Reporting Statements of Conformity, Uncertainty of Measurement and Decision Rules

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1. SCOPE AND FIELD OF APPLICATION

1.1. This policy outlines the approach for reporting statements of conformity, along with the **decision rules** required to ensure compliance with **ISO/IEC 17025:2017**. This policy is applicable to the Reaction to Fire team based at Holmesfield Rd. Additionally, it provides guidance for reporting uncertainty of measurement when a statement of conformity is not applicable.

2. NORMATIVE REFERENCES

2.1. LAB 48 – UKAS Guidance document for decision rules and statements of conformity

2.2. ILAC-G8:09/2019 - Guidance document for decision rules and statements of conformity

2.3. EL-G-OP-X-X-PS 100326 Element policy on reporting statements of conformity in testing

3. TERMS AND DEFINITIONS

3.1. Acceptance Interval: acceptable range of the measurand

3.2. Acceptance Limit (AL): specified boundary for passable measurand after application of the guard band/s. Can be an upper or lower limit or both.

3.3. Coverage factor (k): multiplier used in uncertainty analysis to express how confident we are that a measurand lies within a certain range.

3.4. Decision rule: rule that describes how measurement uncertainty is accounted for when stating a statement of conformity.

3.5. Expanded measurement of uncertainty (U): is obtained by multiplying the combined standard uncertainty uc(y) by a coverage factor k: $U = kuc(y)$ The result of a measurement is then conveniently expressed as $Y = y \pm U$, which is interpreted to mean that the best estimate of the value attributable to the measurand Y is y, and that $y - U$ to $y + U$ is an interval that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to Y. Such an interval is also expressed as $y – U \leq Y \leq y + U$.

3.6. Statement of conformity: declaration that a product, process or result meets or doesn't meet a specified requirement.

3.7. Guard Band (w): interval between a tolerance limit and a corresponding acceptance limit.

3.8. Measurand: the measured result

3.9. **Tolerance Limit (*TL*)**: specified upper or lower limits prior to application of the guard band/s. This can also be known as the specification limit.

3.10. **Uncertainty of measurement (UoM):** A parameter, associated with the result of a measurement, which characterizes the dispersion of the values that could reasonably be attributed to the measurand.

3.11. **Qualitative result:** A result that is categorical or descriptive information in nature. It does not provide any quantifiable data such as numerical measurements, counts, totals.

3.12.

4. POLICY FOR STATEMENTS OF CONFORMITY, UNCERTAINTY OF MEASUREMENT AND DECISION RULES

4.1. Section 7.8.3.1 of **ISO/IEC 17025:2017** stipulates that uncertainty of measurement should be included in test reports under certain circumstances. For example, when it is relevant to the validity or application of tests results; when a customer requires it or when UoM affects conformity to a specification limit.

4.2. Section 7.8.6 of **ISO/IEC 17025:2017** stipulates a decision rule must be applied when a statement of conformity is provided. The decision rule must be clearly communicated and agreed with the customer. There are different types of decision rules (further information can be found in UKAS LAB 48 and ILAC G8:09 2019) which can be utilised depending on the nature of the business.

4.3. At WarringtonFire uncertainty of measurement will be included in test reports as a standard.

4.4. At WarringtonFire a **binary statement with guard bands** decision rule shall be utilised unless a rule is already provided by a specific standard, the test is associated with the BS EN 13501 classification system or the result is of a qualitative nature.

4.5. Where the applicable standard specifies mathematical notation (≤, <, ≥, >) for acceptance criteria, we follow that notation exactly. Where the standard is silent on how to treat results falling on guard band boundaries, we apply a conservative interpretation: values falling exactly on the boundary are treated as falling within the guard band.

4.6. When a sample/s is tested under our ISO/IEC 17025:2017 accreditation, the binary statements of conformity include

PASS	FAIL
If there is a minimum requirement: The measured result is above the acceptance limit which is based on the standard/specification criteria and one expanded uncertainty value.	**If there is a minimum requirement:** The measured result is below the acceptance limit which is based on the standard/specification criteria and one expanded uncertainty value.
If there is a maximum requirement: The measured result is below the acceptance limit which is based on the standard/specification criteria and one expanded uncertainty value.	**If there is a maximum requirement:** The measured result is above the acceptance limit which is based on the standard/specification criteria and one expanded uncertainty value.
If there is a range requirement: The measured result is within the acceptance interval which is based on the standard/specification criteria and one expanded uncertainty value at the upper and lower tolerance limits.	**If there is a range requirement:** The measured result is outside the acceptance interval which is based on the standard/specification criteria and one expanded uncertainty value at the upper and lower tolerance limits.

