

Regular Inter-laboratory Counting Exchange Information Book for Participants



Issue Status

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Note: Latest issue supersedes all previous issues.

Contents:

1. Purpose of the Scheme	3
2. Management of the Scheme	3
3. Overview	3
4. Membership	3
5. Operation of the Scheme	4
a. Slides	4
b. Distribution	4
c. Despatch	5
d. Slide Receipt	5
e. Damaged Slides	5
f. Slide Evaluation	5
g. Reporting of Results	7
h. Despatch from Laboratory	7
i. Processing of Results	7
6. Records and Confidentiality	8
7. Collusion and Falsification of Results	9
8. Queries	9
a. Slide Queries	9
b. Accreditation	9
c. Extensions	10
d. Sample Despatch/Delivery	10
9. Complaints and Appeals Procedure	10
10. Advertising by Participants	10
11. Quality Control and Training Products	11
a. Replacement Batches	11
b. Training Batches	11
c. New Participants	11
Annex 1	12
Scoring System	12
Annex 2	20
Slide Responsibilities & Breakages	20
Annex 3	22
Contacts and Advice	22
Annex 4	23
Glossary of Terms	23
Annex 5	24
Responsibilities, Terms & Conditions	24
Participant Responsibilities	24
Annex 6	26
Analyst Hints & Tips	26

1. Purpose of the Scheme

The Regular Inter-laboratory Counting Exchanges (RICE) Scheme is an international inter-laboratory proficiency testing (PT) scheme, intended to assess and improve the performance of laboratories carrying out air monitoring for asbestos fibres. The scheme provides an externally verified indication of performance that analysts can use to satisfy themselves, their organisation, and their clients that their analyses are of the appropriate standard and level of quality.

Laboratories in the UK offering air monitoring as a service are required to participate in such a proficiency testing scheme to gain accreditation from the United Kingdom Accreditation Service (UKAS).

The scheme is intended to be self-regulatory so that initiatives for improving analytical performance are taken by the individual laboratory and not imposed by an outside body. As the scheme alone cannot ensure day-to-day quality, each laboratory should devise its own internal quality system which will take into account other factors not included in the scheme, such as the choice of sampling location, the sampling method used and test method used, any of which may also affect the outcome of the test result.

2. Management of the Scheme

The RICE scheme is managed by the Science Division of the Health and Safety Executive (SD HSE). The Fibre Proficiency Testing Steering Committee (FPTSC) oversees the operation of AIMS and acts as an appeal panel in cases of dispute. The FPTSC committee has representatives from laboratories in the industry specialising in asbestos analysis, independent experts, HSE and UKAS. In order to ensure confidentiality, each laboratory is identified by a code known only to them and to the PT Team (PT Laboratory number). Participation in the RICE scheme does not constitute recognition or approval of a laboratory by HSE

3. Overview

There are 3 rounds of RICE every year, with each round consisting of a batch of slides. The number of slides within a batch is determined by the number of analysts registered to the scheme. The deadline for results submission is given on the Asbestos PT Scheme Schedule available on the website. Laboratories have approximately **20 working days** to count the slides and submit results. Following the deadline, results from participants are processed by the PT Team and the provisional reports are despatched within 1 week. A certificate is sent approximately 1 month after the round closure. The assessment of laboratory performance is based on the results over four consecutive rounds (Good, Acceptable but needs improvement, Unsatisfactory or Unclassified).

4. Membership

RICE is open to any laboratory involved in counting fibres using Phase Contrast Microscopy (PCM) methods and the WHO counting rules or criteria. The membership fee covers 1 year (financial year April to March) and includes 3 rounds. New participants joining the scheme part way through the year pay only for the remaining rounds in that year on a pro rata basis. Participants may withdraw from the scheme at any time by informing the PT Team in writing. The membership fee is non-refundable. Current participants are sent a renewal subscription form before the end of each financial year. It is the participant's responsibility to ensure all details are filled in correctly on the order form and that payment is promptly made in full. **Failure to pay any outstanding fees (including withdrawal / damaged slide fee) may result in reports and slides being withheld and ultimately exclusion from scheme participation.**

5. Operation of the Scheme

a. Slides

The RICE scheme uses a range of mixed fibre reference density slides to reflect the WHO counting rules. The RICE slides are gridded membrane filters, permanently mounted on glass microscope slides with a range of reference densities and include a number of mounted blank filters. Blanks are included because the standard method in HSG248 recommends routine evaluation of blank filters for quality checking of filters and sampling.

Previously, slides have been donated by the asbestos manufacturing industry and participating laboratories. New slides are also produced by the PT Team by sampling airborne aerosols of fibre/dust mixtures using standard asbestos sampling techniques. Potential RICE slides are screened and counted by the PT Team before entering the scheme as a 'candidate' slide.

A batch of RICE slides will contain 'reference' slides and up to six candidate slides. When a robust number of counts have been accumulated for a candidate slide it will be assessed for promotion to a reference slide. If the slide is deemed suitable, a reference value is derived from the median of all counts.

A number of RICE batches will contain a 'Rogue Slide'. These slides are designed to test participants on the counting rules in relation to the rejection criteria.

Rogue slides should be easily identified and may include slides with uneven deposits, overloaded with dust and irregular or distorted gridlines.

b. Distribution

A batch of slides is usually assigned to two laboratories per round. Prior to the despatch of a round, laboratories are advised by email as to whether the laboratory circulation number is 1 or 2. The deadline date associated to the laboratory circulation number can be found on the scheme schedule.

All batches are cleaned and photographed prior to despatch.

Batches sizes are dependent on the number of analysts registered to the scheme and are as follows:

Number of Counters	Number of Reference Slides	Number of Candidate Slides	Total Number of Slides
1-17	8	4	12
18-29	16	4	20
30-41	24	4	28
42-56	32	6	38
57-68	40	6	46
69-80	48	6	54

If a change of batch size is required, please advise the PT Team at least two months prior to the next round despatch date. This is to allow sufficient time for round preparation.

c. Despatch

To avoid damage to slides during transit, appropriate packaging is used. Slides are placed in a green slide box, secured with an elastic band and placed in a foam lined box. An information pack is provided which includes a photograph of the slides allocated to your laboratory.

Slides are despatched to UK participants by Royal Mail Special Delivery and to non-UK participants by an external courier service according to the schedule. This is subject to change at the discretion of the PT Team.

d. Slide Receipt

Slides should be opened immediately upon receipt and their condition checked against the photograph supplied. If there are any differences the PT Team should be emailed within 24 hours, providing a photograph where possible, as per the Slide Responsibilities & Breakages Procedure. Please see Annex 2. If slides are lost or damaged whilst in the laboratories possession, the PT Team must be notified as soon as possible. Failure to inform the PT Team of damaged slides may result in a charge. This fee is a contribution to the replacement costs, RICE slides are a valuable resource and are expensive to produce and validate.

Please take care when handling the slides and ensure that the cover slips and labels are not removed or defaced in any way. Slides are the responsibility of the laboratory from receipt until accepted by the next laboratory, or are returned and received back at HSE.

Participants should contact the PT Team if they have not received their slides within 10 days of the published despatch date.

e. Damaged Slides

It is the participants' responsibility to ensure broken slides are packaged adequately to avoid injuries to others.

Based on the extent of the damage, the PT Team will determine if the slide is useable within the RICE Scheme. If the slide is to be withdrawn from the scheme, a 'slide withdrawal' fee will be applied. The damaged slide will be returned to the participant on receipt of payment. If the slide is deemed useable by the PT Team, a lesser 'damaged slide fee' will be applied. Full details of these charges can be found on the current RICE QC Order Form. Please refer to Annex 2 for the Slide Responsibilities & Breakages Procedure.

f. Slide Evaluation

The recommended method of evaluation uses the counting rules of the World Health Organisation (WHO), as described in HSG248 (Asbestos: The analyst's guide for sampling, analysis and clearance procedures). The recommended stopping rules for the RICE scheme are to count 100 fibres or evaluate 200 fields (graticule areas). A minimum of 20 fields should be assessed, even if there are more than 100 fibres in the 20 fields.

The PT Team will only accept data which complies with the following:

- All slides in the batch must be counted, failure to do so may result in a band C score being applied.
- The only exception to this rule is if a slide is deemed to be a rogue slide (see definition in Annex 4 and Hints & Tips section for further information). The PT ODES should be updated with the counters initials

and zero entered for fibres, fields and density - a comment should be made on the results form stating 'Rogue Slide'.

