

SECTION R16

Road Markings

R16 01 Scope

The work covered by this Section of the Specification consists in the furnishing all plant, labor, equipment and materials and in performing all operations in connection with the construction of Road Markings complete, subject to the terms and conditions of the Contract and in strict accordance with this Section of the Specification, the applicable drawings and the directions of the Engineer's Representative.

R16 02 General

1. Road markings shall comply with Part II Chapter IV of 'European Rules concerning Road Traffic, Signs and Signals' agreed by the European Conference of Ministers of Transport and dated February 1974 and any amendments and extensions thereof or any Regulations and Directions issued by the Government of Iraq.
2. The markings shall be white or yellow continuous or intermittent lines, letters, figures, arrows or symbols of thermoplastic material or paint laid to the required dimensions as shown on the Drawings. The road markings shall be white, except that zigzag lines showing places where parking is prohibited and continuous or broken lines on the curb or on the edge of the carriageway to show that standing or parking is prohibited or restricted shall be yellow.
3. The pavement shall be finished in the following manner to receive road marking materials which shall only be applied to surfaces which are clean and dry. Immediately before the application of the road markings, the surface to receive them shall be brushed, chipped if necessary, and air blasted clean and free from oil, surplus bitumen, mud, dust and other loose or adhered material.
 - (i) On concrete carriageways the transverse texturing shall be carried across the full width of the pavement under the marking which shall be freed by wire brushing or other approved means from all traces of curing compound.
 - (ii) On bituminous carriageways, chippings applied to the surface shall extend over the area to be covered by the marking.
 - (iii) On surface dressing, all loose chippings shall be removed from the surface before applying markings.

Carriageway centre lines, lane lines and edge lines shall be laid by approved mechanical means to a regular alignment. Other markings may be laid by hand, hand propelled machine or by self-propelled machine as approved or directed by the Engineer's Representative.

Markings shall be free from raggedness at their edges and shall be uniform and free from streaks

R16 03 Thermoplastic material

1. Material

- (i) Thermoplastic material shall be made by an approved manufacturer, well visible by

day and night, durable and resistant to skidding. It shall be suitable for the type and location of application. The material shall possess adequate thermoplastic properties over the range of climatic conditions of the location viz: resistance to spreading under traffic at the highest road temperatures and retention of plasticity at the lowest road temperatures. It must also give a marking which is effective for at least 18 months under normal traffic conditions. It shall comply with the requirements of BS3262 (1976) except as follows:

- (a) The softening point measured in accordance with Appendix C shall not be less than 95°C.
- (b) The luminance factor of white material shall be measured in accordance with Appendix D and shall be not less than 75 for material as delivered by the manufacturer and not less than 70 for material obtained from an applicator or melter on site after remelting.
- (c) After the Heat Stability is tested in accordance with Appendix E, the luminance factor shall be measured in accordance with Appendix D and shall not be less than 70.
- (d) In testing the Flow Resistance, a cone made and tested in accordance with Appendix F at a temperature of 40°C \pm 2°C for 48 hours shall not slump by more than 25%.
- (e) When tested in accordance with Appendix G, the skid resistance of newlylaid marking prepared under the stated conditions shall not be less than 55.
- (ii) The open flash point shall be over 230°C and the temperature of mixing and application shall be within the range 200°C to 225°C. At 20°C ambient temperature the material shall set within 2 minutes.
- (iii) Where specified reflectorization shall be by the incorporation of ballotini (small transparent glass spheres having optical properties such that when backed by a suitable medium, incident light is reflected back in the general direction of the source.) The grading and proportions of the ballotini shall be as specified in BS3262 (1976).
- (iv) The material shall be supplied in sealed metal containers which do not contaminate the contents and which protect them from contamination.
- (v) Each container shall be clearly and indelibly marked with the manufacturer's name, batch number, date of manufacture, reflectorization (if applicable), color, chemical type of binder and maximum safe heating temperature.
- (vi) The material shall be stored in accordance with the manufacturer's instructions and any material that is in damaged containers of which the seal has been broken, or of which the age is over 10 years since manufacture shall not be used unless agreed by the Engineer's Representative.
- (vii) The Contractor shall satisfy the Engineer's Representative that the material he proposes to use has the required properties, stating the maximum and minimum proportions and grading of the constituents, the acid value of the binder, the setting time, the maximum safe heating temperature, the temperature range of the apparatus and the proposed method of laying.

