LINE-DESIGN POCKET ACCORDINGLY.
R3-7L OPTIONS:
a. \( 0 < y < \frac{2}{3} \times x \)
   INSTALL R3-7L SIGN AND POST
b. \( \frac{2}{3} \times x < y < \frac{1}{3} \times x \)
   R3-7L SIGN/POST IS OPTIONAL AND BASED UPON A LOCAL CONDITIONS STUDY AS DETERMINED BY ENGINEER OF RECORD
c. \( \frac{1}{3} \times x < y \leq \frac{2}{3} \times x \)
   R3-7L SIGN/POST TYPICALLY NOT REQUIRED UNLESS DETERMINED AS NEEDED BY ENGINEER OF RECORD AND BASED UPON LOCAL CONDITIONS STUDY

5. IF \( y > 8.5 \) FT THEN \( a = x \) AND \( b = 6 \) FT
   IF \( y \leq 8.5 \) FT THEN \( a = 8.5 \) FT AND ASSUMING THE DASHED GORE STRIPE AT A 7.5:1 SLOPE THEN TYPICALLY
   IF \( x = 10 \) FT THEN \( b = 12 \) FT
   IF \( x = 11 \) FT THEN \( b = 19 \) FT
   IF \( x = 12 \) FT THEN \( b = 27 \) FT
NOTE: OTHER OPTIONS MAY BE ACCEPTABLE DEPENDING ON DESIGN CONSTRAINTS OF LOCAL CONDITIONS.

THE INFORMATION PROVIDED HEREON IS TYPICAL FOR STANDARD SITUATIONS. FOR NON-STANDARD DESIGN SITUATIONS, THE ENGINEER OF RECORD SHALL DETERMINE AN APPROPRIATE DESIGN BASED UPON THE INTENT AS PROVIDED HEREON AND SUBMIT FOR REVIEW AND APPROVAL BY THE CITY TRAFFIC ENGINEER OR DESIGNATED REPRESENTATIVE. FOR NON-STANDARD FIELD SITUATIONS, THE CONTRACTOR SHALL DETERMINE AN APPROPRIATE APPLICATION BASED UPON THE INTENT, AS PROVIDED HEREON AND CONFIRM SUCH WITH THE CITY TRAFFIC ENGINEER OR DESIGNATED REPRESENTATIVE BEFORE PERMANENT IMPLEMENTATION.
GENERAL

This and all associated documents required of the Contractor to correctly perform the work necessary to properly complete the job shall be within easy access, at all times, of the Contractor’s on-site supervisor of the marking(s) crew. If said document(s) are not within easy access of said on-site supervisor, the City can, at its discretion, halt any and all associated work.

The Contractor’s on-site supervisor of the markings crew(s) performing any work must be able to understand:
1. written English and diagram(s)/schematic(s)/drawing(s) and the like, in part or in whole, sufficient to fully understand any City and/or TxDOT written policies, procedures, specifications, standards and/or the like that are presented to him/her for the correct completion of the work to be performed and
2. conversational and technical (as it relates to pavement markings) English sufficient to take instruction(s) from City staff so as to complete the work to be performed, as directed, and without supervision or additional written or spoken guidance by the City or provide a translator with the above noted capabilities, at no cost to the City. If said supervisor/translator is not provided, no marking work shall be performed until said person is on the job’s site. Any work done while said person is not on the job’s site can be considered being non-compliant and thus, not acceptable to the City. If said work (in part or in whole) is rejected by the City as a result of said non-compliance, in any manner, the required pavement marking(s)/marker(s) will be removed by and at the Contractor’s expense (by a method acceptable to the City), and properly reinstalled by and at the Contractor’s expense, in accordance with the City’s requirement(s).

Guides shall be established to mark the location of the pavement markings in the location as shown on the construction plans or as directed by the City. The location shall be verified before the pavement marking(s)/marker(s) is placed. The guides shall not leave a permanent indication on the road surface.

