SABARMATI RIVER FRONT DEVELOPMENT

Sabarmati River Front Development Corporation Limited

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BEHIND H.K. ARTS COLLEGE, BETWEEN GANDHI & NEHRU BRIDGE, PUJYA PRAMUKH SWAMI MAHARAJ MARG, RIVERFRONT WEST, AHMEDABAD.380009

BID DOCUMENT FOR

RATE CONTRACT FOR OIL BASED PAINTING ON KERBS, THERMOPLASTIC ROAD MARKINGS AND OTHER TRAFFIC REGULATION MAINTENANCE WORKS ON BOTH BANKS OF THE SABARMATI RIVER FOR THE SABARMATI RIVERFRONT PROJECT.

VOLUME- 02

Technical specifications

TECHNICAL SPECIFICATIONS

Item: 1 Providing and laying **hot applied thermoplastic road marking compound** of approved paints strictly of **(Automark - "Specsmark", Asian Paints - "Apcomark", Katalline-"Traffix O" or Berger Paints -"Sigmark" make)** on bitumen/concrete road surface in **one coat** including cleaning the surface of all dirt, dust seals, oil, grease and foreign material, markings of 100 mm width and 2.5 mm thick road marking strips with retro-reflective finish, incorporating reflect rising glass beads @ 250 gms per sq.m. of marked area. The thermoplastic material shall be heated using a pre-melter, and the work shall include site demarcation, pre-marking, finishing, and traffic control/management during execution, complete as directed by the Engineer-in-Charge and in accordance with applicable specifications.

The finished surface to be level, uniform and free from streaks and holes.

The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of **IRC 35-2015**.

a. **White colour / Yellow Colour :** Pavement Markings - Zebra patta / Bump patta / Lane line / Centre line / Edge line / cut patta

b. **Letters / Arrows** : Directional Arrows / Word messages / Lettering

General

The colour, width and layout of road markings shall be in accordance with the Code of Practice for Road Markings with paints, IRC : 35-2015, and as specified or as directed by the Engineer.

Materials

Road markings shall be of ordinary road marking paint, hot applied thermoplastic compound, or reflectorized paint as specified in the item and the material shall meet the requirements as specified below.

Hot Applied Thermoplastic Road Marking

General:

The thermoplastic material shall be homogeneously composed of aggregate, pigment, resins and glass reflectorizing beads. The colour of the compound shall be white or yellow (IS colour No. 356) as specified in the drawings or as directed by the Engineer.

Requirements

(1) **Composition:** The pigment, beads, and aggregate shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with requirements indicated in Table 800-9.

TABLE 800-9: PROPORTIONS OF CONSTITUENTS OF MARKING MATERIAL (Percentage by weight)

Component	White	Yellow
Binder	18.0 min.	18.0 min.
Glass Beads	30–30	30–30
Titanium Dioxide	10.0 min.	- -
Calcium Carbonate and Inert Fillers	42.0 max.	See Note below
Yellow Pigments	- -	See Note below

Note: Amount of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, provided all other requirements of this Specification are met.

(2) Properties: The properties of thermoplastic material, when tested in accordance with ASTM D36/BS-3262-(Part 1), shall be as below:

a. Luminance :

White: Daylight luminance at 45º - 65 percent min. as per AASHTO M 249

Yellow: Daylight luminance it 45º - 45 percent min. as per AASHTO M 249

b. Drying time: When applied at a temperature specified by the manufacturer and to the required thickness, the material shall set to ben traffic in not more than 15 minutes.

c. Skid resistance: not less than 45 as per BS 6044.

d. Cracking resistance at low temperature: The material shall show no cracks on application to concrete blocks.

e. Softening point 102.5º ± 9.5º C as per ASTM D 36.

f. Yellowness Index (for white thermoplastic paint): not more than 0.12 as per AASHTO M 249

(iii) **Storage Life:** The material shall meet the requirements of these Specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins or unmelted particles for the one year storage period. Any material not meeting the above requirements to be replaced by the manufacturer/ supplier/Contractor.

