

TOPIC:
**THE USE OF WATERBORNE PAINTS
WITH LARGE GLASS BEADS**

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PURPOSE

The purpose of this technical direction is to:

- highlight the handling and performance advantages of waterborne roadmarking paints.
- note the application conditions necessary to achieve efficient application as well as the enhanced performance of the waterborne material.

THE ADVANTAGES OF WATERBORNE PAINTS

For many years pavement markings and lines have been applied using a fast-drying solvent-borne paint, with drop-on glass spheres (beads). New resin technology has resulted in the development of waterborne paints which have a number of significant advantages over these solvent-borne paints.

1. Solvent-borne paints are highly flammable, requiring special operations procedures to avoid serious incidents. Waterborne paints are non-flammable, eliminating the danger of fire and/or explosion.
2. Solvent-borne paints must be handled with great care by operators to avoid skin, respiratory, and toxicity problems. Waterborne paints have much lower toxicity and volatile organic content, and hence present a much lower health risk to operators.
3. Because solvent-borne paints are highly flammable they must be transported in steel drums, which cannot be re-used, and which are very difficult to dispose of responsibly. Waterborne paints can be transported in bulk containers, composed of a supported plastic membrane, which can be dried and disposed of as small volume, solid waste.

4. About 50% by volume of solvent-borne paints is made up of highly volatile organic solvents, which end up in the atmosphere, adding to pollution.
5. Waterborne paints are longer wearing than solvent-borne paints.
6. Waterborne paints can be applied at greater thickness than solvent-borne paints, allowing the use of larger glass beads. This leads to greatly improved effectiveness of painted lines at night in wet weather.

SUCCESSFUL APPLICATION

The use of waterborne paint with large (class B) glass beads will result in increased service life and improved wet night visibility only if:

- the pavement is clean, dry and not too cold
- the specified paint film thickness is uniformly applied
- a sufficient quantity of glass beads is retained in the paint
- the beads are uniformly distributed across the line
- the work is protected long enough to ensure that the beads are not prematurely dislodged by traffic.

APPLICATION GUIDELINES

In order to achieve the maximum effectiveness in wet weather with larger (class B) beads the paint and beads must be applied in such a way that 60% embedment of the beads is achieved. This will be achieved if the materials are applied in accordance with the requirements of RTA Specification R141. However, the applied lines must also be protected from traffic until the beads are sufficiently bonded into the paint. Therefore, in order to achieve efficient application with good paint durability and good retention of large glass beads, the following guidelines should be followed.

1. Optimum conditions

To achieve the highest performance and durability, waterborne paints with class B beads need to be applied under the following conditions:

- * Air temperature and pavement temperature $>20^{\circ}\text{C}$.
- and * Relative humidity $<70\%$.
- and * Reasonable air movement ($>10\text{kph}$).
- and * Adequate protection of lines during the drying process.

(a) Air Temperature

Ideally waterborne paints should be applied at air temperatures above 20°C. They may be effectively and efficiently applied at temperatures between 15°C and 20°C if there is low relative humidity (<50%) and reasonable air movement (>10kph). If these guidelines cannot be followed, lines will have to be protected from traffic for long periods (possibly for several hours). Paint should never be applied at temperatures below 10°C.

(b) Relative Humidity

Ideally waterborne paints should be applied when the relative humidity is less than 70%. They may be effectively and efficiently applied when the relative humidity is between 70% and 80% if the air temperature is above 25°C and there is reasonable air movement (>10kph). If these guidelines cannot be followed, lines will have to be protected for long periods (possibly for several hours). Paint must not be applied when the relative humidity is above 85%.

(c) Air Movement

If there is very little air movement (<5kph), the air temperature and relative humidity of application should be >20°C and <70% respectively to achieve a reasonable drying time.

(d) Protection

All painted lines must be protected from traffic until the beads are fully bonded into the paint. Under conditions of low temperature (<20°C) or high relative humidity (>70%), care must be taken to *continue protection* for a considerable time after the no-pick-up condition is reached. This could take *several hours*. Paint must not be applied when relative humidity is above 85% or when air or road temperatures are below 10°C.

2. Summary of guidelines

A summary of the above guidelines is set out in Chart 1 (attached).

3. Rainfall

Even when the application conditions are favourable waterborne paint should not be applied if rain is expected within 2 hours.

4. Paint film thickness

When used with class B (large) spherical glass beads, the dry film thickness of the applied unbeaded paint must be *not less than 300µm*. However, in order to promote good drying, the paint film should not be too thick. This means that the wet film thickness range should be 500µm to 600µm for paints with 60% volume solids.

5. Adhesion

In order to achieve satisfactory adhesion of paint to the pavement:

- (a) The pavement must be dry.
- (b) Pavements which are dusty should be cleaned with pressurised water and allowed to dry before the application of the paint.