- A maximum of 3 counts per slide may be submitted
- A maximum of 17 analysts may submit counts per batch of 8 reference slides, or as per table above (5b)
- Each analyst should submit counts for at least 2 slides

The reporting of results involves the calculation of fibre density, which is the number of fibres per square millimetre of the exposed filter surface (fibres.mm⁻²); this is obtained using the formula:

$$d = \frac{f}{Fa}$$

where:

d is the fibre density (in fibres per mm²)

f is the number of fibres counted

F is the number of fields evaluated

a is the single field area (mm²)

A single field area is that defined by the Walton Beckett graticule. These areas should be chosen at random to avoid bias and should be representative of the exposed filter area. Any fields lying within 4mm of the filter edge or within 2mm of the cutting line should be avoided and not counted (as recommended in HSG248).

For a circular field, the area *a* (in mm²) of a circle of diameter *D* mm is given by:

$$a = \frac{\pi.D^2}{4}$$

Example:

A microscope is fitted with a Walton-Beckett graticule having a diameter of 102 µm (0.102mm) in the object plane. Evaluation of the sample gives 101 fibres in 65 fields.

$$\text{Area of single graticule field} = \frac{3.1416 \times (0.102)^2}{4} = 0.00817 \text{ mm}^2$$

$$\text{Fibre density (fibres.mm}^{-2}\text{)} = \frac{101}{0.00817 \times 65} = 190.2 \text{ fibres.mm}^{-2}$$

Results are calculated to the nearest 0.1 fibres.mm⁻².

g. Reporting of Results

Laboratories have until the deadline date, approximately 20 working days, to count the slides and to report the results. If a laboratory is unable to count the slides by the assigned deadline date, they must pass them on uncounted, to the next laboratory.

RICE results are submitted using the PT online data entry system (PT ODES). A unique user name and password is issued to each participating laboratory. Laboratories should enter their results as indicated on screen for each slide. It is the participants' responsibility to submit their results correctly and to ensure their details are fully completed.

Late results will not be processed. Deadline dates will be strictly adhered to and extensions will only be granted in exceptional circumstances at the PT Team's discretion.

Participants are able to miss one round in four. The PT Team and the relevant accreditation body should be advised before the round results deadline date, specified on the scheme schedule.

Laboratories are advised to retain copies of RICE results submitted.

Any queries regarding reporting of results should be sent in writing to the email address in Annex 3.

Please note: Participants may be asked to submit results in an alternative format at the PT Team's discretion.

h. Despatch from Laboratory

The slides must be sent to the next laboratory by the results deadline as indicated on the scheme schedule. When despatching slides to the next laboratory, please ensure the following is completed:

- All slides are despatched in the original packaging.
- The green slide box is secured with an elastic band
- The information pack is included along with the original slide photograph
- The address and fragile label are attached to the outer packaging
- Any remaining labels are included in the package

UK Laboratories must despatch the slides by Royal Mail Special Delivery. Non UK laboratories must use a courier. It is recommended that adequate insurance is obtained to cover any damage which may occur during transit.

i. Processing of Results

Provisional Report

Following results submission, the counts are compared with the performance limits described in Annex 1. The proportion of counts which fall into the target bands A, B or C, are calculated as a percentage of the total number of valid counts. The target bands achieved will be displayed on the 'provisional report' which will be available on the PT ODES.

It is important to note that these results are provisional and are intended to provide laboratories with timely feedback. Valid counts are subject to change following a round at the PT Team's discretion, e.g. slide withdrawal.

The PT Team will aim to provide laboratories with provisional reports within 10 working days of receipt of results.

Certificate

The percentages are expressed as a Category for each period covered by four consecutive rounds. Each category is represented by a classification;

- **Category 1 – Good**
75% or more of the valid counts are banded A
- **Category 2 – Acceptable but needs Improvement**
Less than 75% of the valid counts are banded A, but more than 75% are within Bands A and B combined
- **Category 3 – Unsatisfactory**
The proportion of counts in the target bands A and B are less than 75%
- **Awaiting Classification**
Assigned when fewer than four rounds have been completed or a laboratory has missed more than one round in a four round cycle. However if the laboratory were Category 3 then that category will stand

If a new laboratory has completed 3 rounds and 100% of their counts are banded A they will be classified as category 1 after 3 rounds.

The PT Team will provide laboratories with certificates following completion of slide investigations.

The aim of every laboratory should be to achieve and maintain a Category 1 performance in RICE. Category 2, while acceptable in the short term, should be taken as an indication that improvements are needed. If a laboratory achieves an 'Unsatisfactory' classification, the PT Team may notify the relevant accreditation body.

It is strongly recommended that counts by trainee analysts are not submitted as this could adversely affect the laboratories performance.

HSE guidance recommends that all laboratories undertaking asbestos fibre counting should participate in the RICE scheme (HSG 248 Appendix 1, A1.45). UKAS guidance requires all analysts who are authorised to carry out fibre counting shall participate in the RICE scheme (section 16.2.1.1, UKAS Guidance Lab 30).

6. Records and Confidentiality

Paper and computer records are maintained and include information such as laboratory name, laboratory contact name, accounts contact name, e-mail address, postal address, and telephone numbers. It is the responsibility of the participant to notify the PT Team of any changes of any contact details that are required. This also includes any changes which may be required regarding online data entry user names and passwords. Participants requiring change of contact details should contact the PT Team who will administer a '**PT Change of Details Form**', which should be fully completed and promptly returned to the PT Team.

Results and participant details are submitted to the scheme administrators in confidence and are not revealed to any third party except where required to do so by law, for example in association with a criminal prosecution.

Participant performance will be published on the website if requested by accreditation bodies. A list of laboratories with current classifications of 'Good' or 'Acceptable but needs Improvement' will be released

after each round of RICE. Participants agree to this by joining RICE and undertaking the completion of the subscription form. **Participant laboratory numbers or passwords will not be published by the PT Team at any time**; this information is held confidentially by the PT Team and the participant.

7. Collusion and Falsification of Results

Laboratories must not submit results, which are false reflections of the performances of those laboratories' individual analysts, whether by collusion within or between laboratories, or by any other means. Falsification of results is regarded as an extremely serious matter. The following disciplinary procedures may be applied whenever there is clear documentary evidence of falsification of results or improper collusion.

- The relevant accreditation body will be informed
- The laboratory will revert to unclassified
- The membership of the laboratory may be suspended, subject to review by FPTSC.

Reinstatement after suspension for falsifying results

Lab must satisfy UKAS, or the relevant accreditation body, that appropriate corrective and preventive actions have been put in place to prevent recurrence. Evidence must be supplied to the PT Team, which will be reviewed by FPTSC.

Upon reinstatement, the laboratory will be treated as a new participant (i.e. they will be categorised as unclassified until the relevant numbers of rounds have been completed).

8. Queries

If participants have routine administrative queries these should be directed to the PT Team. To ensure a prompt response the preferred method of enquiry is by email, however enquiries may also be submitted by telephone or letter format. Participants must quote their 'PT laboratory number' in all correspondence to ensure a prompt and efficient response.

Queries of a non-administrative nature (which may affect a laboratory's participation or performance in the scheme) must be written, either in email or letter format and should be sent to the email/postal address given in Annex 3.

a. Slide Queries

Any queries relating to scores or counts should be raised when the Provisional Report has been issued. Laboratories must contact PT Team within 10 working days from the issue date. The final certificate should not be used to challenge results. All queries will be dealt with on an individual basis and will be considered and acted upon by the PT Team. If the PT Team is unable to resolve the query to the satisfaction of the laboratory, it will be forwarded to the FPTSC, refer to section 8.

Slides are constantly reviewed as counts are processed. Deviations from the expected counting pattern are marked for investigation at the end of the round. The PT Team may withdraw investigated slides or re-enter them as candidate slides.

Please be aware that if a slide needs to be re-evaluated following a request from a laboratory this can only take place when it has been returned to the PT Team. It may take several weeks to resolve a query.

