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COMPARISON OF OPERATING CHARACTERISTICS OF OVERLAPPING AND NON-OVERLAPPING "MEANS OF N" TYPE SPECIFICATIONS WITH ESTIMATED STANDARD DEVIATIONS

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COMPARISON OF OPERATING CHARACTERISTICS OF OVERLAPPING
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WITH ESTIMATED STANDARD DEVIATIONS

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SUMMARY:

This report completes an investigation commenced in UNICIV Report No. R-171.

Many codes and specifications make use of an acceptance criterion of the type:

$$m_n \geq f_c + k \cdot \sigma_f$$

where:

m_n = mean strength of a group of "n" results

f_c = specified characteristic strength

σ = standard deviation

k = factor related to acceptance quality level

f = number of degrees of freedom associated with the measurement of σ

Some codes test mutually exclusive sets of "n" results and others test overlapping sets of results. In general the operating characteristics of the overlapping type can only be determined by computer simulation.

A previous report summarised the results of an extensive computer simulation for the case where the standard deviation could be assumed to be known. This report extends the investigation to the cases where the standard deviation is estimated from the data. It concludes that for all practical purposes the same operating characteristic can be obtained with either type of specification, by a suitable change of the parameters k, n & f, and supplies appropriate formulae to govern the change.

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INTRODUCTION:

Many codes and standards make use of an acceptance criterion of the type:

$$m_n \geq f_c + k \cdot \sigma \quad (1)$$

where:

m_n = mean strength of a group of n results

f_c = specified characteristic strength

σ = standard deviation

k = factor related to acceptance quality level

In some cases the value of σ is assumed to be accurately known and in some cases it is measured from the actual test results; in the latter case it is commonly designated by s .

Examples of some standards and codes using this type of requirement are:

Australian Standard, AS1480: 1974

British Code of Practice, CP110: 1972

Various A.C.I. Codes

Various European Codes, including some from West Germany, Holland, Switzerland and Denmark.

Some codes, such as the Australian, apply the acceptance criterion to consecutive, but mutually exclusive, groups of n results. The operating characteristic for such codes can readily be calculated theoretically (Ref. 3).

Other codes, such as the British and A.C.I., apply the acceptance criterion to every overlapping set of n results; thus every result is considered in n consecutive sets. This type of specification is variously referred to as an "overlapping means of n " or a "running means of n " criterion.

A previous report by Manton-Hall (Ref. 1) has shown that the operating characteristic of any non-overlapping specification of the type shown in (1) and having a known standard deviation, plots as a straight line on double probability paper.