Pavement marking(s)/marker(s) shall be placed in accordance with the construction plans or as directed by the City. Said pavement marking(s)/marker(s) shall be in alignment when placed and not deviate by more than two (2) inches. Any pavement marking(s)/marker(s) placed and deemed unsatisfactory by the Engineer shall be removed by an acceptable method to the City and properly reinstalled by and at the Contractor’s expense, in accordance with the City’s requirement(s).
For City directed work, application of pavement markings shall be done on an as needed basis per project. The City shall notify the Contractor of each project required to be completed, in any order and at any time throughout the length of the contract. Each said project shall be completed by the Contractor in its entirety within the time limit(s) as noted on the applicable quantity sheet(s) and as contained within the bid document(s) for and accepted by the City as submitted by the Contractor or, if there is no such condition contained within the bid documents, as agreed upon, in writing by the City and the Contractor prior to any installation, with allowance(s) for inclement weather, as noticed by the City in writing to the Contactor. The Contractor shall make arrangements and meet with appropriate City staff prior to beginning each project to determine the scope and quantities required of said project. The Contractor shall come to the meeting, prepared with estimates of all pavement markings required of each project to be discussed. Estimated quantities greater than 10% of the difference between the City and Contractor for each type of pavement marking shall be resolved by a meeting in the field with a representative of the City and the Contractor and field verifying those items for which there are noted differences. The City has the prerogative to change quantities after the meeting and prior to acceptance of the project, as provided in writing by the City. Said quantity changes by the City shall be done by Contractor only upon written authorization from the City. The Contractor shall be required to complete said written changes prior to final written acceptance by the City.

Traffic Control

Traffic control shall be the responsibility of the Contractor. Traffic control shall comply with North Texas Council of Governments “Standard Specifications for Public Work Construction” latest edition Item 8.1 “Barriers and Warnings and/or Detour Signs” inclusive or current replacement.

Elimination of Existing Pavement Marking(s)/Marker(s)

In areas where the pavement marking(s)/marker(s) are to be removed, the Contractor shall use one of the methods as outlined in item 677 of the TxDOT Standard Specifications for the Construction and Maintenance of Highways, Streets and Bridges and approved by the City.

The Contractor will be responsible for proper disposal of all the material as a result of the removal process.
Pavement markings removed by the Contractor shall be replaced by the Contractor with temporary pavement markings and/or traffic control devices, as directed by the City, when the installation of the permanent pavement marking(s) replacement will not be installed within 4 hours of said removal. If the Contractor does not comply within the 4 hour requirement, the City has the prerogative to occupy the site and cause the site to be adequate for use by the public. The Contractor shall be charged by the City for the cost of all staff time, materials, machinery, traffic control devices and incidentals required of the City.

An existing adhesive installed pavement marking shall be removed in its entirety prior to any application of a Type I or Type II pavement marking in its place.

**Protection of Pavement Marking(s)/Marker(s)**

Newly installed shall be protected from traffic until fully cured.

Existing to remain within the project’s limits, plus those within a radius of 300 feet of the project’s limits shall not be damaged as a result of the work performed by the Contractor.

Any existing to remain or newly installed that is damaged because of a lack of protection (as determined by the City at the time of the acceptance inspection of the work performed) shall be properly removed (by a method acceptable to the City) and replaced by the Contractor in accordance with the City’s direction and at no expense to the City and prior to acceptance by the City of the work performed by the Contractor.

The method of protection shall not constitute a hazard to the traveling public.

**Equipment Use**

All equipment used for pavement marking/marker installation and removal shall be specifically designed for that purpose by a company experienced in the design and manufacture of such equipment.

**Coordination with City Engineer**

The City Engineer and/or his appointed representative will identify for the Contractor the roadways upon which the work will be performed and serve as a liaison between the City and the Contractor.

Pavement marking(s)/marker(s) of the type specified shall be applied at the location(s) as determined by the Engineer and/or his appointed representative and shall be in accordance with the current Manual on Uniform Traffic Control Devices.
Surface Preparation

The surface to which the pavement marking/marker material is to be applied shall be completely dry and free of dirt, oil, grease, debris and other foreign objects necessary for the application to and/or adherence of the pavement marking/marker to the pavement’s surface. The Contractor shall be responsible for the proper preparation of the pavement surface accordingly. Any pavement marking/marker failure as a result of improper pavement surface preparation shall be replaced by the Contractor at the Contractor’s expense upon removal of all of the pavement marking(s)/marker(s), by the Contractor and at the Contractor’s expense, associated with the failure and upon the proper preparation of the surface prior to and the reapplication of the pavement marking/marker, for acceptance of the work by the City.

