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Specification for the Random Selection of Test Sites Within a Lot

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1 Scope

This procedure provides a standardised method for randomly determining test position locations within a lot, for obtaining samples, or in-situ testing. Sites works are divided into lots and where required each lot is further divided into sublots so that the sampling and assessment of quality is stratified.

The procedure is particularly applicable to in-situ density testing of granular pavements, for identifying the location where core specimens are taken from asphalt layers and similar quality assurance processes.

2 Definitions

(a) Lot: A lot is a discrete separable portion of work consisting of a single layer, batch or area of work which has been produced or constructed in a single day, shift or under essentially uniform conditions and is essentially homogeneous.
(b) Sublot: a sublot is a separable portion of a lot bounding one or more test positions, depending on specified requirements.
(c) Test area: the area of a lot, apart from areas excluded from testing, including any non-homogeneous areas.
(d) Test position: depending on the contract or specified requirements, each lot or sublot will have at least one test position with location determined by this procedure. The number of test sites per lot or sublot shall be designated as *n*.

3 Procedure

(a) Prior to entering the site of works, record the time and date in digital form, with the date in days and months, and the time in hours and minutes, using the 24-hour clock.
(b) Add the values of month, day, hour and minute and then sum each digit of the sum to obtain a total X. If X is greater than 9 (i.e. has more than one digit) repeat the process of summing the digits until a single number is reached. Record as N.
(c) Determine the specified size of the lot from the appropriate technical specification. Identify and record the width W and length L of the lot to be tested and ensure compliance with the specified requirements. Exclude any areas that are non-homogeneous in respect of material type or general appearance. Such excluded areas shall either be treated as a separate sublot or be tested following remedial treatments.

Note: If the lot varies significantly in width, then determine the width for each sublot W_{sublot} and substitute this for the lot width W in step 3(e).

(d) Identify the test area within the lot. Except where joint testing is a specific separable requirement, the test area shall be more than 150mm from a longitudinal joint, and 1 metre from a transverse joint.
(e) Determine the test area width W_{test} by subtracting the excluded edges from the lot width W:

$$W_{test} = W - 0.3 \quad (m)$$

(f) Determine the test area length by subtracting the excluded edges from the lot length, L:

$$L_{test} = L - 2.0 \quad (m)$$

(g) Determine the number of sublots, n, within the test area bounded by L_{test} and W_{test}, required by the contract or specification for the lot.
(h) Determine the sublot length:

$$L_{sublot} = \frac{L_{test}}{n} \quad (m)$$

(i) Locate the sublots longitudinally by measuring sublot length L_{sublot} until all n sublots have been identified and marked.
(j) Select a random number R from Table 1 corresponding to N.

Table 1: Random numbers for selection of longitudinal locations

Sum of Digits (N)	Random Number (R)
1	0.5
2	0.7
3	0.1
4	0.6
5	0.4
6	0.9
7	0.3
8	0.8
9	0.2

(k) Determine the longitudinal distance of the test position from each sublot transverse boundary by multiplying the sublot length L_{sublot} by the random number R. Repeat this process to determine the longitudinal test position for each sublot. See Figure 1:

$$L_n = L_{sublot} \text{ x } R \quad (m)$$

(l) Select a test position offset factor F from the row in Table 2 corresponding to the day number of the month. Use the first number in the number set to calculate the lateral offset O_n from the longitudinal boundary:

$$O_n = W_{test} \text{ x } F \quad (m)$$

Calculate the lateral test location O_n for each sublot using the number set in for each test position in order 1 to n until the n sites required have been located laterally. Continue into the following row if n >12.