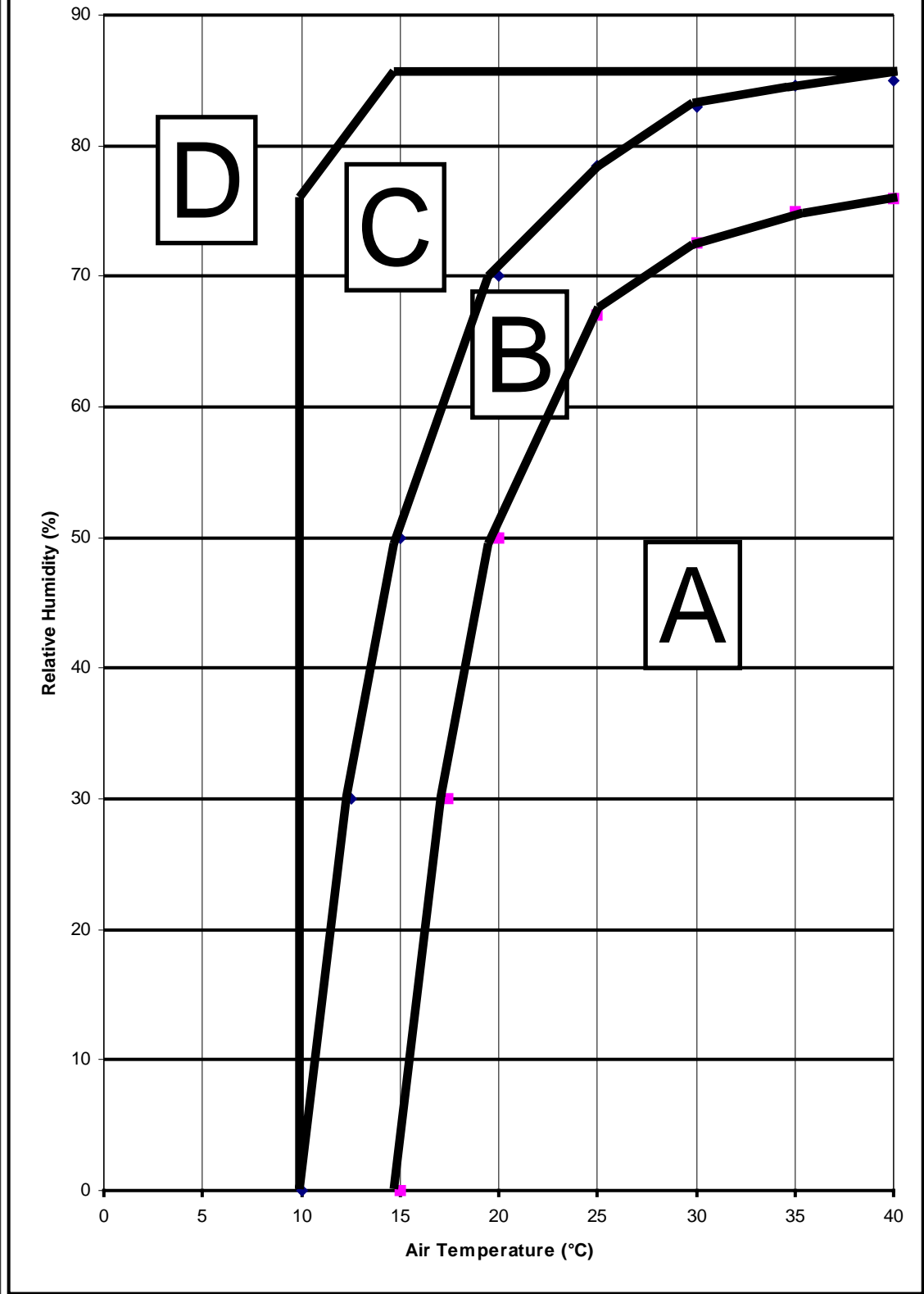
- (c) Freshly laid spray seal pavements should be allowed to age for at least two (2) weeks before paint application.

6. Night work

At night temperature generally decreases, and relative humidity generally increases. Lines applied at night will dry slowly and will require long periods (possibly several hours) of protection to prevent the premature loss of beads. The use of waterborne paints at night or very early in the morning is therefore not recommended.

CHART 1

**Guide to the Application of WB Roadmarking Paint.
Under Different Conditions of Temperature, Humidity and Wind.**



HOW TO USE THIS CHART:

1. Measure the temperature and relative humidity.
2. Identify the area of the chart to which these conditions correspond.
3. Measure or estimate the amount of wind.
4. Estimate the level of protection required to achieve good bead retention.

Area A: Conditions generally favourable for the application of Waterborne Roadmarking Paints. Short periods of protection required to avoid the premature loss of glass beads.

Area B: (a) Conditions favourable for the application of Waterborne Roadmarking Paints if there is a moderate wind. Under these conditions short periods of protection will be required.
(b) Under still or light wind conditions paint will dry slowly. Painted lines must be protected for extended periods to avoid the premature loss of beads.

Area C: (a) If there is no wind the paint may dry very slowly. Near the top and left of the area (the least favourable conditions) paint may take 3 hours to fully dry.
(b) Under moderate winds, drying times may be less than 1 hour. Painted lines therefore need to be protected for extended periods, up to 1 hour, to avoid the premature loss of beads.

Area D: Conditions not suitable for application of Waterborne Roadmarking Paints. Do not apply paint when the temperature is below 10°C or the relative humidity is above 85%.

NOTE:

1. There is not a sudden transition from one area to the next. Any set of conditions which falls close to the border between two areas will lead to drying times and require protection of painted lines which are intermediate between those of the two areas.
2. This chart is only a guide. Always check the bead retention of the paint before removing protection.
3. Do not apply paint when the pavement is wet from rain, dew or other causes. The application of waterborne paint at night is not recommended.