Materials Testing Manual

Part 3: General
Test Method Q020: Calculation of characteristic value of a lot

1 Source
This method is based on the process for calculation of characteristic value as detailed in Department of Transport and Main Roads Technical Specification MRTS01 Introduction to Technical Specifications.

2 Scope
This method provides a means for calculating a characteristic value determined by the analysis of several individual test results, tested using the same methods, using a statistical process. The characteristic value may then be used to determine the compliance of a product.

3 Procedure
The procedure shall be as follows:

3.1 Perform the requested tests, using the same test methods, as detailed in the specified test methods (Notes 6.1, 6.2 and 6.3).

3.2 Use the acceptance constant from Table 12(a) or Table 12(b) of MRTS01 Introduction to Technical Specifications unless otherwise specified.

3.3 Using the calculated values perform the calculations detailed in Section 4.

4 Calculations
Calculations shall be made as follows:

4.1 Calculate the mean of the individual test results as follows:

\[ X_{av} = \frac{1}{n} \sum_{i=1}^{n} X_i \]

where

- \( X_{av} \) = mean of the individual test results for \( i=1, 2, 3, \ldots, n \)
- \( n \) = number of test results
- \( X_i \) = the individual test result for \( i=1, 2, 3, \ldots, n \)

4.2 Calculate the standard deviation of the individual test results as follows:

\[ s = \sqrt{\frac{\sum_{i=1}^{n} (X_i - X_{av})^2}{n - 1}} \]

where

- \( s \) = standard deviation of the individual test results for \( i=1, 2, 3, \ldots, n \)
- \( n \) = number of test results
- \( X_i \) = the individual test result for \( i=1, 2, 3, \ldots, n \)
- \( X_{av} \) = mean of the individual test results
4.3 Calculate the characteristic value using the appropriate method as follows:

4.3.1 For a minimum limit:

\[ CV = X_{av} - k s \]

where

\[ CV \] = characteristic value
\[ X_{av} \] = mean of the individual test results
\[ k \] = an acceptance constant dependent upon the number of tests
\[ s \] = standard deviation of the individual test results

4.3.2 For a maximum limit:

\[ CV = X_{av} + k s \]

where

\[ CV \] = characteristic value
\[ X_{av} \] = mean of the individual test results
\[ k \] = an acceptance constant dependent upon the number of tests
\[ s \] = standard deviation of the individual test results

5 Reporting

The following shall be reported:

5.1 Report the following values rounded to a number of significant figures which exceeds by one that normally reported for the individual test results:

a) mean of the individual test results, and
b) standard deviation of the individual test results.

5.2 Report the characteristic value of the individual test results to the same rounding normally applied to individual test results (refer to MRTS01 Table 12(c)).

5.3 Report the following additional values:

a) number of individual tests, and
b) acceptance constant (k) used to the nearest 0.001.

5.4 Report the following additional information:

a) source of the acceptance constant (k) used, for example MRTS01 Table 12(a)
b) identification of the specification requiring the reporting of the characteristic value of the individual test results

c) statement identifying use of unrounded data in calculation of characteristic value, and
d) the number of this test method, that is Q020.
6 Notes on method

6.1 This method is usually applied to the results of Test Methods AS 1289.5.4.1, AS 1289.5.7.1, Q140A, Q146, Q311 and Q314.

6.2 For example, when determining the relative compaction or voids of asphalt, the method used to determine the compacted density may be one of AS 2891.9.2, AS 2891.9.3, Q306B, Q306C, Q306D or Q306E.

6.3 Where Test Method Q306B or AS 2891.9.2 is used initially to determine the relative compaction of asphalt but is subsequently found not to be applicable to one or more samples due to excessive water absorption, a combination of test results from Test Methods AS 2891.9.2, Q306B, and Q306C may be used.