

# ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

## ISO RECOMMENDATION R 390

### SAMPLING AND INSPECTION OF ASBESTOS-CEMENT PRODUCTS

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## BRIEF HISTORY

The ISO Recommendation R 390, *Sampling and inspection of asbestos-cement products*, was drawn up by Technical Committee ISO/TC 77, *Products in asbestos-cement*, the Secretariat of which is held by the Association Suisse de Normalisation (SNV).

Work on this question by the Technical Committee began in 1961 and led, in 1963, to the adoption of a Draft ISO Recommendation.

In December 1963, this Draft ISO Recommendation (No. 688) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

Australia	Israel	Republic of Korea
Austria	Italy	Republic of South Africa
Belgium	Japan	Romania
Brazil	Lebanon	Spain
Colombia	Morocco	Sweden
Czechoslovakia	Mexico	Switzerland
Denmark	Netherlands	Turkey
Finland	New Zealand	U.A.R.
France	Norway	United Kingdom
Germany	Peru	U.S.A.
Greece	Poland	U.S.S.R.
Hungary	Portugal	Venezuela
Ireland		Yugoslavia.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in November 1964, to accept it as an ISO RECOMMENDATION.

For the practical application of ISO Recommendation R 390, see the "Guide to the use of the Recommendation concerning sampling and inspection of asbestos-cement products", currently under preparation.

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## SAMPLING AND INSPECTION OF ASBESTOS-CEMENT PRODUCTS

### 1. SCOPE

This Recommendation defines certain rules for batching, sampling, inspection and acceptance/rejection of asbestos-cement products.

The purpose of the Recommendation is to provide a uniform method to be used in determining whether supplies of asbestos-cement goods should be accepted as conforming to the relevant Recommendation requirements for such products.

It provides for a double sampling plan for the method of inspection by attributes as well as for an alternative single sampling plan for the method of inspection by variables.

### 2. TERMINOLOGY

Definitions of the various expressions used in this Recommendation are given in the Appendix.

### 3. DIVISION OF A CONSIGNMENT INTO INSPECTION LOTS

#### 3.1 Homogeneous consignments

**3.1.1** Any homogeneous consignment (or sub-consignment — 3.2) should be divided by the manufacturer into inspection lots, the maximum size of which is given in the relevant Recommendation.

**3.1.2** Any fraction of a consignment remaining after taking out the highest possible number of maximum inspection lots and any homogeneous consignment (or sub-consignment) smaller than the maximum lot size, form an inspection lot if larger than the minimum lot size given in the relevant Recommendation.

**3.1.3** Consignments or fractions of consignments smaller than the minimum lot size given in the relevant Recommendation are not submitted to sampling and testing.

#### 3.2 Non-homogeneous consignments

Any consignment which is known to be or is expected to be non-homogeneous as regards any of the properties to be tested by sampling should be divided by the manufacturer into assumed homogeneous sub-consignments prior to the division into inspection lots as per 3.1.

### 4. SAMPLING

**4.1** From each inspection lot (3.1.1 and 3.1.2) the purchaser may draw a sample, the size of which is indicated in table 1 (4.2 and 4.3).

**4.2** The entry to table 1 is the number of units of product in the inspection lot (column 1), the sample size being indicated in column 2.

- 4.3 For products where all units undergo a compulsory non-destructive test during the manufacture, <sup>1</sup> the reduced sample size obtained by entering table 1 at column 7 may be applied.
- 4.4 The possibility mentioned in 4.3 is also available when the manufacturer guarantees or has his production guaranteed by an independent control organisation. <sup>2</sup>
- 4.5 When test pieces are cut from the units of the sample, the cutting is carried out by the manufacturer in the presence of the purchaser.
- 4.6 When the relevant Recommendation calls for more than one property to be tested, the sample size should be appropriately multiplied so as to secure for each test a number of test pieces equal to the sample size (4.2 and 4.3). From one unit of a sample one test piece only should be cut for a particular test, but for different tests the necessary test pieces may be cut from the same unit of the sample.

## 5. INSPECTION

- 5.1 Each unit of the sample should be tested as specified in the relevant Recommendation.
- 5.2 The test results should be evaluated either through the method of inspection by attributes (5.4 and 6.1) or through the method of inspection by variables (5.5 and 6.2).
- 5.3 The method of inspection by attributes should normally be employed. However, by agreement prior to the drawing of the samples (4.1), the method of inspection by variables, if applicable, may be employed.
- 5.4 When the method of inspection by attributes is employed, the number of non-conforming units in the sample should be deduced from the test results and the acceptability of the inspection lot determined as prescribed in 6.1.
- 5.5 When the method of inspection by variables is employed, the test results shall be recorded so as to retain the order in which they are made and the acceptability of the inspection lot determined as prescribed in 6.2.

## 6. DETERMINATION OF ACCEPTABILITY OF INSPECTION LOTS

### 6.1 Inspection by attributes

- 6.1.1 When the number of non-conforming units found in the sample is equal to or less than the acceptance number  $Ac_1$  indicated in column 3 of table 1, the inspection lot from which the sample was drawn should be considered acceptable.
- 6.1.2 When the number of non-conforming units found in the sample is equal to or greater than the rejection number  $Re_1$  indicated in column 4 of table 1, this may justify rejection of the inspection lot.
- 6.1.3 When the number of non-conforming units found in the sample lies between the acceptance number and the rejection number (columns 3 and 4 of table 1), a second sample of the same size as the initial sample (4.2, 4.3 and 4.4) should be drawn and examined.
- 6.1.4 The second sample should be inspected as indicated in 4.5, 4.6 and 5.4.
- 6.1.5 The number of non-conforming units found in the initial and in the second samples should be totalled.

