TEST METHOD T195

SAMPLING PLAN FOR SURFACE LEVEL DEPARTURES FOR SAMPLING CONCRETE PAVEMENT SURFACE HEIGHTS

REVISION SUMMARY

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SAMPLING PLAN FOR SURFACE LEVEL DEPARTURES FOR SAMPLING CONCRETE PAVEMENT SURFACE HEIGHTS

1. SCOPE

This Test Method describes the procedure for defining:

- lot boundaries;
- the position of the surface level departures and
- the number of surface level departures taken within each lot;

for sampling concrete pavement surface heights in accordance with RTA model Contracts Specification Clauses for controlling concrete pavement surface heights and base course thickness. Measurement of the pavement surface heights is by survey as defined by RTA specification Q. A surface level departure is defined as the difference in height between the as constructed pavement surface and its equivalent design height.

2. PURPOSE OF THE SAMPLING PLAN

The purpose of this sampling plan is to gain a valid sample of surface level departures. The mean and standard deviation of the surface level departures will be controlled during construction by, initially, acceptance control charts and later by process control charts.

Surface level departure measurements of concrete pavements are highly correlated. The defined grid pattern described in this Test Method allows adjustments to be applied to the control charts for the effect of data correlation. Variances from the specified grid pattern will make these adjustments incorrect. This will lead to erroneous decisions about process control and the capability of construction processes.

3. DEFINITIONS

The definitions contained in RTA specification clauses for construction of concrete pavements also apply to this Test Method.

4. APPARATUS

The set out markers that controlled the paving machine during placement of the concrete, known as trim pegs, should remain in place to assist selection of the sampling points and to determine the chainages of the ends of lots. The chainage interval between set out markers should not exceed 10 metres.

5. PROCEDURE

5.1 DETERMINING LOT BOUNDARIES

5.1.1 Full Lots

A lot is a subset of a continuous pour of one day's homogeneous work. Each full lot is defined as a nominal 100-metre length of the full width of a continuous pour.

The start chainage of the first full lot shall be the first even 5-metre chainage, as defined by the contract drawings, constructed by the day's work. The start chainage of the next lot shall be 100 metres, taken in the direction of paving, from the start chainage of the first lot. Subsequent lots shall abut and be continuous from the first lot, with start chainages differing by 100 metres for each lot.

Limiting the size of lots to 100-metres improves the efficiency of the control charts.

Where less than 80 lineal metres of concrete placed in a homogeneous day's work, then that constitutes a full lot for the purposes of this is Test Method.

5.1.2 Residue Lots

The whole of a one day's homogeneous work shall be surveyed for surface heights. This includes that portion of the pavement from the finish chainage of the last full lot to the second transverse construction joint. This portion of the pavement shall be treated as a residue lot.

Where the residue lot is not greater than 75 metres in length, the measurements taken on the residue lot shall be included in the last full lot for analysis and testing for acceptance. This implies that the sample size of the last full lot, when combined with the residual pavement of the day's work, will be greater than the sample sizes shown in table 1. Unless one day's homogeneous work is less than 80 metres in length than the minimum length of a lot shall be 75 metres.

5.2 LOCATION OF SAMPLING POINTS

The location of sampling points shall be selected from a defined grid pattern. Equally spaced points in strings that run approximately parallel to the centreline of the concrete pour form the grid pattern. Sampling points in each string shall be approximately 5 metres apart, making 20 sampling points per string per full lot. The even 5 metre chainages, as defined by the contract drawings, where practical, shall define the chainages of each sampling point, subject to the provisions of Clause 5.4.

5.3 NUMBER OF SURFACE LEVEL DEPARTURES MEASUREMENTS

Table 1 contains the number of strings across the pavement and *n*, the number of surface level departure measurements per full lot, for different pour widths. The string for sampling concrete pours less than 1.5 metres wide shall run approximately along the centreline of the pour. The strings for lots that have two strings shall be not less than 0.5 metres or greater than 1.0 metres from the edges of the pour to minimise the effect of "rounding" of the edges of the concrete. Lots with more than two strings shall include the two outer strings, as described for two stringed lots and place additional strings so that the transverse distances between all pairs of adjacent strings are approximately equal.

Pours that tapper may have varying numbers of strings along the pavement if the pour width varies between the Pour Widths shown in column 1 of Table 1.