Warranty

All pavement marking(s), glass beads, pavement marker(s), appurtenance(s), ancillary item(s) and/or any material(s) used in conjunction with them for whatever purpose(s), as well as any material(s) used for the application of and/or the attachment of these items to each other and/or the pavement’s surface (including but not limited to: sealer(s) and epoxy adhesive(s)) shall be warranted by the Contractor as noted on the applicable quantity sheet(s) and as contained within the bid document(s) for and accepted by the City as submitted by the Contractor or, if there is no such condition contained within the bid documents, for a total of 30 days after acceptance of the work by the City. The warranty shall apply to those items as a result of improper: pavement surface preparation; method(s) of application; material(s) used; or the like, in which the item has; is; or is beginning to separate from the pavement surface or between two or more components of an item that has; is; or is beginning to separate from each other. The City shall determine the extent of the impropriety of the each said item and the Contractor shall, for said extent remove the existing item (and any component thereof); prepare the surface; and install the item (being new) in the appropriate location and under the condition(s) as set forth in this document. The warranty period for any such item so installed shall begin anew upon acceptance by the City and such requirement(s) shall continue until at such time as the warranty period has been successfully completed. The City reserves the right to withhold up to 50% of the cost(s) of the Contractor’s billings of any item installed until at such time as the warranty period has been successfully completed.
I PAVEMENT MARKING(S)

General: This item shall govern the installation of pavement marking(s) of the types, colors, shapes, sizes, thickness and widths as shown.

Materials

Materials used shall be classified in accordance with TxDOT Standard Specifications for Construction and Maintenance of Highway, Streets and Bridges item 666:

Type I Materials.

Type I are thermoplastic materials that require heating to elevate the temperatures for applications. Type I materials shall conform to TxDOT Departmental Materials Specifications D-9-8220 or its current replacement. Each container of Type I material shall be clearly marked to indicate the color, mass, type of material, manufacturer’s name and the lot/batch number.

Type II Materials.

Type II materials are paint-type that are applied at ambient or slightly elevated temperatures. Type II materials shall conform to TxDOT Departmental Materials Specifications D-9-8200, YPT-10 and/or WPT 10 and D-9-8290 or its current replacement.

General Construction

Pavement surface preparation shall be done in accordance with Item 678 of the TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges or its current replacement.

Shall essentially have a uniform cross-section. The density and quality shall be uniform throughout the thickness. The application shall have no more than five percent, by area, of holes or voids and shall be free of blisters.

Each edge of each pavement marking shall be well defined and without any splatter, spill-over, splash, spray or the like adjacent to the pavement marking’s edge.

In place or on the roadway, shall be reflectorized both internally and externally.

Glass beads shall be applied to the material at a uniform rate sufficient to achieve uniform and distinctive retroreflective characteristics when observed. Glass beads shall be a minimum of Type I gradation, in accordance with TxDOT specification DMS 8290
Application of Type I

Application of a pavement sealer shall be required for a location that does not have existing marking(s) on all Portland cement concrete surfaces and any asphalt surface that is 3 years or older. The pavement sealer may be a Type II pavement marking, an acrylic sealer or an epoxy sealer. The manufacturer's directions for application of acrylic or an epoxy sealer shall be followed. If the thermoplastic manufacturer does not recommend that a sealer be used, then the Contractor will not be required to furnish one.

Shall be applied within temperature limits of the product as well as ambient air and roadway's surface as recommended by the material's manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway. If the product's manufacturer does not provide such information, then the pavement's surface temperature shall be above 50 F/ 10 C. Pavement temperature shall be measured in accordance with Test Method Tex-829-B or its current replacement.

When applied by spray and operation ceases for five minutes or more, the spray head shall be flushed by spraying the material into a pan or similar container until that which is being sprayed is at the proper temperature for application.

Shall be a minimum thickness of 0.090 inches (2.3 millimeters) when measured in accordance with Test Method Tex-854-B or its current replacement. The maximum thickness shall be 0.180 inches (4.5 millimeters).

Shall be of uniform thickness throughout the length and width.

In excess of 0.090 inches shall be paid as 0.090 inches.

Pre-formed shall be applied in the manner recommended by the manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway.

Shall not be placed in inclement weather.
Application of Type II

Shall be applied within temperature limits of the product, ambient air and roadway’s surface as recommended by the material’s manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway. If the product’s manufacturer does not provide such information, then the pavement’s surface temperature shall be above 50°F/10°C. If applicable, pavement temperature shall be measured in accordance with the current TxDOT requirement.

The application rate shall be: between 15 and 20 gallons per mile of solid four inch wide line or its equivalent ratio for line widths greater and/or not solid except that, for new surface treatment projects the application rate shall be between 25 and 30 gallons per mile of solid four inch line and between 40 and 50 gallons per mile for solid eight inch line or its equivalent ratio for lines other than four and eight inches wide and/or not solid.

For new surface treatment projects, shall be applied in two applications for each approximately one-half the application rate. The first application shall not contain glass beads. The interval between the first and second application shall be a minimum of one hour or until dry, whichever is greater.

Shall not be placed in inclement weather.