<sup>1</sup> Such as the water-tightness test for the pipes.

<sup>2</sup> For example, use of statistical quality control methods in the works.

- 6.1.6** If the total number of non-conforming units is equal to or less than the acceptance number  $Ac_2$  indicated in column 5 of table 1, the inspection lot should be considered acceptable.
- 6.1.7** If the total number of non-conforming units is equal to or greater than the second rejection number  $Re_2$  indicated in column 6 of table 1, this may justify rejection of the inspection lot.
- 6.1.8** When the relevant Recommendation calls for more than one property to be tested, the second sample taken (6.1.3) should only be inspected in accordance with those tests which at the inspection of the initial sample gave numbers of non-conforming units between the acceptance number  $Ac_1$  and the rejection number  $Re_1$ .

Table 1

1	2	3	4	5	6	7	8
Size of inspection lot	Sample size	Initial sample		Initial + second samples		Size of inspection lot for products tested during manufacture	Inspection by variables
		Acceptance number $Ac_1$	Rejection number $Re_1$	Acceptance number $Ac_2$	Rejection number $Re_2$		Acceptability criterion <sup>3</sup> $k$
- 100	3	0	2	1	2	- 200	0.29
101- 200	4	0	2	1	2	201- 400	0.34
201- 400	5	0	2	1	2	401- 800	0.37
401- 800	7	0	2	1	2	801- 1500	0.40
801- 1500	10	0	2	2	3	1501- 3000	0.50
1501- 3000	15	0	3	3	4	3001- 8000	0.51
3001- 8000	25	1	4	5	6	8001-20000	0.52
8001-20000	35	2	5	7	8	-	0.53

## 6.2 Inspection by variables

- divide the readings in the order made into groups of 5, except when the sample size is 3, 4, 5 or 7, in which cases the group size is the same as the sample size;
- for each group the range  $R$  is computed;
- of the group ranges  $R$ , the average range  $\bar{R}$  is computed;
- compute the sample mean  $\bar{X}$  by dividing the sum of measurements by the sample size;
- derive from table 1 (column 8) the acceptability criterion  $k$ ;
- compute the acceptability limit  $AL$  and determine the acceptability by means of table 2.

Table 2

Relevant Recommendation prescribing	$AL =$	Acceptable if	Rejection justified if
Lower specified limit, $L$	$L + k \cdot \bar{R}$	$\bar{X} \geq AL$	$\bar{X} < AL$
Upper specified limit, $U$	$U - k \cdot \bar{R}$	$\bar{X} \leq AL$	$\bar{X} > AL$

<sup>3</sup> In applying ISO Recommendation R 390 to the simultaneous inspection of the two limits of a given property, see the "Guide to the use of the Recommendation concerning sampling and inspection of asbestos-cement products", currently under preparation.

## APPENDIX

### TERMINOLOGY

Throughout this Recommendation the following expressions have the following meanings

*Conforming unit* — a unit of product which conforms to one of the applied tests of the relevant Recommendation (in statistical text books also termed “ non-defective ”).

*Consignment* — the part of a delivery which comprises units of the same category. \*

*Double sampling plan* — a sampling plan containing at most two samples, the initial (first) and the second samples. The final decision to accept or reject the inspection lot may be reached after inspecting the initial or both samples according to the rules given in chapter 6.

*Homogeneous consignment* — a consignment comprising units of product made of the same ingredients and under essentially the same conditions (3.2).

*Inspection* — the process of measuring, examining, testing, gauging or otherwise comparing the unit of product with the applicable requirements.

*Inspection by attributes* — a system of inspection whereby the decision to accept or reject an inspection lot is based on the number of tested units of product classified as conforming or non-conforming to certain requirements.

*Inspection by variables* — a system of inspection whereby the decision to accept or reject an inspection lot is based on the average and the variability of the measurements of a quality characteristic of the tested units of product.

*Inspection lot* — a fraction of a consignment/sub-consignment accepted or rejected as a whole depending on the quality found by inspection of a sample drawn from the lot.

*Maximum inspection lot* — the largest inspection lot which could, a priori, be expected to be homogeneous.

*Minimum inspection lot* — the smallest inspection lot from which samples should be drawn.

*Non-conforming unit* — a unit of product which does not conform to one of the applied tests of the relevant Recommendation (in statistical text book also termed “ defective ”).

*Range* — the difference between the largest reading and the smallest one within a sample or group thereof.

*Relevant Recommendation* — The ISO Recommendation prepared by ISO/TC 77 for the particular type of asbestos-cement products.

*Sample* — one or more units of product drawn from an inspection lot, the units of the sample being selected at random without regard to their quality.

\* Examples:

Pipes of different diameters are regarded as of different categories.

Sheets of different profiles are regarded as of different categories.

Sheets of same profile but of different lengths may be regarded as of the same category.