If it is subsequently found that there is an issue with a slide, results for that slide may be excluded from the performance classification of all who have counted the slide in that round.

b. Accreditation

Any query regarding participant accreditation; i.e. status of performance and related scores; good / acceptable but needs improvement / unsatisfactory / unclassified, or 'missing a round' should be taken up with the participant's appropriate accreditation body.

c. Extensions

Extensions will not normally be considered. If slides are despatched later than published, all participants will be contacted by email and given the revised deadline date. The website will also be amended to display the revised deadline date.

d. Sample Despatch/Delivery

It is the participants' responsibility to provide the PT Team with an up-to-date receipt location/address and contact details, and to inform whoever receives the slides when they are expected. If participants wish to change contact or company details, a request should be sent by email to the PT Team. A 'PT Change of Details Form' will be issued which must be fully completed and promptly returned.

Where necessary, participants must ensure any required paperwork is in place to allow transit of RICE slides through customs. Any additional charges incurred from couriers will be passed onto the participant. If slides are returned to the PT Team by the courier and have to be re-despatched to a different address to that originally given on the order form or on a 'Change of Details Form', then a charge may be levied.

9. Complaints and Appeals Procedure

Complaints **must** be in writing and will be forwarded to and considered by the FPTSC. The complaint will be acknowledged and the participant informed of receipt and date for consideration. The decision of the FPTSC will be sent to the participant as soon as possible.

If the participant wishes to appeal following a slide query investigation, then this also must be in writing and should be sent to the PT Team within 10 working days of the outcome. The appeal will then be considered at the next meeting of the FPTSC or during a convening of FPTSC members by email/teleconference at the discretion of the FPTSC chairperson. The participant will be informed of the outcome by the chairperson of the FPTSC.

10. Advertising by Participants

It is recommended that any publicity and advertising material should describe the laboratory undertaking RICE as a 'RICE Participant'. Participants may wish to describe the level of the laboratory performance, but should state the year in which this status was achieved.

Laboratories or individuals that no longer participate in the RICE scheme or who are suspended must not use materials that claim or imply current membership of RICE.

11. Quality Control and Training Products

a. Replacement Batches

Replacement batches may be used to allow a laboratory to replace a poor score in a round. These are subject to availability. Full details can be found on the RICE QC order form. To request a copy, please email the PT team using the contact details in Annex 3.

The best scores of the last four available rounds will be used to determine the performance category. The PT Team removes the poorest scoring batch from the RICE software. Only one replacement batch is permitted in any sequence of four consecutive rounds.

b. Training Batches

These batches may be used for training purposes and are subject to availability. Full details can be found on the RICE QC order form. To request a copy, please email the PT Team using the contact details in Annex 3.

Slides are despatched with the reference values for laboratories to assess counts internally. The results are not processed by the PT Team and do not contribute to the laboratories performance assessment.

c. New Participants

New participants joining the RICE scheme have the option to purchase a maximum of two extra batches. This enables laboratories to work towards establishing a classification more quickly than waiting to complete four full rounds of RICE. It is strongly recommended that new participants seek advice from, and work with, the relevant accreditation body when using this service.

These are subject to availability. Full details can be found on the RICE QC order form. To request a copy, please email the PT team using the contact details in Annex 3.

Annex 1 Scoring System

If the reference count is denoted by R , the following formulae will give the performance limits which define the target bands A, B and C.

High density slides ($R > 63.7$ fibres. mm^{-2})

Target band A: $> 0.65R$ to $< 1.55R$

Target band B: $> 0.50R$ to $0.65R$ [band -B] and $> 1.55R$ to $2.00R$ [band +B]

Target band C: $< 0.50R$ [band -C] and $> 2.00R$ [band +C]

Low density slides ($R \leq 63.7$ fibres. mm^{-2})*

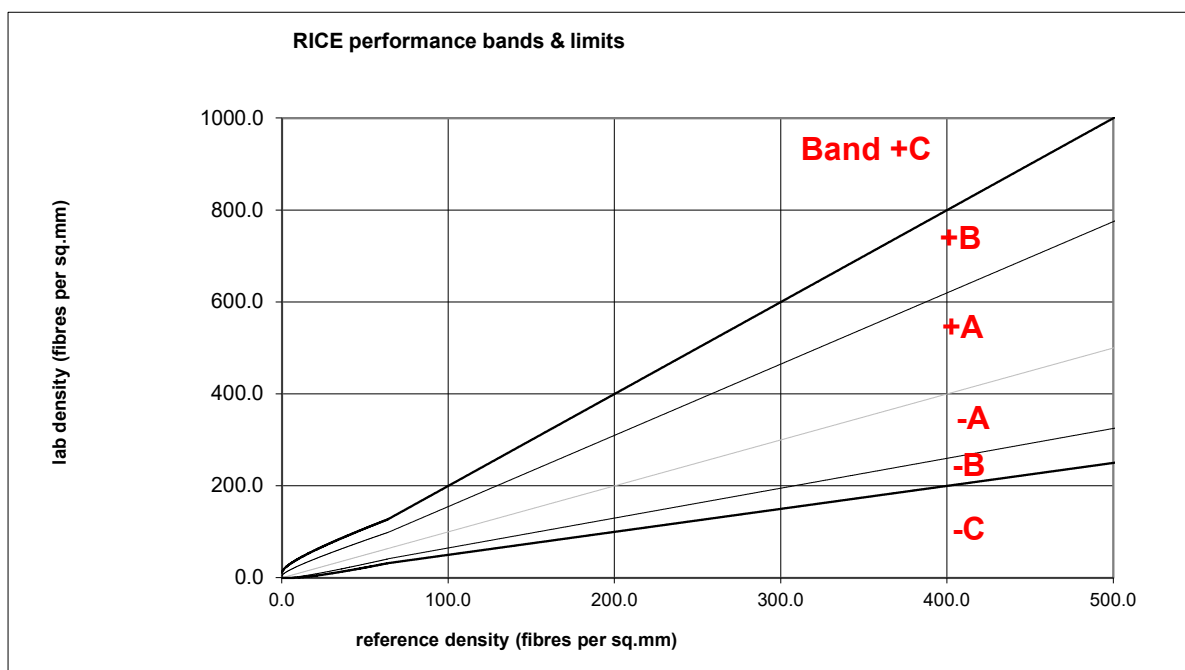
Target band A: $(\sqrt{R-1.57})^2$ to $(\sqrt{R+1.96})^2$ [band A]

Target band B: $< (\sqrt{R-1.57})^2$ to $(\sqrt{R-2.34})^2$ [band -B]
 $> (\sqrt{R+1.96})^2$ to $(\sqrt{R+3.30})^2$ [band +B]

Target band C: $< (\sqrt{R-2.34})^2$ [band -C]
 $> (\sqrt{R+3.30})^2$ [band +C]

* For samples less than 5.5 fibres. mm^{-2} the lower limit is set to zero when the component within the brackets $(\sqrt{R-n})$ is less than zero.

The plot shows the positions of the performance limits in relation to the reference counts up to reference density 1000 fibres per mm^2



The performance limits calculated from the formulae for low-density reference samples are listed below for samples with reference counts 0.0 to 63.7 fibres per mm². A laboratory's count between the lower and upper inner limits is in band **A**; between the lower inner and lower outer limits, band **-B**; between the upper inner and upper outer, band **+B**; below the lower outer limit, band **-C**; above the upper outer limit, band **+C**. Densities, which, after rounding to one decimal place, fall exactly on a boundary, are considered to lie in the better performance band. For example, if a laboratory returns a density of 2.4 fibres.mm⁻² for a sample with reference count 15.1 fibres.mm⁻², the count lies in Band -B.