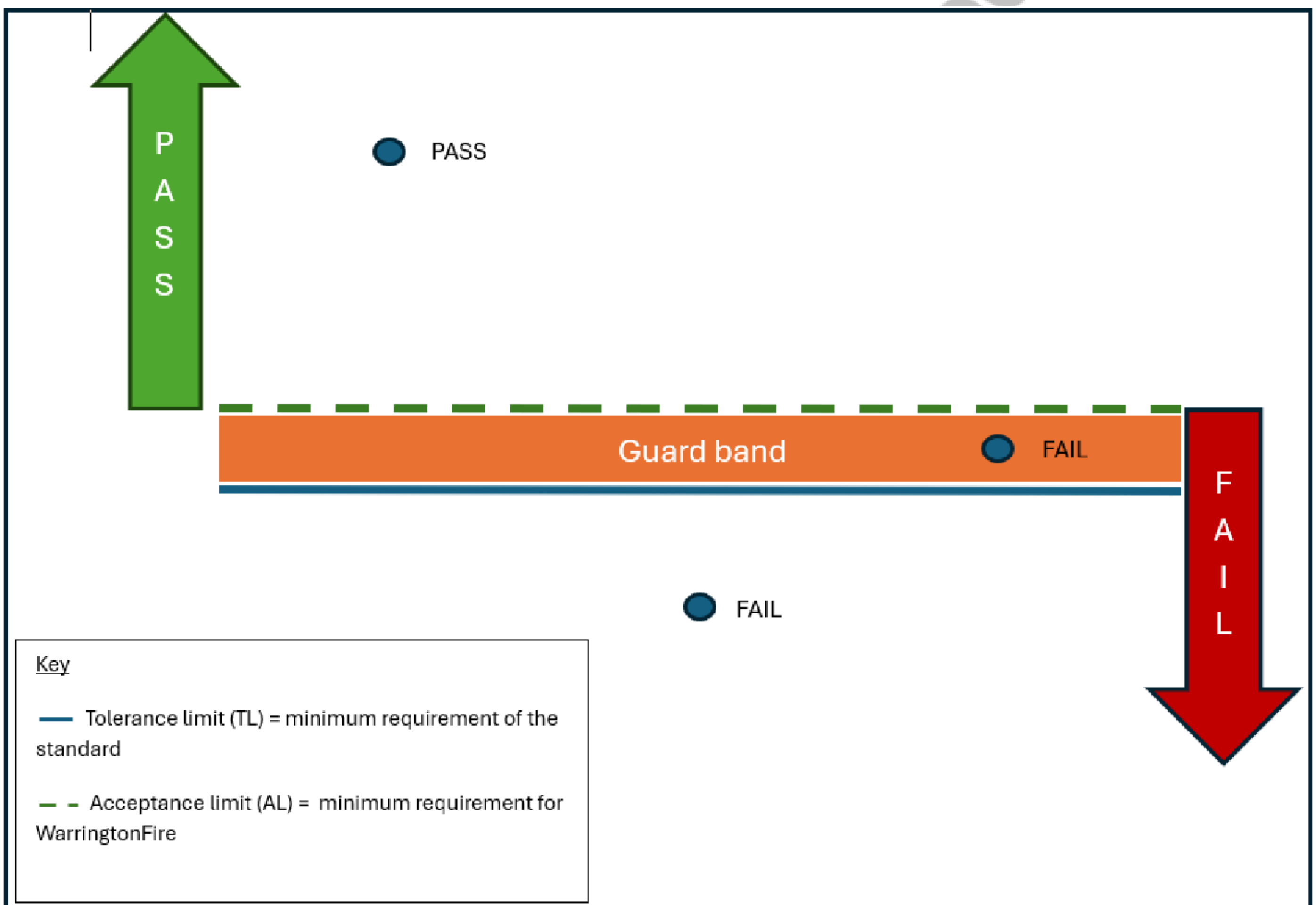
4.7. The guard band/s applied will be 1 expanded measurement of uncertainty (U) as suggested in ILAC G8:09/2019. The expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor

$k=2$, this will provide a coverage probability of 95% and the risk of false acceptance or rejection will be ≤2.5%.

4.8. Acceptance limits produced from application of a decision rule can be located in the uncertainty budgets for the tests.