Table 1

Pour Width (W) in metres	Number of Strings	Sample Size, n Each Lot
W≤ 1.5	1	20
1.5 < W ≤ 6.0	2	40
6.0 < W ≤11.0	3	60
11.0 <W ≤ 14.0	4	80

Sample Size, *n*, of Full Lots for Different Pour Widths

Diagram 1 shows an example of the sampling pattern for a concrete pour 8.5 metres wide.

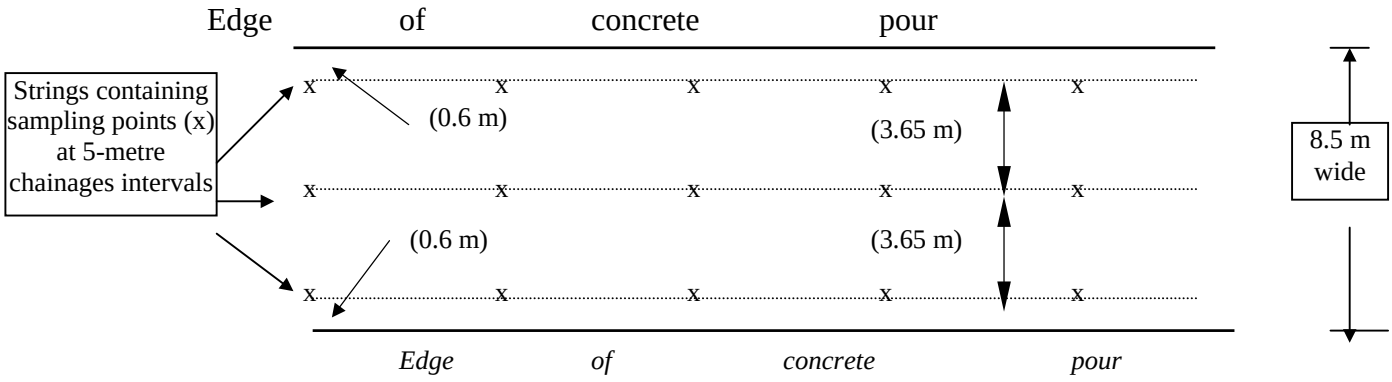

Diagram 1
Sampling Pattern

5.4 CURVE TRANSITIONS

Contract drawings of alignments containing curves usually show cross-sections at chainages that are at even 10-metre intervals from the tangent point of the curve over the length of the curve transition. The design process selects tangent points to fit design parameters and places them at precise chainages, usually quoted to millimetres. As it is extremely unusual for a tangent point of a curve to be located at an even 10 metre chainage, cross-sections on curve transitions are usually at chainages away from even 10 metre chainages.

Samples may be taken at the same cross-sections shown on the contract drawings over the length of curve transitions, provided:

- there are a nominal 5 metres between the chainages of the sampling points in the same string,
- there is a least 2.5 metres and not greater than 7.5 metres between chainages of the sampling points at the start and finish of the curved transition and
- the sampling points are taken at the same chainages on all pavement courses.

Taking samples at the same nominal locations for each course reduces interpolation errors when determining pavement course thicknesses from surveyed heights.

5.5 TOLERANCE OF NOMINAL POSITION OF SAMPLING POINTS

The location of each sampling point shall be within a radius of 0.7 metres of its specified position. The tolerance of 0.7 metres applies to the distance between its nominal position and actual field position. Pacing accuracy is sufficient for selection of sampling points, provided pegs placed to aid construction are still in place and at not more than 10 metre chainage interval, when carrying out surveys to verify conformance.

5.6 TOLERANCE OF ACTUAL POSITION OF SAMPLING POINTS

The actual field position where measurements are taken shall be determined by survey. The accuracy of the surveying procedure that determines actual field position shall have a standard deviation of the error of not greater than 10 millimetres. A standard deviation of 10 millimetres implies that about 95% of the positions of the surface level departures will have an error of less than 20 millimetres.

The positional error is the hypotenuse of a right-angled triangle with the adjacent sides being the error in chainage and the error in offset. The design chainage and offset of the sampling points determine their design heights. Therefore, errors in determining the design position of sampling points cause errors in calculating their design heights due to the longitudinal gradient and the cross fall of the pavement.