Methods of Measurement and for Payment

For City Contracts:

A double solid line shall be measured as one line and shall be calculated based upon two (2) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A single line (including: edgeline, barrier line, bike lane, diagonal marking, stop bar and standard parking stall line) shall be measured as one line and shall be calculated based upon one (1) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.
A broken, dotted or lane drop line shall be measured as one line, including gaps between line segments. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified.

1. A broken line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.
2. Dotted line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.
3. Lane drop line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.

Payment shall be based upon the amount calculated for each.

A two-way left turn pocket shall be measured as one line along one of the solid pavement markings. The total for the entire marking shall be equal to 2.50 times said measurement (of each length as provided herein). Said 2.5 multiplier is determined by the combination of that solid line measurement plus the accompanying broken line's segment to gap ratio of 0.25 times said solid line's measurement, thus equaling 1.25 for each said line combination. Then the 1.25 line combination shall be multiplied by 2 for to obtain the 2.5 multiplier for the two combination lines that equal a two-way left turn pocket. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A yield line shall be measured per triangle type pavement marking and calculated based upon the total number of the measurement. Payment shall be based upon the amount calculated.

A word shall be measured per letter per category and shall be calculated based upon the total number of letters measured for each category. Word pavement markings shall be divided into two categories:

1. Large- those words required of a vehicle lane.
2. Small- those words required of a bicycle lane.

Payment shall be based upon the amount calculated for each letter for each category.

A symbol shall be measured per symbol per category and shall be calculated based upon the total number of symbols measured for each category. Symbols shall be divided into three categories:

1. Large- item(s) shall include: rail-road crossing marking, entire and complete in accordance with MUTCD requirements.
2. Medium- item(s) shall include: right arrow(s), left arrow(s) and through arrow(s) (note: any combination [any two or all three] of right, left and/or through arrows shall be measured as two (2) markings); wrong way arrow(s); and lane transition arrow(s).
3. Small- item(s) shall include: each symbol type as it relates to a bicycle path.

Payment shall be based upon the amount calculated for each symbol for each category.
A cross-walk shall be measured per each pavement marking and shall be calculated based upon one (1) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A standard parking stall shall be measured, calculated and payment shall be in accordance with and as a single line.

An ADA compliant parking stall shall be measured per item per category and shall be calculated based upon the total number of items measured for each category. ADA compliant parking stalls shall be divided into three categories

1. Standard: A standard accessible handicap parking stall and access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for both a standard width access aisle (5ft), and the associated single parking stall (including, but not limited to: the single line and the symbol) per the City’s standard detail.

2. Van: A van accessible handicap parking stall and access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for both a van width access aisle (8ft), and the associated single parking stall (including, but not limited to: the single line and the symbol) per the City’s standard detail.

3. Stall: Any parking stall not associated with an access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for the associated single parking stall (including, but not limited to: the single line and the symbol) per the City’s standard detail.

Payment shall be based upon the amount calculated for each item for each category.

A speed hump shall be measured, calculated and payment shall be in accordance with and as single line for each pavement marking (typical total of four markings) installed per speed hump.

The requirements for any pavement marking not provided herein will be established by the City prior to beginning of the work to be performed by the Contractor.

Any repair work ordered by the Engineer shall not be measured.

Any work done by a Contractor not under contract by the City, will account for the work done in accordance with the requirement(s) of the entity under which the contract for work to be performed was issued.
Methods of Construction

A. Longitudinal lines placed on tangent roadways segments shall be straight and true unless noted otherwise by the City.

B. Longitudinal lines placed on curves shall be continuous smoothly curved lines consistent with roadway alignment unless noted otherwise by the City.

C. Lateral lines shall be straight and true in accordance with City requirements unless noted otherwise by the City.

D. Symbol and word pavement markings shall be centered in the lane and without overlap (except for each of the various arrows when used in combination) or conflict with any other or as directed by the City.

E. Vehicle tracking as a result of vehicle movement through a non dried marking shall be repaired (including, but not limited to: the replacement of the damaged pavement marking(s) and the removal of all tracked pavement marking(s)) by the Contractor to the satisfaction of the City and at the Contractor's expense.

Pavement Marking(s) Description

The following applies to the City's M&S series schematics. The numbers provided in the pavement markings description are in direct relation to the number(s) provided on schematics. Any conflicts will be resolved by the City with appropriate verbal direction and/or in writing prior to application.

The M&S series schematics are an attempt to show various types of pavement marking(s)/marker(s) and their relation to and in combination with each other and are not an endorsement of acceptable geometric design(s). In addition, because each location’s circumstance(s) is different, the Engineer of Record shall apply the information provided by the City to any design with proper engineering consideration and understanding of the specific needs necessary for the local.