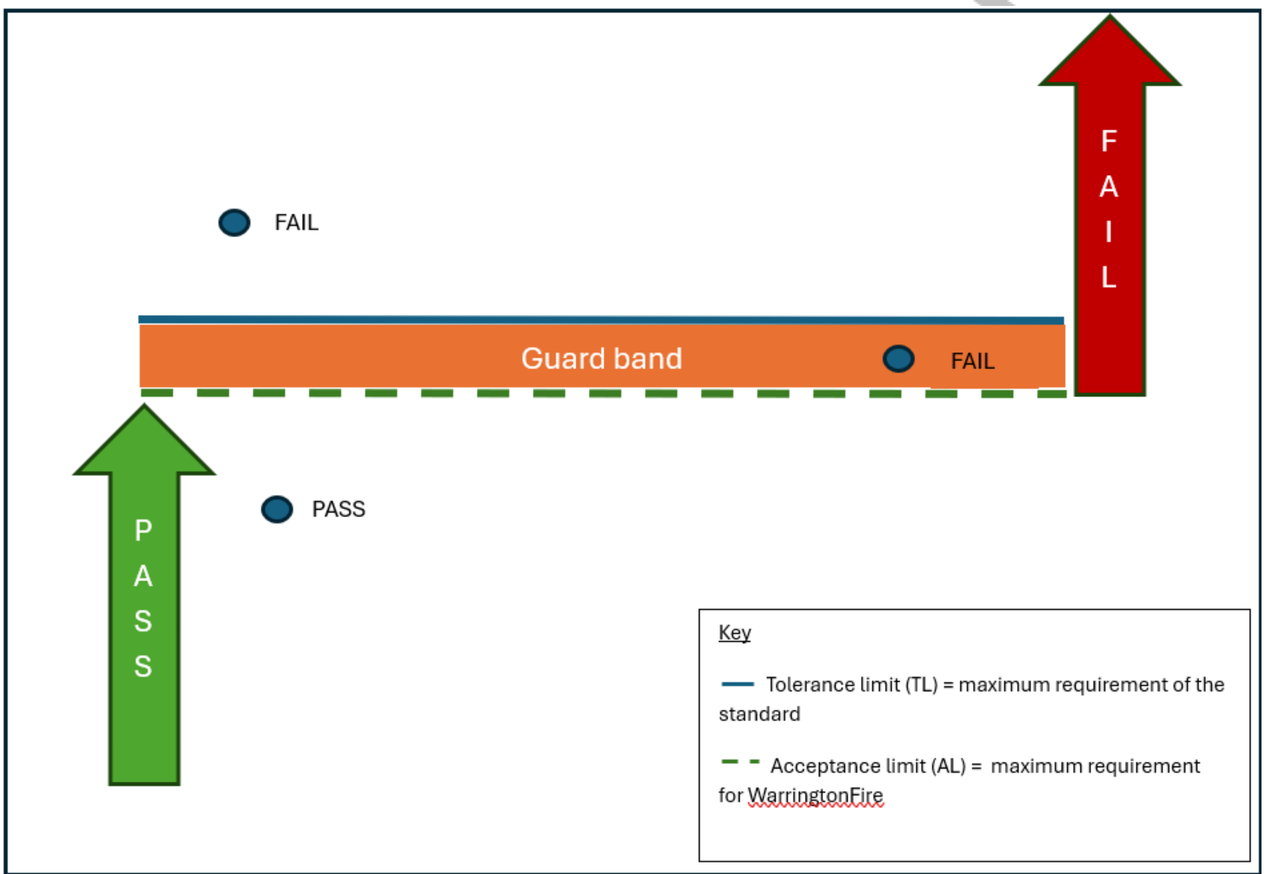
5. EXAMPLES OF DECISION RULES

Diagram of Binary statement with guard band if the criteria state a minimum requirement.