(iv) **Reflectorisation:** Shall be achieved by incorporation of beads, the grading and other properties of the beads shall be as specified in Clause 803.4.2.

(v) **Marking:** Each container of the thermoplastic material shall be clearly and indelibly marked with the following information:

1. The name, trade mark or other means of identification of manufacturer

2, Batch number

3. Date of manufacture

4. Colour (white or yellow)

5. Maximum application temperature and maximum safe beating temperature.

(vi) **Sampling and testing:** The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM/BS method. The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification.

Reflectorized glass beads

General:

This Specification covers two types of glass beads to be used for the production of reflectorized pavement markings.

Type I beads are those which are a constituent of the basic thermoplastic compound vide Table 800-9 and Type 2 beads are those which are to be sprayed on the surface vide Clause 803.6.4.

The glass beads shall be transparent, colourless and free from milkiness, dark particles and excessive air inclusions.

These shall conform to the requirements spelt out in Clause 803.4.2.3.

Specific requirements

A. **Gradation:** The glass beads shall meet the gradation requirements for the two types as given in Table 800-10.

TABLE 800-10. GRADATION REQUIREMENTS FOR GLASS BEAD

Sieve Size	Percent Retained	
	Type 1	Type 2
1.18 mm	0 to 3	
850 micron	5 to 20	0 to 5
600 micron	- -	5 to 20
425 micron	65 to 95	- -
300 micron	- -	30 to 75
180 micron	0-10	10 to 30
Below 180 micron	- -	0 to 15

B. **Roundness:** The glass beads shall have a minimum of 70 per cent true spheres.

C. **Refractive index:** The glass beads shall have a minimum refractive index of 1.50.

D. **Free flowing properties:** The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow-test.

Test methods:

The specific requirements shall be tested with the following methods:

(i) **Free-flow test:** Spread 100 grams of beads evenly in a 100 mm diameter glass dish. Place the dish in a 250 mm inside diameter dessicator which is filled within 25 mm of the top of a dessicator plate with sulphuric acid water solution (specific gravity 1.10). Cover the dessicator and let it stand for 4 hours at 20ºC to 29ºC. Remove sample from dessicator, transfer beads to a pan and inspect for lumps or clusters. Then pour beads into a clean, dry glass funnel having a 100 mm stem and 6 mm orifice. If necessary, initiate flow by lightly tapping the funnel. The glass spheres shall be free of lumps and clusters and shall flow freely through the funnel.

ii) The requirements of gradation, roundness and refractive index of glass beads and the amount of glass beads in the compound shall be tested as per BS:6088 and BS:3262 (Part I).

(iii) The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturer of glass beads obtained from a reputed laboratory showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification. However, if so required. These tests may be carried out as directed by the Engineer.

Application properties of thermoplastic material

The thermoplastic material shall readily get screeded/extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness which shall be continuous and uniform in shape having clear and sharp edges.

The material upon heating to application temperatures shall not exude fumes, which are toxic, obnoxious or injurious to persons or property.

Preparation:

(i) The material shall be melted in accordance with the manufacturer's instructions in a heater with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating.

The temperature of the mass shall be within the range specified by the manufacturer, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged heating, the material shall not be maintained in a molten condition for more than 4 hours.

(ii) After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying.

Properties of finished road marking

(a) The stripe shall not be slippery when wet.

(b) The marking shall not lift from the pavement in freezing weather.

(c) After application and proper drying, the stripe shall show no appreciable deformation or discoloration under traffic and under road temperatures up to 600C.

(d) The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic.

(e) The stripe or marking shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal. Movement with the road surface without chopping or cracking.

(f) The colour of yellow Marking shall conform to IS Colour No. 356 as given in IS: 164.

Reflectorized Paint

Reflectorized paint, **if used**, shall conform to the Specification by the manufacturers and approved by the Engineer. Reflectorizing glass beads for reflectorizing paints where used shall conform to the requirement of Clause 803.4.2.