The identification code for the typical subsets of a particular line pavement marking, where such type of marking(s) has multiple applications (width and/or color) is indicated by:

TYPE
  I = 4 inches wide,
  II = 6 inches wide
  III = 8 inches wide,
  IV = 12 inches wide
  V = 24 inches wide,
  A = white,
  B = yellow
  C = blue

A 4, 6, 8, and 12 inch wide line shall be applied as one single width. A 24 inch wide line may be applied with two 12 inch wide lines, provided the final width of the pavement marking is a true 24 inches wide.
1. Double
   a. TYPE IA – Two parallel lines with a 4 inch parallel space between; each line is 4 inches in width; each line is solid; each line is white – typical use: separates traffic in the same direction on a multilane roadway where conditions are such that a vehicle in either lane is not allowed to change to the other lane.
   b. TYPE IB – Two parallel lines with a 4 inch parallel space between; each line is 4 inches in width; each line is solid; each line is yellow – typical use: separates opposing direction traffic on a multilane roadway or where there is a horizontal and/or vertical curve that restricts passing sight distance. Note: see Broken line, Type 1B for alternate type.

2. Edgeline
   a. TYPE IA - One line; 4 inches in width; solid; white – typical use on right edge of a roadway without curb/gutter (in direction of travel).
   b. TYPE IB - One line; 4 inches in width; solid; yellow – typical use on the left side of a one-way street to transition from an on street no parking area to an on street parking area (or visa versa) or adjacent to a median of a two-way street that is without the curb/gutter.

3. Barrier Line
   a. TYPE IA - One line; 4 inches in width; solid; white – typical use; extension of a broken line immediately upstream of a stop or yield condition or where the changing of a lane is discouraged. Minimum of 120 feet, lengths in excess of 120 feet shall be in 40 foot increments.
   b. TYPE IIIA - One line; 8 inches in width; solid; white - typical use; left or right turn pockets or where the changing of a lane is highly discouraged.

4. Bike Lane TYPE IIA - One line; 6 inches in width; solid; white.

5. Broken line (can also be called a Skip line)
   a. TYPE IA – One line; 4 inches in width; line segment pavement marking - 10 feet in length with a gap - 30 feet in length; white – typical use; separation of through traffic lanes traveling in the same direction.
   b. TYPE IB – (Alternate type centerline) One line; 4 inches in width; line segment pavement marking - 10 feet in length with a gap - 30 feet in length; yellow – typical use; separation of traffic traveling in the opposite direction on a two-lane roadway where there is no horizontal and/or vertical curve that restricts passing sight distance.

6. Dotted Line
   a. TYPE IA - One line, 4 inches in width; line segment pavement marking - 2 feet in length, white - typical use; transition through an intersection for traffic traveling in the same direction (the intersection being defined as being within the tangents of the applicable outer most defined [through the use of an edgeline or curb line] edge of the outer most through lane):
      i. outside the limits of the intersection the gap shall be 6 feet in length,
      ii. within the intersection, the marking shall be placed on the lane line, on the center of the travel lane and on the limit(s) of the intersection with the gap being variable.
b. **TYPE IB** - One line, 4 inches in width; line segment pavement marking - 2 feet in length, yellow - typical use; transition through an intersection for traffic traveling in the opposite direction (the intersection being defined as being within the tangents of the applicable outer most defined [through the use of an edgeline or curb line] edge of the outer most through lane):
   i. outside the limits of the intersection the gap shall be 6 feet in length,
   ii. within the intersection, the marking shall be placed on the lane line, on the center of the travel lane and on the limit(s) of the intersection with the gap being variable.

c. **TYPE IIIA** – One line, 8 inches in width; line segment pavement marking - 2 feet in length and a gap - 6 feet in length, white – typical use; prior to the beginning of a left or right turn pocket, typically within the limits of the transition.

7. **Diagonal Marking**
   a. **TYPE VA** - one line, 24 inches in width, solid; white, if more than one is used, then 20 foot spacing, on center between each, minimum length is 5 feet, generally 45 degrees to direction of travel - typical use;
      i. to better define the edge of the roadway or a location along the edge of the roadway where vehicle travel is restricted from using and therefore, the line is linear/straight or
      ii. better define a painted median that separates vehicles traveling in the same direction and therefore is “V” shaped
   b. **TYPE VB** - one line, 24 inches in width, solid; yellow, if more than one is used, then 20 foot spacing, on center, between each, minimum length is 5 feet, generally 45 degrees to direction of travel - typical use; to better define the edge of the roadway or a location along the edge of the roadway where vehicle travel is restricted from using and therefore, the line is linear/straight or in a painted median that separation of opposing traffic separation of traffic traveling in the opposite direction

8. **Two-Way Left Turn Pocket, TYPE IB** - 2 sets of 4 inch yellow lines with a 4 inch parallel space between; one set shall consist of two lines: the first being a single continuous solid line on the outside and the second being a broken line (see item #5) on the inside. Each set shall be separated (defining the lane’s width) as determined by the City Engineer.

