ROAD MARKING MATERIALS:
NOTES FOR GUIDANCE IN
CARRYING OUT ROAD TRIALS

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ROAD MARKING MATERIALS:
NOTES FOR GUIDANCE IN
CARRYING OUT ROAD TRIALS

ABSTRACT

Road engineers sometimes require to know the relative performance prospects of alternative road-marking materials proposed for a given site. A small road trial will usually furnish the answer within a year. This Report contains notes for guidance on the practical arrangements of such trials and has been compiled in the hope that, by the use of common procedures, the knowledge gained by different engineers in different parts of the country can be readily correlated.

1. INTRODUCTION

Road-marking materials, particularly paints, are usually complex mixtures which are not easily specified by composition. Specification by the results of laboratory tests is also difficult: although some properties such as initial whiteness are relatively easily measured, the all-important property durability cannot be forecast with certainty. The comparative road trial is therefore a common device for enabling an engineer to decide on the most acceptable material. In the case of roadpaints, which rarely last more than 12 months, the results of one year's trial can conveniently be used as the basis of the next year's contract. Alternatively, trials carried out every 5 years or so can be used to establish and to keep up to date a list of acceptable materials.

This Note has been written with the object of providing a common form of conducting road trials so that knowledge obtained by different engineers can be pooled and correlated.

2. SITE

2.1 Traffic Intensity

The site should normally be a heavily trafficked road (carrying 1500 commercial vehicles per day or more). On the other hand if such traffic intensity is unusual, as in some part of Scotland for instance, a more representative site should be chosen.

2.2 Type of surface

The surface should be of a uniform type throughout the length of the test site, be in good condition, and be representative of local practice. Where possible it is useful to repeat the trials on 2 or
3 roads with different surfacings. A recently surfaced road without previous markings is an advantage.

2.3 General requirements

The site should be, as far as possible, free from sharp bends, steep gradients, cross-roads, busy side-entrances etc. If any features of this type are included in the test length they should be treated as non-experimental areas.

2.4 Layout of test-markings on non-urban roads

Two types of layout are possible. The markings can (a) form part of the normal longitudinal centre-lines or lane-markings or (b) be specially laid transverse or diagonal lines across the carriageway.

If not more than five materials are to be compared they should be incorporated as part of the normal markings (i.e. (a) above). The length of road marked with each material should normally be between 100 yds and 400 yds but longer lengths can be used if this is preferred and the site is suitable. It is desirable, however, that the lengths be short enough to enable all of the markings to be laid within one or two days to ensure constant weather conditions.

If a large number of materials are to be compared the system of short transverse strips may be preferable. It has the advantages that:

(a) the materials can all be laid on one day,
(b) they only require a short piece of road, and
(c) comparisons are easily made between adjacent strips.

The disadvantages are that:

(a) laying difficulties might not be detected on a short run,
(b) care is needed to ensure that the laying machine is operating correctly on a short run,
(c) the unfamiliar markings might be objected to as a hazard by the public,
(d) the results obtained have to be related to practical conditions.

It is best when using this type of test-marking to lay two or three lines with each material on any one site, and to repeat the trials on two or three roads.

2.5 Lay-out of test markings on urban roads

On heavily-trafficked city streets it is unlikely that long lengths of carriageway with uniform traffic conditions will be available and some form of compact layout is usually essential. On the other hand clusters of transverse lines may confuse the public.

If the materials to be tested are obtainable in the yellow colour approved by the Ministry of Transport\(^1\), a "box junction" provides an ideal site for comparing several materials. If such a site is not available, or if the materials are available only in white, then it is generally best to confine the test at any one site to a few materials only and to incorporate them into pedestrian-crossing markings.
If a crossing is divided in half in a direction transverse to the line of the road, two materials can be compared in each traffic-lane, i.e. four in all at one crossing.

3. MATERIALS AND LAYING METHODS

3.1 Materials

Hot-applied thermoplastic material to B.S.3262 Part 12, obtained from a reputable supplier, should be included as a 'control' in all trials. Where paints are being compared a reputable chlorinated-rubber type should be included. Suppliers should be asked to state the nature of the main constituents of their products for classification purposes but should not necessarily be required to give detailed analyses.

3.2 Laying methods

Where possible it is desirable that the materials be laid by the authority concerned. Equipment for laying hot-applied thermostaticas on a small scale is cheap and simple to use. Painting really requires an experienced operator and a machine with which he is familiar but useful results can be obtained with a paint brush and stencil.

If necessary the markings may be laid by a contractor but close control will be needed to ensure consistent and impartial treatment to all materials.

Some of the more modern materials may require laying by specialist equipment owned only by the supplier. In these cases careful planning will be required to ensure that all the materials are laid at about the same time.

The presence of a representative from the suppliers at trials should be encouraged rather than discouraged.

4. LAYING CONDITIONS

4.1 Time of trials

The time of year at which the markings are laid will affect their life. To enable results from one trial to be compared with another it is recommended that the materials be laid between April and June. In any case the laying should be between March and October.

4.2 Weather and site conditions

The materials should be laid when the air temperature is between 10°C and 30°C. The road should be dry and free from dirt. The experimental markings should not be laid over old markings; if present, old markings should be allowed to fade away alongside or else be removed by sand blasting some days beforehand.