Application

Marking shall be done by machine. For locations where painting cannot be done by machine, approved manual methods shall be used with prior approval of the Engineer. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

The thermoplastic material shall be applied hot either by screeding or extrusion process. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer the particular method of lying being used. The paint shall be applied using a screed or extrusion machine.

The pavement temperature shall not be less than 10º C during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt/grease, oil and all other foreign matter before application of the paint.

The material, when formed into traffic stripes, must be readily renewable by placing an overlay of new material directly over an old' line of compatible material. Such new material shall so bond itself to the old line that no splitting or separation takes place.

Thermoplastic paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless specified otherwise. Where arrows or letters are to be provided, thermoplastic compound may be hand- sprayed. In addition to the beads included in the material, a further quantity of glass beads of Type 2, conforming to the above noted Specification shall be sprayed uniformly into a mono-layer on to the hot paint line in quick succession of the paint spraying operation. The glass beads shall be applied at the rate of 250 grams per square meter area.

The minimum thickness specified is exclusive of surface applied glass beads. The method of thickness

measurement shall be in accordance with Appendices B and C of BS - 3262 (Part 3).

The finished lines shall be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform and free from streaks

Measurements for Payment

The painted markings shall be measured in **sq. metre** of actual area marked (excluding the gaps, if any).

In respect of markings like directional arrows and lettering, etc., the measurement shall be by numbers.

Contractor shall have to submit the manufacture test certificate before Starting the work at no Extra cost

Contractor Shall have to Submit the test report of Both thermoplastic paint and glass beads from approved Laboratory for paint & glass beads at no extra cost before producing bill and then after on end when asked by AMC.

Contractor shall have to submit the filled form as mentioned above in Soft (Signed & scanned) and two hard copies.

Rate

The Contract unit rate for road markings shall be payment in full compensation for furnishing all labour, materials, tools, equipment, including all incidental costs necessary for carrying out the work at the site conforming to these Specifications complete as per the approved drawing(s) or as directed by the Engineer and all other incidental costs necessary to complete the work to these Specifications.

ITEM 2: Supplying and fixing **cat eye/Road Stud/RPM** (Stimsonite) made out from Acrilo beautile sterine injuction high compressed molding with reflector made of MMC (prismatic type of size 12cm x 6cm x2.5cm) provided with bituminous adhesive 100g. with each unit for fixing. (High Intensity grade)

1. Material & Workmanship

Relevant specifications given for sign boards as described in MORTH 5th revision Section 804 shall be applicable to this item.

2. Mode of Measurement

The rate shall be for a unit of one No.

The work shall cover the providing and fixing of reflective pavement marker (RPM) or road stud, a device which is bonded to or anchored within the road surface, for lane marking and delineation for night-time visibility, as specified in the Contract.

3. MATERIAL

3.1 Plastic body of RPM/road stud shall be moulded from ASA (Acrylic Styrene Acrylonitrite) or HIPS (Hi-impact Polystyrene) or Acrylonitrile Butadiene Styrene (ABS) or any other suitable material approved by the Engineer. The markers shall support a load of 13,635 kg tested in accordance with ASTM D 4280.

3.2 Reflective panels shall consist of number of lenses containing single or dual prismatic cubes capable of providing total internal reflection of the light entering the lens face. Lenses shall be mould of methyl methecrylate conforming to ASTMD 788 or equivalent.

4. DESIGN

4.1 The slope or retro-reflective surface shall preferably be 35 $\pm 5^{0}$ to base. The area of each retro-reflective surface shall not be less than 13.00 Sq cm.

5.0 Optical Performance

5.1 Unidirectional and bi-directional studs

5.1.1 Each reflector or combination of reflectors on each face of the stud shall have a Coefficient of Luminous Intensity (C.I.L). not less than given in the Table 1.

Table 1- Minimum C.I.L Values for category "A" Studs

Entrance Angle	Observation Angle	C.I.L. in mcd/lx		
		White	Amber	Red
0º U 5º L &R	0.3º	220	110	44
0º U 10º L&R	0.5º	120	60	24

Note: **(1)** The entrance angle of 0º U corresponds to the normal aspect of the reflectors when the reflecting road stud is installed in horizontal road surface.