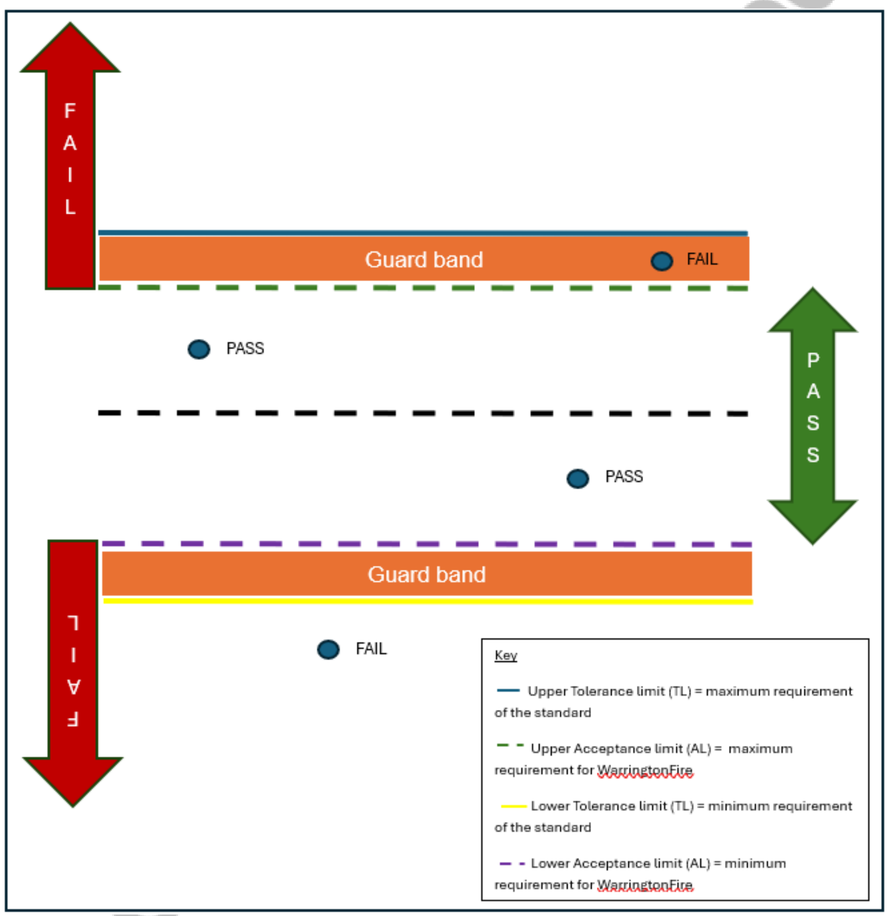
BS EN ISO 4589-2 (Determination of burning behaviour by oxygen index) has an expanded uncertainty of ±0.54%. The classification criteria for a specimen to be issued as an HL3 (R24) under BS EN 45545-2+A1 is that the oxygen content must be a minimum of 32% (tolerance limit, TL). Considering the expanded uncertainty and the above decision rule a test result with an oxygen content of 32.54% (acceptance limit, AL) will have passed and be classified as HL3 (R24). A test result with an oxygen content of 32.20% will have failed the classification criteria for HL3 (R24).

Diagram of Binary statement with guard band if the criteria state a maximum requirement.



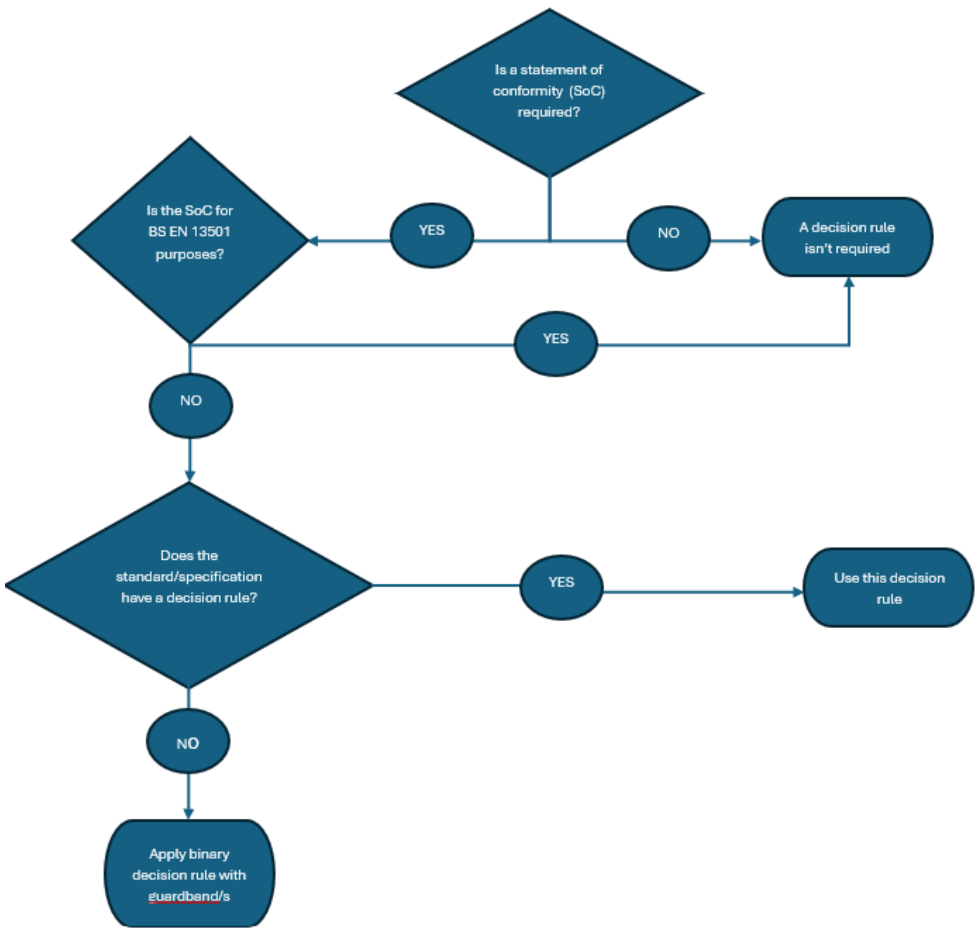
A UL94 V-0 test has an expanded uncertainty of ±10% on the duration of after flaming time. The classification criteria for a specimen to achieve classification V-0 is that after flame time is ≤10 seconds (tolerance limit,TL). Considering the expanded uncertainty and the above decision rule a test result with an after-flame time of 9 seconds(acceptance limit, AL) will have passed and be classified as V-0, a test result with an after-flame time of 10 seconds will have failed the classification criteria for v-0 and be classified as V-1.