9. **Lane Drop, TYPE IIIA** – One line, 8 inches in width; 3 foot line segment pavement marking and a 9 foot gap, white – typical use; prior to a barrier line for a through lane that turns into a mandatory left or right turn lane/pocket. Minimum of 120 feet, lengths in excess of 120 feet shall be in 40 foot increments.

10. **Stop Bar, TYPE VA** – One line; 24 inches in width, solid, white; length to be from the curb-line/edge of pavement to the marked centerline/nearest edge of the median of a roadway. Typically 18 feet from tangent of cross-street unless otherwise directed by the City.

11. **Yield Line** – Solid, white, alternating marking with 12 inch spacing, as measured along the top of the marking; the marking is in the shape of a triangle with it being 12 inches wide, as measured along the top edge of the marking and 18 inches deep, as measured at a 90 degree angle and away from the top edge. See Pedestrian crosswalk for further information.
12. **Word** – White, a letter or any combination thereof used to convey a message and typically is used to supplement a sign, per TxDOT standards and as directed and approved by the City.

13. **Symbol** – Typically white, a diagrammatic representation of a word, typically designates a desired direction of travel, per TxDOT standards and as directed and approved by the City.

14. **Pedestrian Crosswalk, TYPE VA** – Multiple line segments and gaps; each line segment pavement marking is 24 inches in width, minimum 6 feet in length; solid; white
   a. One line segment on the lane line (for an outside lane greater than 12 feet in width, place marking 12 feet from the adjacent vehicle’s lane marking, install any additional line segment(s) beyond the 12 feet as directed by engineering design plans or the City),
   b. one line segment on the centerline of a vehicle travel lane
   c. one line segment at:
      i. the gutter-line/edge of pavement if on a tangent or
      ii. the projection of the gutter line/edge of pavement’s tangent if within the curve of an intersection of two streets.

The gap’s width is variable, but at no time shall it be less than 2 feet.

At a median, patterns of line segments and gaps will be installed so as to meet the line segment and gap requirements so noted.

Crosswalk shall be installed so as to fully include projection of applicable ADA ramps/pedestrian way.

The pedestrian crosswalk marking shall be aligned and parallel with the direction of travel of the vehicle.

Where not controlled by a stop bar at an intersection, a yield line will be installed upstream of the pedestrian crosswalk, unless otherwise directed by the City.

15. **Standard Parking Stall, TYPE IA** – One line; 4 inches in width; solid; white

16. **ADA parking stall** – Shall meet the Americans with Disabilities requirements in accordance with City schematic M&S 100 or current replacement

17. **Speed Hump, TYPE IIIA** – Shall meet the requirements of the 2003 revised MUTCD Section 3B-26 and Figure 3B29, Option C or its current replacement.

18. **Misc.** – Other pavement markings than those noted above may be required to be installed by the City. Specific criteria will be verbally provided by the City at the time of installation or design plans indicating the criteria will be provided prior to installation.
II PAVEMENT MARKER(S)

Pavement markers shall be of the following classes and types as specified in TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Item 672.2:

Classes


Types

Reflectorized:

Type I-A. Shall contain one (1) face that reflects amber light. The body, other than the reflective face, shall be yellow.

Type I-C. Shall contain one (1) face that reflects white light. The body, other than the reflective face, shall be white.

Type I-R. Shall contain one (1) face that reflects red light. The body, other than the reflective face, shall be white.

Type II-A/A. Shall contain two (2) reflective faces oriented 180 degrees to each other, each of which shall reflect amber light. The body, other than the reflective faces, shall be yellow.

Type II-C/R. Shall contain two (2) reflective faces oriented 180 degrees to each other, one (1) of which shall reflect white light and one (1) of which shall reflect red light. The body, other than the reflective faces, shall be white.

Type II-B/B. Shall contain two (2) reflective faces oriented 180 degrees to each other, each of which shall reflect blue light. The body, other than the reflective faces, shall be blue. This item shall be placed in the center of the adjacent through lane closest to the fire hydrant and in the direction the fire hydrant is facing, with one reflective face of the RPM facing in the direction of travel.
None Reflectorized traffic buttons shall be of the following types:

Type W. Type W shall have a white body and no reflective faces.