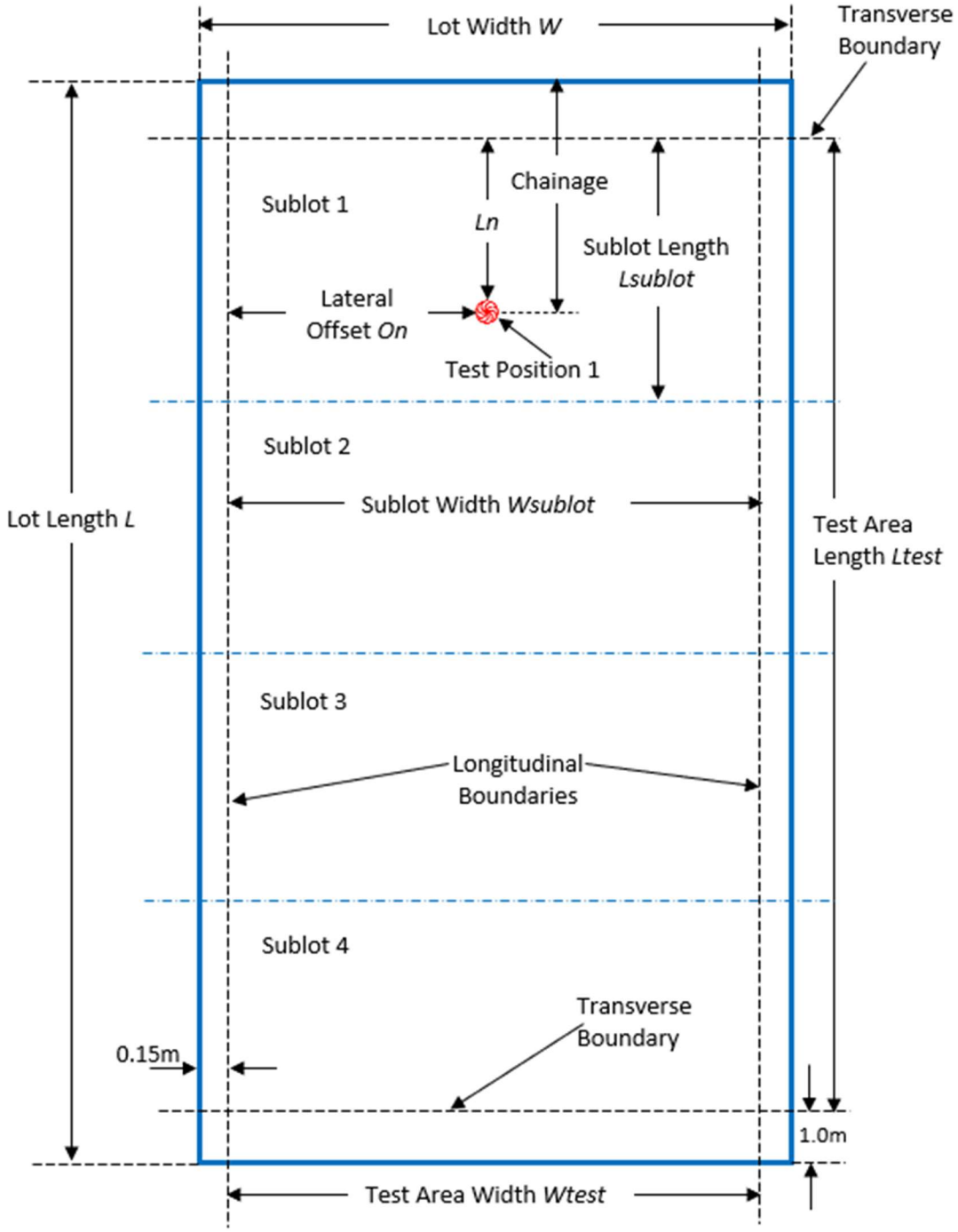
(m) Mark the test positions for all the n test positions to within 0.1m of the longitudinal distance L_n and transverse offset O_n determined in steps 3(k) and 3(l) respectively.

