

**Item No. 866S
Jiggle Bar Tile**

866S.1 Description

This item shall govern the materials, composition, quality, sampling and testing of jiggle bar tile of either ceramic or plastic resin body construction, reflectorized or nonreflectorized types as described herein.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, the inch-pound units are given preference followed by SI units shown within parentheses.

866S.2 Submittals

The submittal requirements of this specification item include:

- A. List of specific application(s) [i.e. designation and type: (reflectorized Type I-A, I-C or II-A-A; nonreflectorized-Type W or Y)] and applicable epoxy system and adhesive types [Standard Specification Item Section 867S.5].
- B. Specific manufacturer with test results and technical specifications for proposed jiggle bar tile
- C. Manufacturer's recommendations for surface preparation, cleaning, placement temperatures and installation instructions.
- D. Adhesive components and mixing recommendations.

866S.3 Materials

Jiggle bar tiles shall be either ceramic body or plastic resin body construction and shall be either reflectorized or nonreflectorized as indicated on the Drawings. Jiggle bar tiles furnished for any one project shall be of the same material and manufacturer. The Jiggle Bar Tile shall comply with TxDoT Departmental Materials Specifications DMS-4100.

A. Types of Jiggle Bar Tile

1. Reflectorized jiggle bar tiles shall be of the following types:
 - (a) Type I-A shall contain an approach face that reflects amber light and the body other than the reflective face shall be yellow.
 - (b) Type I-C shall contain an approach face that reflects white light. The body, other than the reflective face, shall be white.
 - (c) Type II-A-A shall contain 2 reflective faces (approach and trailing) each of which shall reflect amber light. The body, other than the reflective faces, shall be yellow. The direction of the reflection of the trailing face shall be directly opposite to the direction of reflection of the approach face.
2. Nonreflectorized jiggle bar tiles shall be of the following types:
 - (a) Type W shall have a white body.
 - (b) Type Y shall have a yellow body.

B. Appearance Requirement

The top and sides of the jiggle bar tile shall be smooth and free from surface irregularities, pits, cracks, checks, chipping, discoloration and any other defects which adversely affect appearance and application.

The bottom of the jiggle bar tile may be of a rough texture, free from gloss, glaze or any other substance that may reduce its bond to the adhesive. It shall be shaped such that any air, which may be entrapped during installation, will not impair adhesion. Exclusive of any irregularities that are intentionally manufactured as functional characteristics of the tile, the bottom shall not deviate from a true plane by more than 1/16 inch (1.5 mm).

C. Color Requirements

The diffuse day color shall comply with the specified color requirements. Color requirements are defined by an enclosed area formed by using the following CIE Chromaticity Coordinates as corner points and the listed Y reflectance limits.

CHROMATICITY COORDINATES AND REFLECTANCE LIMITS			
Color	Chromaticity Points		Reflectance Limits
	x	y	y
White	0.290	0.316	70 minimum
	0.310	0.296	
	0.330	0.321	
	0.310	0.342	
Yellow	0.448	0.455	38.0 - 60.0
	0.468	0.420	
	0.544	0.456	
	0.516	0.484	

Individual yellow jiggle bar tiles in any shipment or lot shall not have a variance in chromaticity coordinates x and y greater than 0.025 units nor shall the variance in reflectance exceed 6.0 units. Color shall be determined in accordance with TxDOT Test Method Tex-839-B.

D. Optical Requirements for Reflectorized Jiggle Bar Tiles

1. Reflective Device(s)

Reflective jiggle bar tiles shall have an approved reflective device(s) inserted in a protective ramp and adhered to a recess in the ramp base. The reflective device(s) shall be as indicated on the Drawings.

2. Optical Performance

The reflective device(s) shall be capable of providing reflection of amber, red or white light as indicated. The reflective light of each reflective face shall conform to the minimum reflective intensity requirements as follows:

Specific Intensity per Reflective Face At 0.2 Degrees Observation Angle		
Horizontal Entrance Angle	Crystal	Amber
4 Degrees	3.00	2.00
20 Degrees	1.50	1.00

Horizontal entrance angle shall mean the angle, in a plane parallel to the base of the marker, between a line in the direction of the incident light and a line perpendicular to the leading edge of the reflective surface.

Observation angle shall mean the angle at the reflector between observer's line of sight and the direction of the light incident on the jiggle bar tile.

Specific intensity shall mean candlepower of the returned light at the chosen observation and entrance angles for each foot-candle of incident light per reflective face. TxDoT Test Method Tex-842-B will be used to determine specific intensity.

E. Physical Requirements for Ceramic Jiggle Bar Tiles

1. Appearance

The top and sides of the ceramic jiggle bar tile shall be smooth and free from surface irregularities, pits, cracks, checks, chipping, discoloration and any other defects which adversely affect appearance and application.