lower outer limit	lower inner limit	reference count	upper inner limit	upper outer limit
-	-	0.0	3.8	10.9
-	0.0	0.1	5.2	13.1
-	0.0	0.2	5.8	14.0
-	0.0	0.3	6.3	14.8
-	0.0	0.4	6.7	15.5
-	0.0	0.5	7.1	16.1
-	0.0	0.6	7.5	16.6
-	0.0	0.7	7.8	17.1
-	0.0	0.8	8.1	17.6
-	0.0	0.9	8.5	18.1
-	0.0	1.0	8.8	18.5
-	0.0	1.1	9.1	18.9
-	0.0	1.2	9.3	19.3
-	0.0	1.3	9.6	19.7
-	0.0	1.4	9.9	20.1
-	0.0	1.5	10.1	20.5
-	0.0	1.6	10.4	20.8
-	0.0	1.7	10.7	21.2
-	0.0	1.8	10.9	21.5
-	0.0	1.9	11.1	21.9
-	0.0	2.0	11.4	22.2
-	0.0	2.1	11.6	22.6
-	0.0	2.2	11.9	22.9
-	0.0	2.3	12.1	23.2
-	0.0	2.4	12.3	23.5
-	0.0	2.5	12.5	23.8
-	0.0	2.6	12.8	24.1
-	0.0	2.7	13.0	24.4
-	0.0	2.8	13.2	24.7
-	0.0	2.9	13.4	25.0
-	0.0	3.0	13.6	25.3
-	0.0	3.1	13.8	25.6
-	0.0	3.2	14.1	25.9
0.0	0.1	3.3	14.3	26.2
0.0	0.1	3.4	14.5	26.5
0.0	0.1	3.5	14.7	26.7
0.0	0.1	3.6	14.9	27.0
0.0	0.1	3.7	15.1	27.3
0.0	0.1	3.8	15.3	27.6
0.0	0.2	3.9	15.5	27.8
0.0	0.2	4.0	15.7	28.1
0.0	0.2	4.1	15.9	28.4
0.0	0.2	4.2	16.1	28.6
0.0	0.3	4.3	16.3	28.9
0.0	0.3	4.4	16.5	29.1
0.0	0.3	4.5	16.7	29.4
0.0	0.3	4.6	16.8	29.6
0.0	0.4	4.7	17.0	29.9
0.0	0.4	4.8	17.2	30.1
0.0	0.4	4.9	17.4	30.4
0.0	0.4	5.0	17.6	30.6

lower outer limit	lower inner limit	reference count	upper inner limit	upper outer limit
0.0	0.5	5.1	17.8	30.9
0.0	0.5	5.2	18.0	31.1
0.0	0.5	5.3	18.2	31.4
0.0	0.6	5.4	18.4	31.6
0.0	0.6	5.5	18.5	31.9
0.0	0.6	5.6	18.7	32.1
0.0	0.7	5.7	18.9	32.3
0.0	0.7	5.8	19.1	32.6
0.0	0.7	5.9	19.3	32.8
0.0	0.8	6.0	19.4	33.1
0.0	0.8	6.1	19.6	33.3
0.0	0.8	6.2	19.8	33.5
0.0	0.9	6.3	20.0	33.8
0.0	0.9	6.4	20.2	34.0
0.0	1.0	6.5	20.3	34.2
0.1	1.0	6.6	20.5	34.4
0.1	1.0	6.7	20.7	34.7
0.1	1.1	6.8	20.9	34.9
0.1	1.1	6.9	21.0	35.1
0.1	1.2	7.0	21.2	35.4
0.1	1.2	7.1	21.4	35.6
0.1	1.2	7.2	21.6	35.8
0.1	1.3	7.3	21.7	36.0
0.1	1.3	7.4	21.9	36.2
0.2	1.4	7.5	22.1	36.5
0.2	1.4	7.6	22.2	36.7
0.2	1.5	7.7	22.4	36.9
0.2	1.5	7.8	22.6	37.1
0.2	1.5	7.9	22.8	37.3
0.2	1.6	8.0	22.9	37.6
0.3	1.6	8.1	23.1	37.8
0.3	1.7	8.2	23.3	38.0
0.3	1.7	8.3	23.4	38.2
0.3	1.8	8.4	23.6	38.4
0.3	1.8	8.5	23.8	38.6
0.4	1.9	8.6	23.9	38.8
0.4	1.9	8.7	24.1	39.1
0.4	2.0	8.8	24.3	39.3
0.4	2.0	8.9	24.4	39.5
0.4	2.0	9.0	24.6	39.7
0.5	2.1	9.1	24.8	39.9
0.5	2.1	9.2	24.9	40.1
0.5	2.2	9.3	25.1	40.3
0.5	2.2	9.4	25.3	40.5
0.6	2.3	9.5	25.4	40.7
0.6	2.3	9.6	25.6	40.9
0.6	2.4	9.7	25.8	41.1
0.6	2.4	9.8	25.9	41.4
0.7	2.5	9.9	26.1	41.6
0.7	2.5	10.0	26.2	41.8

lower outer limit	Lower inner limit	reference count	upper inner limit	upper outer limit
0.7	2.6	10.1	26.4	42.0
0.7	2.6	10.2	26.6	42.2
0.8	2.7	10.3	26.7	42.4
0.8	2.7	10.4	26.9	42.6
0.8	2.8	10.5	27.0	42.8
0.8	2.8	10.6	27.2	43.0
0.9	2.9	10.7	27.4	43.2
0.9	2.9	10.8	27.5	43.4
0.9	3.0	10.9	27.7	43.6
1.0	3.1	11.0	27.8	43.8
1.0	3.1	11.1	28.0	44.0
1.0	3.2	11.2	28.2	44.2
1.0	3.2	11.3	28.3	44.4
1.1	3.3	11.4	28.5	44.6
1.1	3.3	11.5	28.6	44.8
1.1	3.4	11.6	28.8	45.0
1.2	3.4	11.7	29.0	45.2
1.2	3.5	11.8	29.1	45.4
1.2	3.5	11.9	29.3	45.6
1.3	3.6	12.0	29.4	45.8
1.3	3.6	12.1	29.6	45.9
1.3	3.7	12.2	29.7	46.1
1.4	3.8	12.3	29.9	46.3
1.4	3.8	12.4	30.0	46.5
1.4	3.9	12.5	30.2	46.7
1.5	3.9	12.6	30.4	46.9
1.5	4.0	12.7	30.5	47.1
1.5	4.0	12.8	30.7	47.3
1.6	4.1	12.9	30.8	47.5
1.6	4.1	13.0	31.0	47.7
1.6	4.2	13.1	31.1	47.9
1.7	4.3	13.2	31.3	48.1
1.7	4.3	13.3	31.4	48.3
1.7	4.4	13.4	31.6	48.4
1.8	4.4	13.5	31.7	48.6
1.8	4.5	13.6	31.9	48.8
1.9	4.5	13.7	32.1	49.0
1.9	4.6	13.8	32.2	49.2
1.9	4.7	13.9	32.4	49.4
2.0	4.7	14.0	32.5	49.6
2.0	4.8	14.1	32.7	49.8
2.0	4.8	14.2	32.8	50.0
2.1	4.9	14.3	33.0	50.1
2.1	4.9	14.4	33.1	50.3
2.2	5.0	14.5	33.3	50.5
2.2	5.1	14.6	33.4	50.7
2.2	5.1	14.7	33.6	50.9
2.3	5.2	14.8	33.7	51.1
2.3	5.2	14.9	33.9	51.3
2.4	5.3	15.0	34.0	51.5
2.4	5.4	15.1	34.2	51.6
2.4	5.4	15.2	34.3	51.8
2.5	5.5	15.3	34.5	52.0
2.5	5.5	15.4	34.6	52.2
2.6	5.6	15.5	34.8	52.4
2.6	5.7	15.6	34.9	52.6
2.6	5.7	15.7	35.1	52.7
2.7	5.8	15.8	35.2	52.9
2.7	5.8	15.9	35.4	53.1
2.8	5.9	16.0	35.5	53.3
2.8	6.0	16.1	35.7	53.5
2.8	6.0	16.2	35.8	53.7
2.9	6.1	16.3	36.0	53.8