2. Preparation

- (i) The material shall be melted in accordance with the manufacturer's instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material and such that local overheating will be avoided. 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 shall be used as expeditiously as possible, and for thermoplastic material which has natural resin 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 apparatus, the material shall be maintained within the temperature range specified by the manufacturer and stirred to maintain the right consistency for laying.
- (iii) On concrete carriageways a tack coat compatible with the marking material shall be applied in accordance with the manufacturer's instructions prior to the application of thermoplastic material.

3. Laying

- (i) Thermoplastic material shall be laid hot by screened or sprayed application to the following thicknesses:

(a) Screed Markings	$4 \pm 1\text{mm}$
(b) Sprayed markings other than yellow lines	$2 \pm 0.5\text{mm}$
(c) Sprayed yellow edge lines	$1 \pm 0.2\text{mm}$

These thicknesses are exclusive of surface applied ballotini. The method of thickness measurement shall be in accordance with Appendix H of BS3262 (1976).

Thermoplastic markings on expressways, Class AA roads and other roads as specified shall be screed or spray applied incorporating ballotini and also has a surface application of ballotini applied evenly at the rate of 400 to 500g/m².

- (ii) Thermoplastic material shall not be inset in the road surfacing unless expressly authorized by the Engineer's Representative. Where permitted the surfacing shall be cut to the depth specified by an approved milling machine.

R16 04 Road marking paint

1. **Material:** Road marking paint shall be made by an approved manufacturer. It shall be suitable for applying by brush or mechanical means to cement concrete or bituminous pavement to give a chemically stable film of uniform thickness and shall be chlorinated rubber, one pack epoxy or alkyd based.

White paint shall contain not less than 6 per cent by weight of titanium dioxide as a pigment, conforming to type A (anatase) or type R (rutile) specified in B51851 (1967). Yellow paint shall be the standard color and contain not less than 6 per cent by weight of a suitable yellow pigment.

The paint shall be supplied fresh and ready for use in sealed containers and stored in accordance with the manufacturer's instructions.

2. **Application:** The paint shall be applied without the use of thinners or other additives. Paint shall be applied at a covering rate recommended by the

manufacturer and approved by the Engineer's Representative. Where markings are to be reflectorized with ballotini it shall be sprayed uniformly on to the wet paint film at the rate of 400 to 500g/m². Ballotini shall comply with the requirements of B53262 (1976) Clause 15.

R16 05 Reflecting road studs

Reflecting road studs shall be "Unistuds" as made by Prismo Ltd. or similar set into the carriageway surfacing or corner cube road studs set on the road surface, of the type and at the centers shown on the Drawings and all as approved by the Engineer's Representative.

Road studs for lane lines shall be white bi-directional unistuds and for the nearside edge of carriageways red uni-directional unistuds, unless otherwise approved by the Engineer's Representative.

On expressways only road studs for the offside edge of carriage ways shall be amber bi-directional corner cube road studs and across merging or diverging tapers at junctions green uni-directional unistuds, unless otherwise approved by the Engineer's Representative.

All road studs shall be set in or on the carriageway in accordance with the manufacturer's instructions. The adhesive for corner cube road studs shall be that recommended by the manufacturer which has been tested and approved by the Engineer's Representative.

R16 06 Measurement

The unit of measurement for road marking lines shall be the linear meter of each type of line as completed and accepted, In the case of broken lines, the overall length shall be measured.

The unit of measurement for hatched markings shall be the square meter and for letters, figures, arrows and symbols the number as completed and accepted.

The unit of measurement for road studs shall be the number of each type as completed and accepted.

R16 07 Payment

Payment will be made in accordance with the unit prices in the Bill of Quantities for the various items in accordance with the Specification, and shall constitute full compensation for furnishing all material, equipment and labor and for performing all operations necessary to complete the work. The provision, delivery of material to the Site, handling and storage and all incidentals shall be included in the unit prices for the various items and, where authorized, the cutting of recesses by a milling machine for inset thermoplastic markings and the cutting of recesses for catseyes by an approved method.