The bottom of the ceramic jiggle bar tile may be of a rough free from gloss, glaze or any other substance that may reduce its bond to the adhesive. Excluding any protrusions, which are intentionally manufactured as functional characteristics of the jiggle bar tile, the base shall not deviate from a true plane by more than 1/16 inch (1.6 mm).

2. Glaze Thickness

The glazed surface shall have a mean thickness not less than 0.005-inch (125- μ m) when measured not closer than 1/4-inch (6.5-mm) from the edge of the jiggle bar tile. The thickness shall be measured on a fractured edge with a calibrated scale microscope.

3. Autoclave

The ceramic glaze shall not discolor, craze, spall or peel when subjected to 1 cycle of the autoclave test ASTM Designation: C-424 at 250 psi (1.725 mPa).

4. Water Absorption

The water absorption of the jiggle bar tile shall not exceed 1.0 percent of the original dry weight when tested in accordance with ASTM Designation: C-373. Specimens may be broken pieces taken from the strength test.

5. The compressive strength of ceramic tiles shall be as follows:

(a) 6000 psi (41.4 mPa), minimum average of 5 units.

(b) 5000 psi (34.5 mPa), minimum for any individual unit.

Compressive strength shall be determined on a 1 inch (25 mm) diameter right cylinder test specimen cut through the center portion of the tile by core drilling. Specimen ends shall be ground or lapped to form plane and parallel faces. The faces shall be capped with high strength capping compound to make them perpendicular to the axis of the specimen. The specimen shall be loaded in accordance with TxDoT Test Method Tex-418 A.

6. Adhesion

The ceramic jiggle bar tile shall be tested in accordance with TxDoT Test Method Tex-611-J. Unless otherwise specified, the following shall be the criteria for acceptance:

The 5 specimens tested must evidence a minimum average bond strength of 500 psi (3.45 mPa). In addition, no more than 1 individual specimen may evidence a bond strength less than 500 psi (3.45 mPa). If the average bond strength is less than 500 psi (3.45 mPa) or 2 or more individual specimens evidence a bond strength less than 500 psi (3.45 mPa), the lot represented by the samples shall be rejected.

F. Physical Requirements of Plastic Resin Jiggle Bar Tiles

1. Appearance

Plastic jiggle bar tiles may contain inert fillers and coloring pigments. Except for the base filler, the plastic jiggle bar tile shall be of the same material throughout.

2. Hardness

Plastic jiggle bar tiles shall have a Shore Durometer Hardness (Type D) of 70 minimum conforming to ASTM Designation: D-2240.

3. X-Ray Analysis

Plastic jiggle bar tiles shall match the X-ray analysis of previously approved jiggle bar tiles.

4. Infrared Analysis

Plastic jiggle bar tiles shall match the infrared analysis of previously approved jiggle bar tiles.

5. Adhesion

Plastic jiggle bar tiles shall meet the same requirements as ceramic jiggle bar tile unless otherwise specified or indicated on the Drawings.

866S.4 Construction Methods

The Contractor shall use a crew experienced in the work of installing jiggle bar tile and in the necessary traffic control for such operations on the roadway surface and shall supply all the equipment, personnel, traffic control and materials necessary for the placement of the pavement markings as indicated or as directed by the Engineer or designated representative. All work shall conform to the current edition of the Texas Manual of Uniform Traffic Control Devices (TMUTCD), The City of Austin Transportation Criteria Manual and Standard Detail Series 804S-3.

The jiggle bar tile shall be installed to the lines and spacings where indicated on the Drawings or as directed by the Engineer or designated representative. Guides to mark the lateral location of jiggle bar tile shall be established as indicated on the Drawings or as directed by the Engineer or designated representative. The Contractor will establish the pavement marking guides and the Engineer or designated representative will verify the location of the guides prior to final installation.

The pavement markers shall be placed in proper alignment with the Guides. The deviation rate in alignment shall not exceed 1 inch per 200 feet (25 millimeters per 60 meters) of roadway. The maximum deviation shall not exceed 2 inches (50 millimeters) nor shall any deviation be abrupt.

Markers placed which are not in alignment indicated on the Drawings shall be removed by the Contractor at the Contractor's expense. Removal shall be in accordance with Specification Item 874S except for measurement and payment. Guides placed on the roadway for alignment purposes shall not establish a permanent marking on the roadway.

When deemed necessary by the Engineer or designated representative, the Contractor, at the Contractor's expense, shall place any additional pilot markings required to facilitate the placement of the permanent markings in the alignment specified. Any and all additional markings placed on the roadway for alignment purposes shall be temporary in nature and shall not establish a permanent marking on the roadway. Materials used for pilot markings and equipment used to place such markings shall be approved by the Engineer or designated representative.