lower outer limit	lower inner limit	reference count	upper inner limit	upper outer limit
3.2	6.6	17.1	37.2	55.3
3.3	6.6	17.2	37.3	55.5
3.3	6.7	17.3	37.4	55.6
3.4	6.8	17.4	37.6	55.8
3.4	6.8	17.5	37.7	56.0
3.4	6.9	17.6	37.9	56.2
3.5	7.0	17.7	38.0	56.4
3.5	7.0	17.8	38.2	56.5
3.6	7.1	17.9	38.3	56.7
3.6	7.1	18.0	38.5	56.9
3.7	7.2	18.1	38.6	57.1
3.7	7.3	18.2	38.8	57.2
3.8	7.3	18.3	38.9	57.4
3.8	7.4	18.4	39.1	57.6
3.8	7.5	18.5	39.2	57.8
3.9	7.5	18.6	39.3	58.0
3.9	7.6	18.7	39.5	58.1
4.0	7.7	18.8	39.6	58.3
4.0	7.7	18.9	39.8	58.5
4.1	7.8	19.0	39.9	58.7
4.1	7.8	19.1	40.1	58.8
4.2	7.9	19.2	40.2	59.0
4.2	8.0	19.3	40.4	59.2
4.3	8.0	19.4	40.5	59.4
4.3	8.1	19.5	40.7	59.5
4.4	8.2	19.6	40.8	59.7
4.4	8.2	19.7	40.9	59.9
4.5	8.3	19.8	41.1	60.1
4.5	8.4	19.9	41.2	60.2
4.5	8.4	20.0	41.4	60.4
4.6	8.5	20.1	41.5	60.6
4.6	8.6	20.2	41.7	60.8
4.7	8.6	20.3	41.8	60.9
4.7	8.7	20.4	41.9	61.1
4.8	8.7	20.5	42.1	61.3
4.8	8.8	20.6	42.2	61.4
4.9	8.9	20.7	42.4	61.6
4.9	8.9	20.8	42.5	61.8
5.0	9.0	20.9	42.7	62.0
5.0	9.1	21.0	42.8	62.1
5.1	9.1	21.1	42.9	62.3
5.1	9.2	21.2	43.1	62.5
5.2	9.3	21.3	43.2	62.7
5.2	9.3	21.4	43.4	62.8
5.3	9.4	21.5	43.5	63.0
5.3	9.5	21.6	43.7	63.2
5.4	9.5	21.7	43.8	63.3
5.4	9.6	21.8	43.9	63.5
5.5	9.7	21.9	44.1	63.7
5.5	9.7	22.0	44.2	63.8
5.6	9.8	22.1	44.4	64.0
5.6	9.9	22.2	44.5	64.2
5.7	9.9	22.3	44.7	64.4
5.7	10.0	22.4	44.8	64.5
5.8	10.1	22.5	44.9	64.7
5.8	10.1	22.6	45.1	64.9
5.9	10.2	22.7	45.2	65.0
5.9	10.3	22.8	45.4	65.2
6.0	10.3	22.9	45.5	65.4
6.0	10.4	23.0	45.6	65.5
6.1	10.5	23.1	45.8	65.7
6.1	10.5	23.2	45.9	65.9
6.2	10.6	23.3	46.1	66.0

2.9	6.1	16.4	36.1	54.0
3.0	6.2	16.5	36.3	54.2
3.0	6.3	16.6	36.4	54.4
3.1	6.3	16.7	36.6	54.6
3.1	6.4	16.8	36.7	54.7
3.1	6.5	16.9	36.9	54.9
3.2	6.5	17.0	37.0	55.1

6.2	10.7	23.4	46.2	66.2
6.3	10.7	23.5	46.3	66.4
6.3	10.8	23.6	46.5	66.6
6.4	10.9	23.7	46.6	66.7
6.4	10.9	23.8	46.8	66.9
6.5	11.0	23.9	46.9	67.1
6.5	11.1	24.0	47.0	67.2

lower outer limit	lower inner limit	reference count	upper inner limit	upper outer limit
6.6	11.2	24.1	47.2	67.4
6.7	11.2	24.2	47.3	67.6
6.7	11.3	24.3	47.5	67.7
6.8	11.4	24.4	47.6	67.9
6.8	11.4	24.5	47.7	68.1
6.9	11.5	24.6	47.9	68.2
6.9	11.6	24.7	48.0	68.4
7.0	11.6	24.8	48.2	68.6
7.0	11.7	24.9	48.3	68.7
7.1	11.8	25.0	48.4	68.9
7.1	11.8	25.1	48.6	69.1
7.2	11.9	25.2	48.7	69.2
7.2	12.0	25.3	48.9	69.4
7.3	12.0	25.4	49.0	69.6
7.3	12.1	25.5	49.1	69.7
7.4	12.2	25.6	49.3	69.9
7.5	12.2	25.7	49.4	70.0
7.5	12.3	25.8	49.6	70.2
7.6	12.4	25.9	49.7	70.4
7.6	12.5	26.0	49.8	70.5
7.7	12.5	26.1	50.0	70.7
7.7	12.6	26.2	50.1	70.9
7.8	12.7	26.3	50.2	71.0
7.8	12.7	26.4	50.4	71.2
7.9	12.8	26.5	50.5	71.4
7.9	12.9	26.6	50.7	71.5
8.0	12.9	26.7	50.8	71.7
8.0	13.0	26.8	50.9	71.9
8.1	13.1	26.9	51.1	72.0
8.2	13.1	27.0	51.2	72.2
8.2	13.2	27.1	51.3	72.3
8.3	13.3	27.2	51.5	72.5
8.3	13.4	27.3	51.6	72.7
8.4	13.4	27.4	51.8	72.8
8.4	13.5	27.5	51.9	73.0
8.5	13.6	27.6	52.0	73.2
8.5	13.6	27.7	52.2	73.3
8.6	13.7	27.8	52.3	73.5
8.7	13.8	27.9	52.4	73.7
8.7	13.8	28.0	52.6	73.8
8.8	13.9	28.1	52.7	74.0
8.8	14.0	28.2	52.9	74.1
8.9	14.1	28.3	53.0	74.3
8.9	14.1	28.4	53.1	74.5
9.0	14.2	28.5	53.3	74.6
9.0	14.3	28.6	53.4	74.8
9.1	14.3	28.7	53.5	74.9
9.2	14.4	28.8	53.7	75.1
9.2	14.5	28.9	53.8	75.3
9.3	14.6	29.0	54.0	75.4
9.3	14.6	29.1	54.1	75.6
9.4	14.7	29.2	54.2	75.8
9.4	14.8	29.3	54.4	75.9
9.5	14.8	29.4	54.5	76.1
9.6	14.9	29.5	54.6	76.2
9.6	15.0	29.6	54.8	76.4
9.7	15.1	29.7	54.9	76.6
9.7	15.1	29.8	55.0	76.7
9.8	15.2	29.9	55.2	76.9
9.8	15.3	30.0	55.3	77.0
9.9	15.3	30.1	55.4	77.2
10.0	15.4	30.2	55.6	77.4
10.0	15.5	30.3	55.7	77.5
10.1	15.6	30.4	55.9	77.7

lower outer limit	lower inner limit	reference count	upper inner limit	upper outer limit
10.5	16.1	31.1	56.8	78.8
10.5	16.1	31.2	56.9	79.0
10.6	16.2	31.3	57.1	79.1
10.7	16.3	31.4	57.2	79.3
10.7	16.3	31.5	57.3	79.4
10.8	16.4	31.6	57.5	79.6
10.8	16.5	31.7	57.6	79.7
10.9	16.6	31.8	57.7	79.9
10.9	16.6	31.9	57.9	80.1
11.0	16.7	32.0	58.0	80.2
11.1	16.8	32.1	58.2	80.4
11.1	16.8	32.2	58.3	80.5
11.2	16.9	32.3	58.4	80.7
11.2	17.0	32.4	58.6	80.9
11.3	17.1	32.5	58.7	81.0
11.4	17.1	32.6	58.8	81.2
11.4	17.2	32.7	59.0	81.3
11.5	17.3	32.8	59.1	81.5
11.5	17.4	32.9	59.2	81.6
11.6	17.4	33.0	59.4	81.8
11.7	17.5	33.1	59.5	82.0
11.7	17.6	33.2	59.6	82.1
11.8	17.6	33.3	59.8	82.3
11.8	17.7	33.4	59.9	82.4
11.9	17.8	33.5	60.0	82.6
11.9	17.9	33.6	60.2	82.7
12.0	17.9	33.7	60.3	82.9
12.1	18.0	33.8	60.4	83.1
12.1	18.1	33.9	60.6	83.2
12.2	18.2	34.0	60.7	83.4
12.2	18.2	34.1	60.8	83.5
12.3	18.3	34.2	61.0	83.7
12.4	18.4	34.3	61.1	83.8
12.4	18.4	34.4	61.2	84.0
12.5	18.5	34.5	61.4	84.2
12.5	18.6	34.6	61.5	84.3
12.6	18.7	34.7	61.6	84.5
12.7	18.7	34.8	61.8	84.6
12.7	18.8	34.9	61.9	84.8
12.8	18.9	35.0	62.0	84.9
12.8	19.0	35.1	62.2	85.1
12.9	19.0	35.2	62.3	85.2
13.0	19.1	35.3	62.4	85.4
13.0	19.2	35.4	62.6	85.6
13.1	19.3	35.5	62.7	85.7
13.2	19.3	35.6	62.8	85.9
13.2	19.4	35.7	63.0	86.0
13.3	19.5	35.8	63.1	86.2
13.3	19.6	35.9	63.2	86.3
13.4	19.6	36.0	63.4	86.5
13.5	19.7	36.1	63.5	86.6
13.5	19.8	36.2	63.6	86.8
13.6	19.8	36.3	63.8	87.0
13.6	19.9	36.4	63.9	87.1
13.7	20.0	36.5	64.0	87.3
13.8	20.1	36.6	64.2	87.4
13.8	20.1	36.7	64.3	87.6
13.9	20.2	36.8	64.4	87.7
13.9	20.3	36.9	64.6	87.9
14.0	20.4	37.0	64.7	88.0
14.1	20.4	37.1	64.8	88.2
14.1	20.5	37.2	65.0	88.3
14.2	20.6	37.3	65.1	88.5
14.3	20.7	37.4	65.2	88.7