Type Y. Type Y shall have a yellow body and no reflective faces.

Unless specified in the construction plans or the special contract definitions of these specifications, use with same-directional lines shall be Type II-C-R, use with opposing-directional lines shall be Type II A-A.

If non reflectorized traffic buttons are specified (as approved in writing by the City), lane lines shall be type W and centerlines shall be Type Y.

**Appearance Requirements**

The outer surface of the pavement marker shall be smooth except for the molding or stamping of the manufacture's unique model imprint. All corners and edges exposed to traffic shall be rounded. The interface between the reflective face(s) and the body of the marker shall be solid.

The bottom surface of the pavement marker shall have a minimum roughness comparable to that of fine sandpaper, but shall not be of such roughness or grooved such that air will be entrapped when pressed into the adhesive.

**Epoxy Adhesive**

 Shall meet the minimum requirements of TxDOT Standard Specifications for Construction and maintenance of Highways, Streets and Bridges Item 575 and TxDOT Departmental Material Specification D-9-6100 or the current replacement. Epoxy shall be machine mixed.

Those that are acceptable are as follows:

Types I and I-M: Rapid setting for use when a very fast set is required or if markers must be placed when pavement temperature is below 50F/10C.

Types II, II-M and II-MA: Medium setting.

Types III and III-M: Standard setting

Types IV and IV-M: Slow setting for use when setting time is not a consideration.

Those designated as Types I and IV are intended for hot mixing and application.
On projects where the adhesive is to be handled by automatic metering, mixing and application equipment, Types I-M through IV-M which are designated specifically for machine application, shall be used. Type II-MA adhesive is designated for placement of all-weather markers. For all types, the resin component shall be pigmented white and the hardener component black.

The type of adhesive to be used for placing ceramic or plastic markers on a specific project shall be based upon the setting time required under the prevailing weather and traffic conditions and approved by the Engineer.

Prior to use, each component shall be stirred to re-disperse any settling or separation of the fillers and liquid portions until a uniform color and appearance obtained. No addition of solvents shall be allowed unless indicated by the manufacturer or approved by the Engineer.

**Bituminous Adhesive**

Shall meet the minimum requirements of TxDOT Departmental Material Specification D-9-6130 or its current replacement.

The adhesive shall be suitable for bonding ceramic and plastic markers to and applicable when road surface and pavement marker temperatures are in the approximate range of 4 to 71 C (40 to 160 F). The composition of the adhesive must be such that its properties will not deteriorate when heated to and applied at temperatures up to 218 C(425 F) using either air or oil-jacketed melters.

**Construction**

Pavement surface preparation shall be done in accordance with Item 678 of the TxDOT Standard Specifications for Construction and Maintenance of highways, Streets, and Bridges or its current replacement.

Each class shall come from the same manufacturer.

The Contractor shall use bituminous adhesive for Class A, B, C, and D on a bituminous type surface.

The Contractor shall use epoxy adhesive for Class A, B, C, and D on a Portland concrete cement surface.

The Contractor shall only use epoxy adhesive for Class E, for both bituminous or Portland concrete cement surfaces.
The epoxy shall be applied in sufficient quantity such that 100% of the bonding area of the raised pavement marker shall be in contact with the adhesive and such that the pavement marker is seated on a continuous layer of adhesive and not in contact with the pavement surface, except for Class E.

Adhesive shall be applied in accordance with manufacturer’s specifications except where different in these specifications.

Where bituminous adhesive is required, the pavement and pavement marker shall be at least 40°F/5°C. The bituminous adhesive shall not be heated above 400°F/205°C. The bituminous adhesive shall be agitated intermittently to ensure even heat distribution.

Shall be placed immediately after adhesive is applied and shall be firmly bonded to the pavement. The surfaces, especially the reflective surfaces, shall be free of adhesive.

**Methods of Measurement and for Payment**

For City Contracts:

Measurement and payment shall be per unit class/type, as may apply, installed.

The requirements for any pavement marker not provided herein will be established by the City prior to finalization of the work to be performed by the Contractor.

Any repair work ordered by the Engineer shall not be measured.

Any work done by a Contractor not under contract by the City, will account for the work done in accordance with the requirement(s) of the entity under which the contract for work to be performed was issued.

**Raised Pavement Marker(s) (RPMs) Description**

Unless approved otherwise by the City in writing, only Type II shall be used.