Table 2: Number sets for selection of lateral locations

Day Number	Test Position Offset Factor F											
	1	2	3	4	5	6	7	8	9	10	11	12
1	1.0	0.4	0.0	0.9	0.8	0.2	0.6	0.5	0.7	0.1	0.3	0.9
2	0.5	0.4	0.7	0.8	1.0	0.6	0.0	1.0	0.1	0.2	0.9	0.3
3	0.0	0.7	0.6	1.0	0.5	0.3	0.2	0.1	0.4	0.9	0.5	0.8
4	0.2	0.8	1.0	0.5	0.1	0.4	0.0	0.3	0.6	0.4	0.7	0.9
5	0.7	0.1	0.6	0.2	0.3	0.4	0.6	0.0	0.5	0.9	0.8	1.0
6	0.9	0.4	1.0	0.0	0.7	0.2	0.8	0.6	0.5	0.3	0.6	0.1
7	0.8	0.3	0.2	0.5	1.0	0.5	0.1	0.6	0.9	0.4	0.0	0.7
8	0.8	0.3	0.6	0.1	1.0	0.0	0.7	0.5	0.9	0.4	0.5	0.2
9	0.9	0.3	1.0	0.5	0.3	0.8	0.1	0.2	0.6	0.0	0.7	0.4
10	0.4	0.0	0.8	0.4	0.9	0.5	1.0	0.1	0.7	0.2	0.6	0.3
11	0.5	0.0	0.3	1.0	0.6	0.9	0.3	0.8	0.2	0.7	0.1	0.4
12	0.1	0.8	0.2	0.7	0.9	0.6	0.3	0.0	0.4	1.0	0.2	0.5
13	0.5	0.2	0.4	0.3	0.0	0.5	0.1	1.0	0.7	0.8	0.6	0.9
14	0.9	0.6	0.2	0.1	0.0	0.8	0.5	1.0	0.4	0.2	0.7	0.3
15	0.5	0.0	1.0	0.2	0.7	0.4	0.8	0.6	0.1	0.9	0.3	0.5
16	0.7	0.6	0.0	0.1	1.0	0.2	0.7	0.3	0.8	0.4	0.5	0.9
17	0.9	0.6	0.1	0.7	0.3	1.0	0.5	0.4	0.2	0.8	0.9	0.0
18	0.2	1.0	0.2	0.9	0.6	0.0	0.8	0.1	0.5	0.3	0.7	0.4
19	0.8	0.7	0.5	0.9	0.6	0.1	1.0	0.0	0.2	0.3	0.4	0.6
20	0.8	1.0	0.6	0.9	0.2	0.5	0.1	0.5	0.3	0.7	0.4	0.0
21	0.6	0.8	0.2	0.8	0.4	0.9	0.3	0.1	0.5	0.7	0.0	1.0
22	0.4	1.0	0.0	0.2	0.1	0.8	0.9	0.5	0.6	0.7	0.3	0.4
23	0.7	0.0	0.8	1.0	0.9	0.1	0.5	0.3	0.2	0.6	0.7	0.4
24	0.0	0.8	0.1	0.3	0.7	0.9	0.5	0.4	1.0	0.6	0.2	0.1
25	0.2	0.9	0.0	0.7	0.3	0.8	0.5	1.0	0.1	0.6	0.4	0.7
26	0.2	0.7	1.0	0.8	0.1	0.6	0.3	0.0	0.5	0.4	0.9	0.8

Day Number	Test Position Offset Factor F											
	1	2	3	4	5	6	7	8	9	10	11	12
27	0.1	0.9	0.3	0.7	0.0	0.3	0.2	0.5	0.6	0.4	1.0	0.8
28	0.6	0.0	0.9	0.1	1.0	0.2	0.4	0.8	0.1	0.5	0.3	0.7
29	0.4	0.1	0.8	0.5	0.7	0.6	0.2	0.3	0.9	1.0	0.5	0.0
30	0.1	0.7	0.9	0.8	0.5	0.6	0.3	0.6	0.4	1.0	0.2	0.0
31	0.2	0.8	0.0	0.3	0.6	0.5	0.7	0.5	1.0	0.1	0.9	0.4

Figure 1: Test lot site diagram



4 Reporting

Record and report the following information:

(a) The lot bounds and any areas excluded from the lot.
(b) The date and time used for the selection of the test sites and test positions and the value of *N*.

(c) The random number selected in step 3(j).
(d) The number of the number set, or sets, selected in step 3(l).
(e) The longitudinal and lateral location, L_n and O_n respectively, and chainage for each test position.
(f) The relevant construction specification.

5 Worked Example

(a) Assume the date is 19 April, and the time is 13:20. Assume lot width W = 10m and lot length L = 200m with n = 10 sublots.

(b) Add the values of day, month, hour and minute, i.e. 19 + 4 + 13 + 20 = 56. Sum each digit of the total, i.e. 5 + 6 = 11. As the sum is not a single digit, repeat the summation of the individual digits, i.e. 1 + 1 = 2. Thus N = 2, and hence from Table 1, R = 0.7.

(c) Calculate the test area width as $W_{test} = W - 0.3$ = 9.7m.

(d) Calculate the test area length as $L_{test} = L - 2.0$ = 198m.