10.1	15.6	30.5	56.0	77.8
10.2	15.7	30.6	56.1	78.0
10.2	15.8	30.7	56.3	78.2
10.3	15.8	30.8	56.4	78.3
10.4	15.9	30.9	56.5	78.5
10.4	16.0	31.0	56.7	78.6
lower outer limit	Lower inner limit	reference count	upper inner limit	upper outer limit
14.7	21.2	38.1	66.1	89.7
14.8	21.3	38.2	66.3	89.9
14.8	21.3	38.3	66.4	90.0
14.9	21.4	38.4	66.5	90.2
14.9	21.5	38.5	66.7	90.3
15.0	21.6	38.6	66.8	90.5
15.1	21.6	38.7	66.9	90.6
15.1	21.7	38.8	67.1	90.8
15.2	21.8	38.9	67.2	91.0
15.2	21.9	39.0	67.3	91.1
15.3	21.9	39.1	67.5	91.3
15.4	22.0	39.2	67.6	91.4
15.4	22.1	39.3	67.7	91.6
15.5	22.2	39.4	67.8	91.7
15.6	22.2	39.5	68.0	91.9
15.6	22.3	39.6	68.1	92.0
15.7	22.4	39.7	68.2	92.2
15.8	22.5	39.8	68.4	92.3
15.8	22.5	39.9	68.5	92.5
15.9	22.6	40.0	68.6	92.6
15.9	22.7	40.1	68.8	92.8
16.0	22.8	40.2	68.9	92.9
16.1	22.8	40.3	69.0	93.1
16.1	22.9	40.4	69.2	93.2
16.2	23.0	40.5	69.3	93.4
16.3	23.1	40.6	69.4	93.5
16.3	23.1	40.7	69.5	93.7
16.4	23.2	40.8	69.7	93.8
16.4	23.3	40.9	69.8	94.0
16.5	23.4	41.0	69.9	94.2
16.6	23.4	41.1	70.1	94.3
16.6	23.5	41.2	70.2	94.5
16.7	23.6	41.3	70.3	94.6
16.8	23.7	41.4	70.5	94.8
16.8	23.7	41.5	70.6	94.9
16.9	23.8	41.6	70.7	95.1
17.0	23.9	41.7	70.9	95.2
17.0	24.0	41.8	71.0	95.4
17.1	24.0	41.9	71.1	95.5
17.1	24.1	42.0	71.2	95.7
17.2	24.2	42.1	71.4	95.8
17.3	24.3	42.2	71.5	96.0
17.3	24.3	42.3	71.6	96.1
17.4	24.4	42.4	71.8	96.3
17.5	24.5	42.5	71.9	96.4
17.5	24.6	42.6	72.0	96.6
17.6	24.6	42.7	72.2	96.7
17.7	24.7	42.8	72.3	96.9
17.7	24.8	42.9	72.4	97.0
17.8	24.9	43.0	72.5	97.2
17.9	25.0	43.1	72.7	97.3
17.9	25.0	43.2	72.8	97.5
18.0	25.1	43.3	72.9	97.6
18.0	25.2	43.4	73.1	97.8
18.1	25.3	43.5	73.2	97.9
18.2	25.3	43.6	73.3	98.1
18.2	25.4	43.7	73.5	98.2

14.3	20.7	37.5	65.3	88.8
14.4	20.8	37.6	65.5	89.0
14.4	20.9	37.7	65.6	89.1
14.5	21.0	37.8	65.7	89.3
14.6	21.0	37.9	65.9	89.4
14.6	21.1	38.0	66.0	89.6
lower outer limit	lower inner limit	reference count	upper inner limit	upper outer limit
19.1	26.5	45.1	75.3	100.3
19.2	26.6	45.2	75.4	100.5
19.3	26.6	45.3	75.5	100.6
19.3	26.7	45.4	75.7	100.8
19.4	26.8	45.5	75.8	100.9
19.5	26.9	45.6	75.9	101.1
19.5	26.9	45.7	76.0	101.2
19.6	27.0	45.8	76.2	101.4
19.7	27.1	45.9	76.3	101.5
19.7	27.2	46.0	76.4	101.7
19.8	27.2	46.1	76.6	101.8
19.9	27.3	46.2	76.7	102.0
19.9	27.4	46.3	76.8	102.1
20.0	27.5	46.4	76.9	102.2
20.1	27.6	46.5	77.1	102.4
20.1	27.6	46.6	77.2	102.5
20.2	27.7	46.7	77.3	102.7
20.3	27.8	46.8	77.5	102.8
20.3	27.9	46.9	77.6	103.0
20.4	27.9	47.0	77.7	103.1
20.5	28.0	47.1	77.8	103.3
20.5	28.1	47.2	78.0	103.4
20.6	28.2	47.3	78.1	103.6
20.7	28.2	47.4	78.2	103.7
20.7	28.3	47.5	78.4	103.9
20.8	28.4	47.6	78.5	104.0
20.9	28.5	47.7	78.6	104.2
20.9	28.6	47.8	78.7	104.3
21.0	28.6	47.9	78.9	104.5
21.1	28.7	48.0	79.0	104.6
21.1	28.8	48.1	79.1	104.8
21.2	28.9	48.2	79.3	104.9
21.3	28.9	48.3	79.4	105.1
21.3	29.0	48.4	79.5	105.2
21.4	29.1	48.5	79.6	105.4
21.4	29.2	48.6	79.8	105.5
21.5	29.3	48.7	79.9	105.6
21.6	29.3	48.8	80.0	105.8
21.6	29.4	48.9	80.2	105.9
21.7	29.5	49.0	80.3	106.1
21.8	29.6	49.1	80.4	106.2
21.8	29.6	49.2	80.5	106.4
21.9	29.7	49.3	80.7	106.5
22.0	29.8	49.4	80.8	106.7
22.0	29.9	49.5	80.9	106.8
22.1	30.0	49.6	81.0	107.0
22.2	30.0	49.7	81.2	107.1
22.2	30.1	49.8	81.3	107.3
22.3	30.2	49.9	81.4	107.4
22.4	30.3	50.0	81.6	107.6
22.4	30.3	50.1	81.7	107.7
22.5	30.4	50.2	81.8	107.9
22.6	30.5	50.3	81.9	108.0
22.7	30.6	50.4	82.1	108.1
22.7	30.7	50.5	82.2	108.3
22.8	30.7	50.6	82.3	108.4
22.9	30.8	50.7	82.5	108.6

18.3	25.5	43.8	73.6	98.4
18.4	25.6	43.9	73.7	98.5
18.4	25.6	44.0	73.8	98.7
18.5	25.7	44.1	74.0	98.8
18.6	25.8	44.2	74.1	99.0
18.6	25.9	44.3	74.2	99.1
18.7	25.9	44.4	74.4	99.3
18.8	26.0	44.5	74.5	99.4
18.8	26.1	44.6	74.6	99.6
18.9	26.2	44.7	74.7	99.7
19.0	26.2	44.8	74.9	99.9
19.0	26.3	44.9	75.0	100.0
19.1	26.4	45.0	75.1	100.2