(2) The stud incorporating one or more corner cube reflectors shall be included in Category 'A'. The stud incorporating one or more bi-convex reflectors shall be included in Category 'B'

5.1.2 **OMNI- DIRECTIONAL STUDS**

Each omni-directional studs shall have minimum C.I.L of not less than 2 mcd/1x

5.2 TESTS

5.2.1 Coefficient of luminance intensity can be measured by procedure described in ASTM E 809 "Practice for Measuring Photometric Characteristics" or as recommended in BS:873-Part 4:1973

5.2.2 Under test conditions, a stud shall not be considered to fail the Photometric requirements if measured C.I.L at any position of measurement is less than the value specified in Table-01 provided that;

(i) The value is not less than 80% of the specified minimum, and

(ii) Average of the left and right measurements for the specification angle is grater then the specification minimum.

6. FIXING OF REFLECTIVE MARKING

6.1 Requirement

The enveloping profile of the head of the stud shall be smooth and the studs shall not present any sharp edges to traffic. The reflecting portions of the studs shall be free from crevices or ledges where dirt might accumulate. Marker height shall not be less than 10 mm and shall not exceed 20 mm. and its width shall not exceed 130 mm. The base of the marker shall be flat within 1.3 mm. If the bottom of the marker is configured, the outermost faces of the configurations shall not deviate more than 1.3 mm from a flat surface. All road studs shall be legibly marked with the name, trade mark or other means of identification of the manufacturer.

6.2 Placement

The reflective marker shall be fixed to the road surface using the adhesives and the procedure recommended by the manufacturer. No nails shall be used to affix the marker so that they do not pose safety hazard on the roads. Regardless of the type of adhesive used, the markers shall not be fixed if the pavement is not surface dry and on new asphalt concrete surfacing until the surfacing has been opened to traffic for a period of not less than 14 hours. The portions of the highway surface, to which the marker is to be bonded by the adhesive, shall be free of dirt, curing compound, grease, oil, moisture, loose or unsound layers, paint and any other material which would adversely affect the bond of the adhesive. The adhesive shall be placed uniformly on the cleaned pavement surface or on the bottom of the of the

marker in a quantity sufficient to result in complete coverage of the area of contract of the marker with no voids present and with a slight excess after the marker has been lightly pressed in place. For epoxy installations, excess adhesive around the edge of the marker, excess adhesive on the pavement and adhesive on the exposed surfaces of the markers shall be immediately removed.

7. Warranty and Durability

The contractor shall obtain from the manufacturer a two-year warranty for satisfactory field performance including stipulated retro-reflective of the reflecting panel and submit the same to the Engineer. In addition, a two-year warranty for satisfactory infield performance of the finished road marker shall also be given by the contractor who carries out the work of fixing of reflective road markers as per the format attached. In case the markers are displaced, damaged, get worn out or lose their reflectivity compared to stipulated standards, the contractor would be required to replace all such markers within 07 days of the intimation from the Engineer at his own cost and with no extra cost to be paid for such works.

8. Rate

The contract unit rate for reflective road marker shall be payment in full compensations for all labor, material, tools, equipment's including incidental costs necessary for carrying out the work at site conforming to the specifications complete as per approved drawing or as directed by the Engineer in Charge.

USAGE CONFORMANCE CERTIFICATE

CLIENT NAME_____

CONVERTER NAME_____

CONTRACTOR NAME_____

WORK ORDER DETAILS_____

Details of the Cat-Eye fixing work is carried out using Name of Manufacturer

Sr no.	Type of work with location	size	Qty	Remarks

Certified that the Cat-Eye fixing work have been manufactured using Brand Name of **Reflective pavement marker (RPM)** (According to ASTM D- 4280) and are covered by

the Warranty No.....Dated.....

which will be expired on dated.....