The following applies to the City’s M&S 004 series schematics. The numbers provided herein are in direct relation to the number(s) provided in the Pavement Markings Description section of this document. Any conflicts will be resolved by the City with appropriate verbal direction and/or written notes prior to application.
The following RPMs shall be installed in association with the associated pavement marking:

1. **Double**
   a. **TYPE IA** - C/R RPM shall be installed in a repeating set of 3, set of 2 and set of 2 RPMs pattern with 40 foot spacing between each set for the entire length of pavement marking. The 3-RPM set shall be located such that all said 3 RPMs are located laterally on center and across from each other and such that one RPM is on the outside edge of each of the 2 pavement markings (total: 2 of the 3) and the third shall be centered between said 2 pavement markings. The 2-RPM set shall be located such that all said 2 RPMs are located laterally on center and cross from each other and such that one RPM is on the outside edge of each of the 2 pavement markings. The clear portion shall face oncoming traffic.
   
b. **TYPE IB** - A/A RPM shall be installed in the same repeating set of 3, set of 2 and set of 2 RPMs pattern as for the Double Type IA noted immediately above.

2. **Edgeline**
   a. **TYPE IA** - Unless directed by the City, no RPM installed with the associated pavement marking.
   
b. **TYPE IB** - Unless directed by the City, no RPM installed with the associated pavement marking.

3. **Barrier Line**
   a. **TYPE IA** - C/R RPM, 10 feet on center for the entire length of the pavement marking. Starting with the most inside through lane (#1 lane, through lane closest to the centerline of the roadway). Located on the outside edge of said through lanes pavement marking.
   
b. **TYPE IIA** - C/R, 10 feet on center for the entire length of the pavement marking. Located on the inside edge of said lane's pavement marking.

4. **Bike Lane** - Unless directed by the City, no RPM installed with the associated pavement marking.

5. **Broken line (may also be called a Skip line)**
   a. **TYPE IA** - C/R RPM shall be installed such that it is centered on the gap between each line for the entire length of the pavement marking.
   
b. **TYPE IB** - A/A RPM shall be installed such that it is centered on the gap between each line for the entire length of the pavement marking.

6. **Dotted Line**
   a. **TYPE IA** - Unless directed by the City, no RPM installed with the associated pavement marking.
   
b. **TYPE IIA** - Unless directed by the City, no RPM installed with the associated pavement marking.

7. **Diagonal Markings**
   a. **TYPE IIIA** - one C/R RPM shall be installed immediately upstream of the intersection of the Edgeline Type 1A and the diagonal Type 3A pavement markings.
b. **TYPE IIIB** - one A/A RPM shall be installed immediately upstream of the intersection of the Edgeline Type IB and the diagonal Type 3B pavement markings.

8. **Two-Way Left Turn Pocket**
   a. for the broken line: A/A RPM shall be installed such that it is centered on the gap between each line.
   b. For the solid line: Unless directed by the City, no RPM(s) installed with the associated pavement marking.

9. **Lane Drop, TYPE IIIA** – Unless directed by the City, no RPM installed with the associated pavement marking.

10. **Stop Bar, TYPE VA** – Unless directed by the City, no RPM installed with the associated pavement marking.

11. **Yield Line** – Unless directed by the City, no RPM installed with the associated pavement marking.

12. **Word** – Unless directed by the City, no RPM installed with the associated pavement marking.

13. **Symbol** – Unless directed by the City, no RPM installed with the associated pavement marking.

14. **Pedestrian Crosswalk, TYPE VA** – Unless directed by the City, no RPM installed with the associated pavement marking.

15. **ADA parking stall, TYPE IA** – Unless directed by the City, no RPM installed with the associated pavement marking.

16. **Speed Hump** – Unless directed by the City, no RPM installed with the associated pavement marking.

17. **Misc.** – Other pavement markers than those noted above may be required to be installed by the City. Specific criteria will be verbally provided by the City at the time of installation or design plans indicating the criteria will be provided prior to installation.
General Comments:

1) The following M&S 005 series schematics apply to the City's M&S 004 series schematic. The numbers provided in the pavement markings description of the M&S 004 series schematics are in direct relation to the number(s) provided on these schematics. Any conflict will be resolved by the City with appropriate verbal direction and/or written notes prior to application.

2) The M&S 005 series schematics are an attempt to show various types of pavement markings/markers and their relation to and in combination with each other and not an endorsement of acceptable geometric design(s). In addition, because each location's circumstances(s) is different, the Engineer of Record shall apply the information provided herein to any design with proper engineering consideration and understanding of specific needs necessary for the local situation.