The surface on which tiles are to be placed shall be dry and shall be prepared by any method approved by the Engineer or designated representative to remove all forms of grease, oil, dirt and other materials deleterious to proper adhesion. Unless indicated otherwise on the Drawings, surface preparation for installation of jiggle bar tile will not be paid for directly but shall be included in the unit price bid for this specification item.

Epoxy adhesive shall conform to the requirements of City of Austin Specification Item 8676S. The wet epoxy shall be machine mixed and applied in sufficient quantity so as to insure the following:

- 100 percent of the bonding area of the tile shall be in contact with the epoxy.
- The tile itself shall not contact the pavement surface but shall sit on an epoxy "cushion".
- When the tile is pressed onto the pavement, adhesive shall be forced out around its entire perimeter.

Any excess adhesive or other foreign material on or in front of the reflective face(s) of the tile shall be removed so that reflectivity will not be impaired. Any individual jiggle bar tile placed that does not conform to the requirements of this specification and/or as indicated on the Drawings shall be removed and replaced with tile conforming to these requirements at the Contractor's expense.

866S.5 Measurement

Jiggle Bar Tile will be measured as each jiggle bar tile complete in place.

866S.6 Payment

The work performed under this item and measured as provided under "Measurement" shall be paid for at the unit bid price for "Jiggle Bar Tile", of the type, color and material specified on the Drawings. The unit bid price shall include full compensation for all labor, materials, incidentals and services necessary to complete the work.

Payment will be made under one of the following:

Pay Item No. 866S-1:	Jiggle Bar Tile (Type I-A) -	Per Each.
Pay Item No. 866S-2:	Jiggle Bar Tile (Type I-C) -	Per Each.
Pay Item No. 866S-3:	Jiggle Bar Tile (Type II-A-A) -	Per Each.
Pay Item No. 866S-4:	Jiggle Bar Tile (Type W) -	Per Each.
Pay Item No. 866S-5:	Jiggle Bar Tile (Type Y) -	Per Each.

End

SPECIFIC CROSS REFERENCE MATERIALS

Texas Department of Transportation: Manual of Testing Procedures

<u>Designation</u>	<u>Description</u>
--------------------	--------------------

Tex-418-A	Compressive Strength of Cylindrical Concrete Specimens
Tex-611-J	Adhesion Test For Traffic Buttons, Markers, And Jiggle Bars
Tex-839-B	Method for Determining Color In Reflective Materials
Tex-842-B	Method For Measuring Retroreflectivity

American Society for Testing and Materials (ASTM)

<u>Designation</u>	<u>Description</u>
C-373	Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
C-424	Test Method for Craze Resistance of Fired Glazed Whitewares by Autoclave Treatment
D-2240	Test Method for Rubber Property-Durometer Hardness

Texas Department of Transportation: Departmental Materials Specifications

<u>Designation</u>	<u>Description</u>
DMS-4100	Jiggle Bar Tile

RELATED CROSS REFERENCE MATERIALS

City of Austin Standard Specifications

<u>Designation</u>	<u>Description</u>
Item No. 867S	Epoxy Adhesive
Item No. 874S	Eliminating Existing Pavement Markings and Markers
Item No. 875S	Pavement Surface Preparation For Markings

City of Austin Transportation Criteria Manual

<u>Designation</u>	<u>Description</u>
Section 8	Traffic Control

State of Texas Manual on Uniform Traffic Control Devices for Streets and Highways

<u>Designation</u>	<u>Description</u>
Part III	Markings
Part VI	Traffic Controls for Street and Highway Construction, Maintenance, Utility and Incident Management Operations
Part VI, Article D	Markings
Part VI, Article F	Control of Traffic Through Work Areas

City of Austin Standard Specifications

<u>Designation</u>	<u>Description</u>
Item No. 865S	Non-Reflectorized Traffic Buttons
Item No. 873S	Raised Pavement Markers

City of Austin Standard Details

<u>Designation</u>	<u>Description</u>
863S-1	Pavement Buttons (Reflectorized-Type I & Type II)
865S-1	Traffic Buttons (Non-Reflectorized)

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

<u>Designation</u>	<u>Description</u>
Item No. 575	Epoxy
Item No. 672	Raised Pavement Markers
Item No. 677	Eliminating Existing Pavement Markings and Markers
Item No. 678	Pavement Surface Preparation For Markings

Texas Department of Transportation: Manual of Testing Procedures

<u>Designation</u>	<u>Description</u>
Tex-828-B	Determining Functional Characteristics of Pavement Markings
Tex-829-B	Method For Measuring Pavement Temperature