Name of Cat -Eye Manufacturer

Name of Converter

Authorized Signatory

Authorized Signatory

Special Note: Contractor may submit a certificate of being authorized converter of approved manufacturers

ITEM NO. 3 Providing and fixing **signage film of reflectorized Micro Prismatic Grade Sheet (Type-XI)** of require size suitable for fixing on existing Traffic Bollard.

Type XI Micro Prismatic Grade Retro-Reflective Sheeting are governed by the **Ministry of Road Transport and Highways (MoRTH)** Specifications for Road and Bridge Works (Section 800) and **IRC:67** (latest revision).

Measurement for payment

The measurement shall be in Sq.m. of Actual size used and fixed.

ITEM NO. 4 Providing and applying **One coat of oil paint of approved make** strictly such as **Nerolac, Dulux, Berger Paints, Asian Paints, Nippon** on existing curbs of the central verge and footpath, over previously painted surfaces, including surface cleaning, and as directed by the Engineer-in-Charge.

ITEM NO. 5 Providing and applying **Two coat of oil paint of approved make** strictly such as **Nerolac, Dulux, Berger Paints, Asian Paints, Nippon** on existing curbs of the central verge and footpath, over previously painted surfaces, including surface cleaning and as directed by the Engineer-in-Charge.

ITEM NO. 6 Providing and applying **One coat of primer and Two coat of oil paint** of approved make strictly such as **Nerolac, Dulux, Berger Paints, Asian Paints, Nippon** on new and existing curbs of the central verge and footpath including surface cleaning and preparation as directed by the Engineer-in-Charge.

Painting One/Two coats of Enamel paints over concrete/plastered surface including making smooth surface if any**.**

General

The colour and workmanship shall be in accordance with the Code of Practice for painting, and as specified in the drawings or as directed by the Engineer

1.0 **Materials:** It shall be from **approved makes list**. It shall conform to the relevant IS Codes.

2.0 **Workmanship:**

2.1 **General:**

2.1.1 The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, kegs etc. with seal unbroken.

2.1.2 All materials not in actual use shall be kept properly protected, lids of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of turpentine to prevent formation of skin. The materials which have become stale or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins. When not in use, the containers shall be kept properly closed.

2.1.3 If for any seasons, thinning is necessary, the brand of thinner recommended by the manufacturer shall be used.

2.1.4 The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp of otherwise unfavorable weather and all the surfaces shall be thoroughly dry before painting work is started.

2.2 Application:

2.2.1 Brushing operations are to be adjusted to the spreading capacity advised by the manufacture of particular paint. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same.

In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

2.2.2 Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sand paper and loose particles brushed off before next coat is applied. Each coat shall vary slightly in shade and shall be got approved from Engineer-in-charge before next coat is started.

2.2.3 Each coat except the last cost shall be lightly rubbed down with sand-paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush or clogging of paint puddles in the corners of panels angles of mouldings etc. shall be left on the work.

2.2.4 Approved best quality brushes shall be used.

3.0 Mode of measurements &payment:

3.1 Any type of C.C. Central verges curbs surface shall be measured under this item.

3.2 All the work shall be measured not in the decimal system as executed subject to the following limits unless otherwise stated hereinafter:

(a) Dimensions shall be measured to the nearest 0.01 metre.

(b) Areas shall be worked out to the nearest 0.01 Sq. metre.

3.3 No deductions shall be made for openings not exceeding 0.5 sq. mt. each and no addition shall be made for painting to beadings, moldings, edges, jambs, soffits, etc. of such opening.

3.4 The different surfaces shall be grouped into one general item, areas of uneven surface being converted into equivalent plain areas in accordance with the mode of measurement for payment.

3.6 The rate shall be for a unit of one **sq. metre.**

4.0 Rate

The Contract unit rate for painting shall be payment in full compensation for furnishing a labour, materials, tools, equipment, including all incidental costs necessary for carrying out the work at the site conforming to these Specifications complete as per the approved drawing(s) or as directed by the Engineer and all other incidental costs necessary to complete the work to these Specifications.