22.9	30.9	50.8	82.6	108.7
23.0	31.0	50.9	82.7	108.9
23.1	31.0	51.0	82.8	109.0
23.1	31.1	51.1	83.0	109.2
23.2	31.2	51.2	83.1	109.3
23.3	31.3	51.3	83.2	109.5
23.3	31.4	51.4	83.3	109.6
23.4	31.4	51.5	83.5	109.8
23.5	31.5	51.6	83.6	109.9
23.5	31.6	51.7	83.7	110.0
23.6	31.7	51.8	83.9	110.2
23.7	31.7	51.9	84.0	110.3
23.7	31.8	52.0	84.1	110.5

lower outer limit	lower inner limit	reference count	upper inner limit	upper outer limit
23.8	31.9	52.1	84.2	110.6
23.9	32.0	52.2	84.4	110.8
23.9	32.1	52.3	84.5	110.9
24.0	32.1	52.4	84.6	111.1
24.1	32.2	52.5	84.7	111.2
24.1	32.3	52.6	84.9	111.4
24.2	32.4	52.7	85.0	111.5
24.3	32.4	52.8	85.1	111.6
24.3	32.5	52.9	85.3	111.8
24.4	32.6	53.0	85.4	111.9
24.5	32.7	53.1	85.5	112.1
24.5	32.8	53.2	85.6	112.2
24.6	32.8	53.3	85.8	112.4
24.7	32.9	53.4	85.9	112.5
24.7	33.0	53.5	86.0	112.7
24.8	33.1	53.6	86.1	112.8
24.9	33.2	53.7	86.3	113.0
24.9	33.2	53.8	86.4	113.1
25.0	33.3	53.9	86.5	113.2
25.1	33.4	54.0	86.6	113.4
25.2	33.5	54.1	86.8	113.5
25.2	33.5	54.2	86.9	113.7
25.3	33.6	54.3	87.0	113.8
25.4	33.7	54.4	87.2	114.0
25.4	33.8	54.5	87.3	114.1
25.5	33.9	54.6	87.4	114.3
25.6	33.9	54.7	87.5	114.4
25.6	34.0	54.8	87.7	114.5
25.7	34.1	54.9	87.8	114.7
25.8	34.2	55.0	87.9	114.8
25.8	34.3	55.1	88.0	115.0
25.9	34.3	55.2	88.2	115.1
26.0	34.4	55.3	88.3	115.3
26.0	34.5	55.4	88.4	115.4
26.1	34.6	55.5	88.5	115.6
26.2	34.7	55.6	88.7	115.7
26.2	34.7	55.7	88.8	115.8
26.3	34.8	55.8	88.9	116.0
26.4	34.9	55.9	89.0	116.1
26.5	35.0	56.0	89.2	116.3
26.5	35.0	56.1	89.3	116.4
26.6	35.1	56.2	89.4	116.6
26.7	35.2	56.3	89.6	116.7
26.7	35.3	56.4	89.7	116.9
26.8	35.4	56.5	89.8	117.0
26.9	35.4	56.6	89.9	117.1
26.9	35.5	56.7	90.1	117.3
27.0	35.6	56.8	90.2	117.4
27.1	35.7	56.9	90.3	117.6

lower outer limit	lower inner limit	reference count	upper inner limit	upper outer limit
28.6	37.4	59.1	93.1	120.7
28.7	37.5	59.2	93.2	120.9
28.7	37.6	59.3	93.3	121.0
28.8	37.7	59.4	93.5	121.2
28.9	37.7	59.5	93.6	121.3
28.9	37.8	59.6	93.7	121.4
29.0	37.9	59.7	93.8	121.6
29.1	38.0	59.8	94.0	121.7
29.2	38.1	59.9	94.1	121.9
29.2	38.1	60.0	94.2	122.0
29.3	38.2	60.1	94.3	122.2
29.4	38.3	60.2	94.5	122.3
29.4	38.4	60.3	94.6	122.4
29.5	38.5	60.4	94.7	122.6
29.6	38.5	60.5	94.8	122.7
29.6	38.6	60.6	95.0	122.9
29.7	38.7	60.7	95.1	123.0
29.8	38.8	60.8	95.2	123.2
29.9	38.9	60.9	95.3	123.3
29.9	38.9	61.0	95.5	123.4
30.0	39.0	61.1	95.6	123.6
30.1	39.1	61.2	95.7	123.7
30.1	39.2	61.3	95.8	123.9
30.2	39.3	61.4	96.0	124.0
30.3	39.3	61.5	96.1	124.1
30.3	39.4	61.6	96.2	124.3
30.4	39.5	61.7	96.3	124.4
30.5	39.6	61.8	96.5	124.6
30.6	39.7	61.9	96.6	124.7
30.6	39.7	62.0	96.7	124.9
30.7	39.8	62.1	96.8	125.0
30.8	39.9	62.2	97.0	125.1
30.8	40.0	62.3	97.1	125.3
30.9	40.1	62.4	97.2	125.4
31.0	40.1	62.5	97.3	125.6
31.0	40.2	62.6	97.5	125.7
31.1	40.3	62.7	97.6	125.9
31.2	40.4	62.8	97.7	126.0
31.3	40.5	62.9	97.8	126.1
31.3	40.5	63.0	98.0	126.3
31.4	40.6	63.1	98.1	126.4
31.5	40.7	63.2	98.2	126.6
31.5	40.8	63.3	98.3	126.7
31.6	40.9	63.4	98.5	126.8
31.7	40.9	63.5	98.6	127.0
31.8	41.0	63.6	98.7	127.1
31.9	41.4	63.7	98.7	127.4

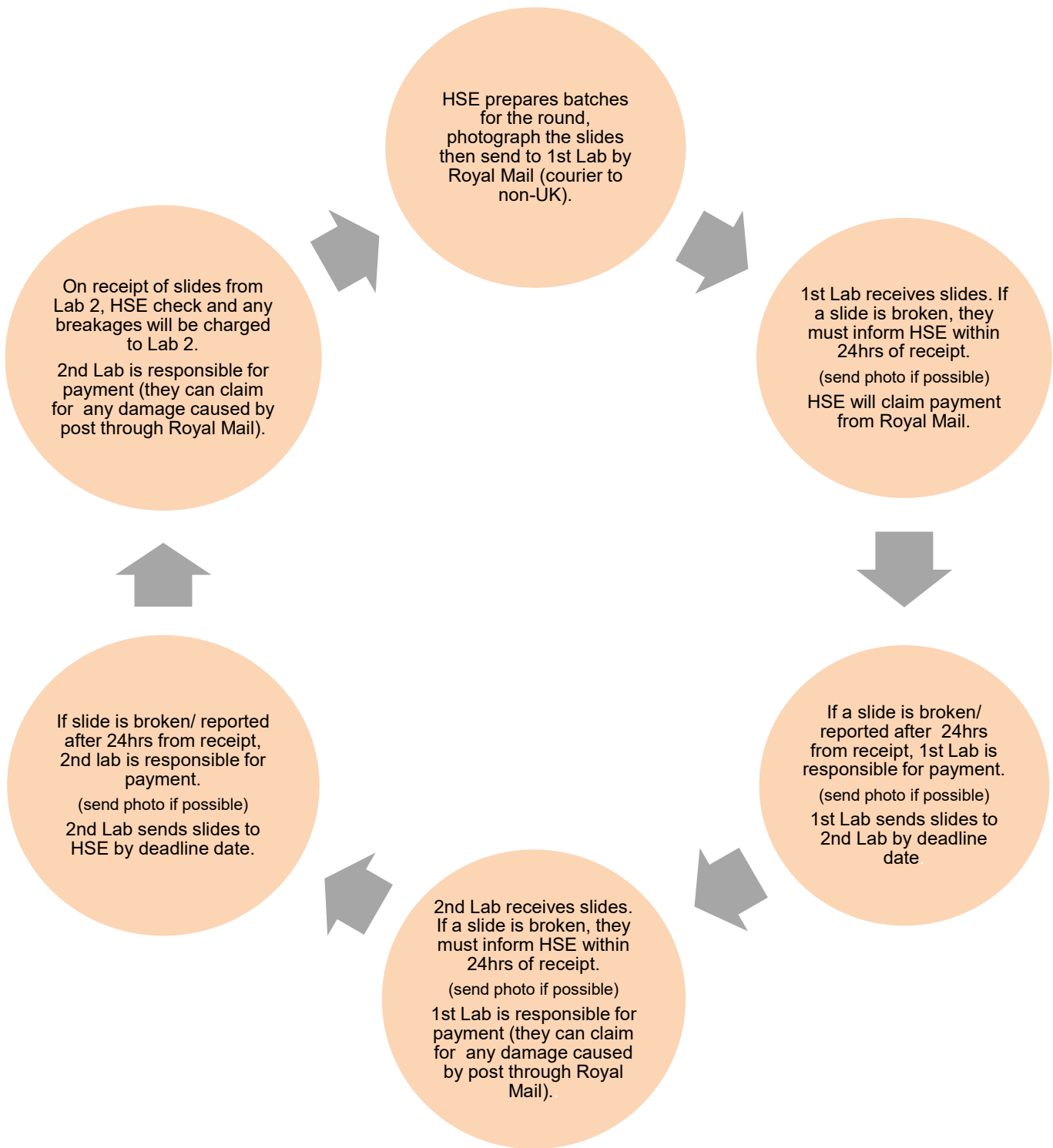
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27.1	35.8	57.0	90.4	117.7
27.2	35.8	57.1	90.6	117.9
27.3	35.9	57.2	90.7	118.0
27.3	36.0	57.3	90.8	118.1
27.4	36.1	57.4	90.9	118.3
27.5	36.2	57.5	91.1	118.4
27.6	36.2	57.6	91.2	118.6
27.6	36.3	57.7	91.3	118.7
27.7	36.4	57.8	91.4	118.9
27.8	36.5	57.9	91.6	119.0
27.8	36.6	58.0	91.7	119.2
27.9	36.6	58.1	91.8	119.3
28.0	36.7	58.2	91.9	119.4
28.0	36.8	58.3	92.1	119.6
28.1	36.9	58.4	92.2	119.7
28.2	36.9	58.5	92.3	119.9
28.2	37.0	58.6	92.4	120.0
28.3	37.1	58.7	92.6	120.2
28.4	37.2	58.8	92.7	120.3
28.5	37.3	58.9	92.8	120.4
28.5	37.3	59.0	93.0	120.6