Diagram of Binary statement with guard band if the criteria state a range of acceptance.



6. REPORTING STATEMENTS OF CONFORMITY, UNCERTAINITY OF MEASUREMENT AND DECISION RULES

6.1. Upon receiving a work request involving a statement of conformity, the following process flow should be followed to assess whether a decision rule is necessary:



6.2. To promote transparency and clarity, customers will be able to access our decision rules policy via the following avenues:

- In the quotation paperwork, a copy of this policy will be embedded for reading in addition to the following statement – *“To understand our approach to applying reporting statements of conformity and measurement of uncertainty in testing, please refer to our policy here.”*

- Section 7 of the order acknowledgment documentation will outline the decision rule applicable to the standard requirements. For example,

  “Where a specification or standard does not describe how to account for measurement uncertainty and is not for BS EN 13501 classification purposes, we will use the following statements of conformity and decision rules:

PASS	FAIL
If there is a minimum requirement: The measured result is above the acceptance limit which is based on the standard/specification criteria and one expanded uncertainty value.	**If there is a minimum requirement:** The measured result is below the acceptance limit which is based on the standard/specification criteria and one expanded uncertainty value.
If there is a maximum requirement: The measured result is below the acceptance limit which is based on the standard/specification criteria and one expanded uncertainty value.	**If there is a maximum requirement:** The measured result is above the acceptance limit which is based on the standard/specification criteria and one expanded uncertainty value.
If there is a range requirement: The measured result is within the acceptance interval which is based on the standard/specification criteria and one expanded uncertainty value at the upper and lower tolerance limits.	**If there is a range requirement:** The measured result is outside the acceptance interval which is based on the standard/specification criteria and one expanded uncertainty value at the upper and lower tolerance limits.

- Within the report an overview will be provided in the

  <u>Executive summary and test result section (only applicable to SoC and decision rules)</u>

Options will be deleted as applicable:

OPTION 1 PASS – result meets the requirement of the test standard

The measured results meet the acceptance criteria specified in **insert test standard** for **insert product type**. When the measurement uncertainty is taken into account using the applied decision rule, the result remains within the acceptance limit.

The decision rule applied is based on a binary statement with a guard band. The guard band/s applied will be 1 expanded measurement of uncertainty (U) as suggested in ILAC G8:09/2019. The expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k=2, this will provide a coverage probability of 95% and the risk of false acceptance or rejection will be ≤2.5%.

On this basis, the test outcome is reported as a PASS.

OPTION 2 FAIL – result does not meet the requirement of the test standard

The measured result does not meet the acceptance criteria specified in **insert test standard** for **insert product type**. When the measurement uncertainty is taken into account using the applied decision rule, the result remains outside the acceptance limit.