(e) Calculate the sublot length $L_{sublot} = L_{test}/n$ = 198/10 = 19.8m

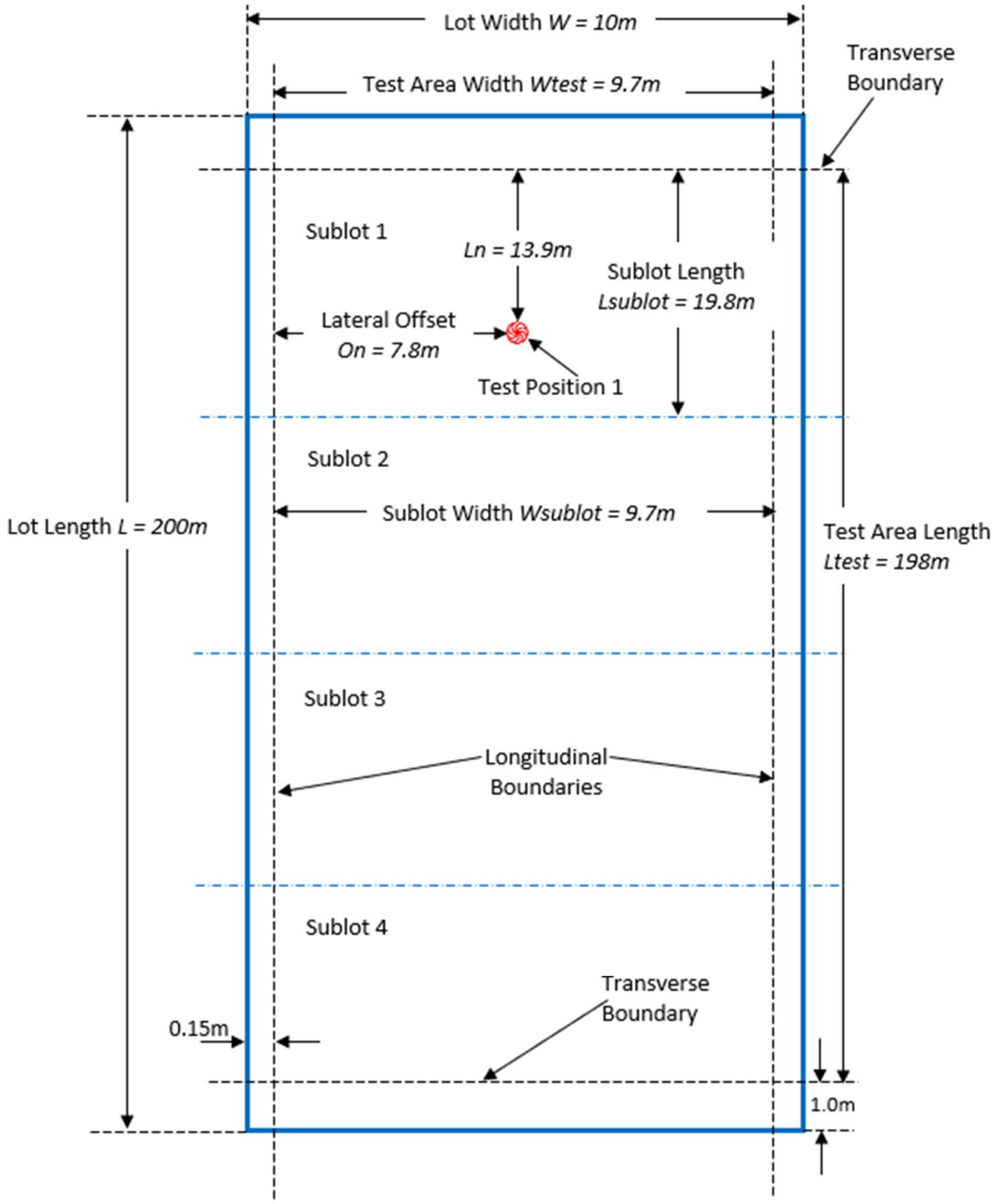
(f) Calculate the test position distance from the sublot transverse boundary, L_n, = L_{sublot} x R = 19.8 x 0.7 = 13.9m.

(g) Calculate the lateral offset O_n for the test position by multiplying the test position offset factor for the 19th day of the month, F = 0.8, by the test area (or sublot) width, $O_n = W_{test}$ x F = 9.7 x 0.8 = 7.8m.

(h) Mark the test position at 13.9m from the transverse boundary of the test site, and 7.8m from the longitudinal boundary of the test site.

(i) Repeat from step (g) until n test positions have been identified and marked. See Figure 2 for a diagram of the dimensions referenced above.

Figure 2: Worked Example Site Diagram



Note: Diagram only shows 4 sublots of the 10 sublots referenced in the worked example.