5. INSPECTION AND ASSESSMENT

The evaluation of the markings is best made subjectively providing that an adequate team of observers (not less than 3) inspects at suitable intervals. If paints are involved the intervals should be a maximum of 4 weeks but if only hot-applied thermoplastics or materials such as 'Verynyl' are concerned the intervals may be extended to 8 or 12 weeks.

The general daylight appearance from the driver's viewpoint (i.e. viewed from normal eye-level at a distance of not less than 3 metres (10 ft)) should be assessed on a scale from 0 to 10. The general night-
time appearance when viewed from a car by the light of the car's headlamps should also be similarly assessed. The scale of values is as follows:

- **10** Very good
- **9**
- **8** Good
- **7**
- **6** Fairly good
- **5**
- **4** Fair
- **3** Poor
- **2** Inadequate
- **1** Bad

When either rating for any material reaches the value of 4, its age is taken as the useful life of that material. As the appearance of markings may fluctuate according to weather conditions some judgement may be needed to decide the end-point.

### 6. DATA TO BE RECORDED

#### 6.1 At the time of laying

In addition to items already mentioned such as site details, material details, and weather, various other factors should be measured and recorded.

The rate of spread or thickness of most materials will influence their lives markedly. As far as is consistent with suppliers' instructions, similar materials should all be laid to the same mean thickness. For paints this should be between 0.4 and 0.5 mm (0.015 in. and 0.020 in.), and for thermoplastics about 3 mm (0.125 in.). In any case actual mean thickness used should be determined. In some cases the thickness may be measured directly; in others the weight per unit area is more readily obtained and the mean thickness calculated from the specific gravity which is determined subsequently. Thicknesses or weights are measured on samples obtained by placing stout waterproof paper, card, metal foil, or thin plastic sheeting between the laying apparatus and the road during the test run.

The time taken for a material to harden sufficiently to carry traffic is important. Hot-applied thermoplastics harden almost instantaneously but with paints the time of application should be noted and the condition then periodically examined by running a finger along until no soft or sticky spots are detectable. The same observer (or observers) should be used throughout the work.

Bleeding may occur when paints are laid on bituminous surfacings. Generally it is least noticeable on surfacings made with hard bitumen and most severe on surfacings made with soft tar. If the paints are being applied by brush care should be taken to keep disturbance of the substrate to a minimum. Discoloration should be assessed on a 10-point scale similar to that used for general appearance.

Any abnormal behaviour such as unworkability or difficulties in spraying should be recorded.
6.2 Subsequently

As well as the general appearance of the materials throughout their lives, various special features may be measured or assessed if required.

Whiteness may be measured periodically by means of a portable photometer such as that described in B.S. 3262. This apparatus is not suitable, however, for paint markings on a very rough substrate such as a new surface-dressing.

Skid-resistance may be measured periodically using the pendulum tester. The value for the road surface adjacent to the markings should be determined at the same time.

The appearance of the markings when the road is wet will generally be much worse than when dry. If there is reason to believe that some materials appear markedly better than others when wet, extra inspections during wet weather may be made and the differences noted.

If the marking fails in some way other than gradual general wear, the type of failure should be recorded, e.g. flaking, undue dirt retention, excessive slipperiness etc.

7. REPORTING

General details should be reported in the form shown in the Appendix. The results of the inspections should be tabulated together with any details of the materials known, measurements made of properties, and comments, and attached to the report sheet.

8. REFERENCES


9. APPENDIX

Typical report sheet

(1) Date(s) of laying materials: e.g. 12.5.68 - 14.5.68.
(2) Site: e.g. Trunk Road A.999 between .......... and ............ Grid Ref. ............
(3) Traffic: e.g. 1500 - 2000 commercial vehicles/day.
(4) Road width: e.g. 10 metres (33 ft)
(5) Line layout: e.g. 10 cm (4 in.) lane lines on a 3-lane road. Approximately 200 lineal metres with each material.
(6) Road surface: e.g. Rolled asphalt, B.S.594, 25% stone, 13 mm (½ in.) surface chippings, 10 years old.
(7) Conditions at time of laying:
   (a) Temperature: e.g. Air temperature 20 - 250°C.
   Road temperature 30 - 40°C.
   (b) Wind: e.g. negligible.
   (c) Rainfall in following 24 hours: e.g. heavy rainfall the same evening.
(8) Laying method e.g. Thermoplastic markings by hand-propelled machine ( ....... type).
     Paints sprayed by hand-propelled machine ( ....... type). All laying done by County staff.

This sheet should be accompanied by a table listing the materials used, with rates of spread, drying times, etc., together with the inspection results.
ABSTRACT
Road marking materials: Notes for guidance in carrying out road trials. Ministry of Transport, RRL Report LR 169: Crowthorne, 1968 (Road Research Laboratory). Road engineers sometimes require to know the relative performance prospects of alternative road-marking materials proposed for a given site. A small road trial will usually furnish the answer within a year. This Report contains notes for guidance on the practical arrangements of such trials and has been compiled in the hope that, by the use of common procedures, the knowledge gained by different engineers in different parts of the country can be readily correlated.