The decision rule applied is based on a binary statement with a guard band. The guard band/s applied will be 1 expanded measurement of uncertainty (U) as suggested in ILAC G8:09/2019. The expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k=2, this will provide a coverage probability of 95% and the risk of false acceptance or rejection will be ≤2.5%.

On this basis, the test outcome is reported as a FAIL.

OPTION 3 MEASURED PASS → Decision rule fail

The measured result is within the acceptance limit specified in **insert test standard** for **insert product type.** However, when the measurement uncertainty is taken into account using the applied decision rule, the result cannot be shown with sufficient confidence to meet the acceptance criteria.

The decision rule applied is based on a binary statement with a guard band. The guard band/s applied will be 1 expanded measurement of uncertainty (U) as suggested in ILAC G8:09/2019. The expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k=2, this will provide a coverage probability of 95% and the risk of false acceptance or rejection will be ≤2.5%.

On this basis, the test outcome is reported as a FAIL.

Example:

Delete as applicable:

OPTION 1 PASS – result meets the requirement of the test standard

The measured results meet the acceptance criteria specified in IMO Resolution MSC 307(88): Annex 1: Part 2 / IMO MSC.399(95): 2015 for **bulkhead, wall and ceiling / floor covering / primary deck covering**. When the measurement uncertainty is taken into account using the applied decision rule, the result remains within the acceptance limit.

The decision rule applied is based on a binary statement with a guard band. The guard band/s applied will be 1 expanded measurement of uncertainty (U) as suggested in ILAC G8:09/2019. The expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k=2, this will provide a coverage probability of 95% and the risk of false acceptance or rejection will be ≤2.5%.

On this basis, the test outcome is reported as a PASS.

OPTION 2 FAIL – result does not meet the requirement of the test standard

The measured result does not meet the acceptance criteria specified in IMO Resolution MSC 307(88): Annex 1: Part 2 / IMO MSC.399(95): 2015 for **bulkhead, wall and ceiling / floor covering / primary deck covering**. When the measurement uncertainty is taken into account using the applied decision rule, the result remains outside the acceptance limit.

The decision rule applied is based on a binary statement with a guard band. The guard band/s applied will be 1 expanded measurement of uncertainty (U) as suggested in ILAC G8:09/2019. The expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k=2, this will provide a coverage probability of 95% and the risk of false acceptance or rejection will be ≤2.5%.

On this basis, the test outcome is reported as a FAIL.

OPTION 3 MEASURED PASS → Decision rule fail

The measured result is within the acceptance limit specified in IMO Resolution MSC 307(88): Annex 1: Part 2 / IMO MSC.399(95): 2015 for **bulkhead, wall and ceiling / floor covering / primary deck covering**. However, when the measurement uncertainty is taken into account using the applied decision rule, the result cannot be shown with sufficient confidence to meet the acceptance criteria.

The decision rule applied is based on a binary statement with a guard band. The guard band/s applied will be 1 expanded measurement of uncertainty (U) as suggested in ILAC G8:09/2019. The expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor k=2, this will provide a coverage probability of 95% and the risk of false acceptance or rejection will be ≤2.5%.

On this basis, the test outcome is reported as a FAIL.

- Main body of the report or Appendix – Uncertainty of Measurement

  - A summary of the UoM for the test (applicable on any test report)
  - Simplified explanation on expanded uncertainty (only applicable to SoC and decision rules)

Example:

Specimen No.	***1***	***2***	***3***	***4***	***5***	***6***
Maximum distance travelled at 1.5 minutes (mm)	**±3**	**±3**	**±3**	**±3**	**±3**	**±3**
Maximum distance travelled at 10 minutes (mm)	**±5**	**±10**	**±5**	**±10**	**±5**	**±5**

"The standard does not describe how to account for measurement uncertainty, therefore the following decision rule has been applied:

To ensure reliable pass/fail decisions, we apply a guard band to the test limit. This means the measurement uncertainty is taken into account so that a result is only marked as a pass when we can state compliance with high confidence. If the result overlaps the limit when uncertainty is considered, it is reported as Fail, because compliance cannot be confirmed with sufficient confidence.

***** Explanation notes for tests which have previously been reported as pass and now fail due to decision rule –***

This result would be within the limit on its raw value; however, after applying the required uncertainty guard band, compliance cannot be confirmed and the result is therefore reported as Fail.**

Revision History

Version 1 – Initial release

Version 2 – Update to wording following review