For reference densities above 63.7 fibres per mm², see formulae at beginning of this appendix.

Annex 2

Slide Responsibilities & Breakages



Annex 3

Contacts and Advice

For all RICE enquiries please contact:

Proficiency Testing Team
HSE Science & Research Centre
Harpur Hill
Buxton
Derbyshire
SK17 9JN

Tel: +44 (0) 203 028 3382

proficiency.testing@hse.gov.uk

<http://www.hsl.gov.uk/proficiency-testing-schemes/rice>

Annex 4

Glossary of Terms

Accreditation body - a formal, third party who assess the competence of laboratories to perform specific tasks

Batch - a set of slides of various densities

Candidate slide - a new slide introduced into the RICE PT scheme, which is counted by RICE laboratories' counters during RICE distributions in order to obtain sufficient counts so that such a slide may be upgraded to a reference slide status once a reference value has been determined.

Certificate - document issued electronically to laboratories at the end of each round detailing their performance in each of the preceding four rounds and the overall four round classification.

Classification – performance of a laboratory over a period of time

Count – the evaluation of a slide, to determine the reference density

Distribution/round - a defined period of time wherein batches of slides are send out to laboratories for evaluation.

FPTSC - Fibre Proficiency Testing Steering Committee

HSE – Health & Safety Executive

PT Laboratory Number – Laboratory identification number (unique and applied across all individual asbestos PT schemes)

PCM - Phase Contrast Microscopy

Provisional Report – A document issued to laboratories following the submission of their counts for a single batch within a round, this will detail the data sent to the PT Team by the participant, the reference data and the participant's performance compared with the reference count.

PT – Proficiency Testing

RICE - Regular Inter-laboratory Counting Exchanges

Reference density/ value - the robust median of the counts made on a reference slide by a combination of results from laboratories' counters and from results from expert counters obtained during the its initial life as a candidate slide.

Rogue Slide – A slide designed to test participants' ability to apply the sample rejection criteria correctly (i.e. quality of slide, dust obscuration etc.) Note: Not every batch will contain a rogue slide.

Round – process covered from receiving slides to the certificate being issued

QC – Quality Control

Subscription - a charge for membership of the RICE scheme.

UKAS – United Kingdom Accreditation Service

WHO – World Health Organisation

Annex 5

Responsibilities, Terms & Conditions

HSE will operate the Proficiency Testing (PT) schemes in accordance with its obligations as set out in the relevant Scheme Information Book for Participants, available on our website.

Participants must abide by the rules and responsibilities of the scheme set out in the information book and in particular as detailed below.

Participants should comply with the HSE's standard conditions of business, a copy of which is available upon request.

Participant Responsibilities

Participant responsibilities are outlined below:

- Your PT Laboratory Number **must be quoted in all correspondence**.
- All queries should be directed to the proficiency testing email address and the PT Team will respond as soon as possible.
- To ensure participants are kept up to date with important information it is the participants' responsibility to inform the PT Team of any changes to contact details.
- Participants must ensure that any required paperwork / permits are in place to allow samples through national border controls / customs (additional charges from the courier will be passed on to participant should there be further fees payable). Failure to do so may result in delays or detainment of sample shipment and hence participation in the round.
- Participants must use the Proficiency Testing Online Data Entry System (PT ODES) to subscribe to the scheme.
- Samples **will not** be despatched until full payment has been received.
- The preferred method of payment is via Worldpay (online credit/ debit card system). A full VAT receipt is available immediately after the payment has been processed.

- If an invoice is required, the participant needs to allow 4-6 weeks for it to be issued and must pay, in full, within 30 days of the invoice date. An invoice shall not be regarded as paid until funds (GBP) are received into a UK sterling bank account operated by Health and Safety Executive.
- It is the participants' responsibility to ensure that scheme round results are submitted by the defined deadline dates. Participants must have access to certain mandatory IT facilities such as Microsoft Word and Excel, an email account and a web access facility in order to participate.
- Participants must submit round results via the PT ODES for each scheme. The PT Team reserves the right to refuse results submitted on reporting formats alternative to the online data entry system provided.
- Transcription errors and / or errors in reporting results in the correct format by participants is considered by the PT Team to be part of the proficiency testing assessment process. As such, the PT Team will not amend or correct any submitted results if requested. Participants can however, change their results, provided that any amendments are made by the close of the round and the before the predefined reporting deadline.
- For a copy of HSE's standard conditions of business, or for any queries regarding AIMS please email proficiency.testing@hse.gov.uk or visit the website at <http://www.hsl.gov.uk/proficiency-testing-schemes>
- For urgent queries, please call 00 44 (0) 203 028 3382. Please remember to quote the allocated PT laboratory number in all correspondence.

Annex 6

Analyst Hints & Tips

- The counting/ rejection criteria HSG248; The Analysts Guide (section A1.38, A1.39 & A1.40) should be followed. A free copy of the guide is available to download on the HSE website: <https://www.hse.gov.uk/pubns/books/hsg248.htm>.
- When analysing slides, counters should follow the requirements of HSG248, in particular paragraph A1.38 (low magnification scan of slide) which, according to UKAS, is often overlooked by laboratories. This will also help analysts to determine whether a slide is a rogue or not.
- Some slides contain fine chrysotile fibres which are difficult to count. Remember to check the set-up of your microscope using an HSE test slide, ensuring that all of band 5 is visible to be sure of seeing these fibres. Careful use of the fine focus is essential to detect chrysotile and should be adjusted for each field of view. Chrysotile fibres also tend to appear as split fibres, fibre bundles or agglomerates. Analysts should refer to the WHO counting rules to ensure these are counted correctly.
- Analysts should count 200 fields or 200 ends, whichever comes first, but always a minimum of 20 fields even when the number of ends exceeds 200. Some analysts count less than 200 fields and there seems to be a correlation between counting fewer fields

and getting a poor result. This is because the reference densities for slides in the RICE Scheme are based on counting at least 200 fields.

- Remember not to count too close to the edge of the filter. The rules state that fields lying within 4mm of the edge of the filter or within 2mm of a cutting line should not be counted. Counting too close to the edge may result in the counting of spurious fibres i.e. fine cellulose fibres where the sampling cowl has rubbed into the filter. This can cause a significant count difference on some slides.
- If results are submitted prior to the deadline date, a provisional report will be issued within approximately 2 working days. If the report shows any B's/C's, participants have time to look at the slides again before sending them on to the next laboratory/ HSE. This will help laboratories to determine whether counters are struggling with a particular slide or whether the slide itself is poor. To request a slide investigation, laboratories should send the relevant details, including their PT Lab Number to the Proficiency Testing Team, by email.
- Laboratories are encouraged to comment on the results form when submitting results if there is an issue with a slide. The PT Team will investigate further once the slide is returned to HSE.