

Approval Batteryspray by Dutch Authorities

On May 14, 2018, Batteryspray submitted a request to the assessment committee Sci-547. This independent committee was selected by the Ministry of Social Affairs and Employment. The Sci-547 committee approved the Batteryspray Method and decided that the Batteryspray application for removing asbestos gaskets, under certain conditions, to be admitted in Dutch Asbestos Legalisation. This change has since been implemented in Dutch Legalisation and took effect on July 14, 2018.

Batteryspray validation studies

Between 2014 and the end of 2020, Batteryspray has conducted various studies into gaskets, spacers, and compression seal gaskets, in compliance with SCI-548.

These studies focussed on obtaining results to support the low-emissions working method through the collection of air measurements. The measurements were performed based on a context of equivalence, meaning the actions performed, distribution of labour, and duration were comparable.

A total of 242 measurement were conducted, subdivided into 128 personal exposure measurement (PAS) and 116 stationary exposure measurements (STAT). The measurements were conducted at 63 locations.

These validation studies were performed in collaboration with companies such as:

- Exxon Mobil
- Shell
- Fuji Film
- Neptune Energy
- Chemelot (former DSM)
- Croda
- Vattenfall (former NUON)
- Eneco

Validation studies in the Netherlands

The validation studies were performed in the Netherlands, and in compliance with protocol Sci-548, the protocol for determining the concentration in respirable asbestos fibres in the air during asbestos removal activities at the project level, and in compliance with protocol Sci-547, the protocol for the validation of new working methods and/or innovative techniques with regard to asbestos removal for risk-group classification.

Sci-548 focusses on conducting measurements to determine the concentration of respirable asbestos fibres in the air during specific removal activities of asbestos-containing materials as described in the inventory report relating to a specific location (known as 'project'). Here, the principle is that comparable actions performed with asbestos-containing materials will lead to a comparable emission of asbestos.

Sci-547 describes the methodology for national validation of new working methods and/or techniques for asbestos removal and, therefore, the establishing of objective criteria to be used as the basis for the inclusion in SMART of (new) working methods following their acceptance.

Sci-547 describes the methodology of benchmark testing. This methodology is based in current knowledge regarding labour hygiene (NEN-EN 689; BOHS & NVvA, 2011). This methodology can be used to test in comparison to legal benchmarks, but can also be used to test for the upper limit of a risk category (fibre concentration level) to determine to which risk category a certain working method belongs.

Risk categorisation in the Netherlands

Three risk categories are used with regard to asbestos exposure.

The risk categories are defined based on art. 4.46 Grenswaarden (*Limit Values*):

1. *The concentration of asbestos fibres of the chrysotile type shall not exceed the limit value of 2,000 fibres per cubic metre, calculated over a reference period of eight hours per day.*
2. *The concentrations of amphibole asbestos fibres actinolite, amosite, anthophyllite, tremolite and crocidolite combined shall not exceed the limit value of 2,000 fibres per cubic metre, calculated over a reference period of eight hours per day.*

Risk category

● Risk category 1: low risk

No exceeding of the limit value of 2,000 fibres per cubic metre, calculated over a reference period of eight hours per day.

● Risk category 2: risk

The sum of the concentration of asbestos fibres in the chrysotile type as a fraction of the limit value and the concentration of amphibole asbestos fibres actinolite, amosite, anthophyllite, tremolite and crocidolite as a fraction of the limit value exceeds or equals 1.

● Risk category 2a: high risk

The concentration in amphibole asbestos fibres actinolite, amosite, anthophyllite, tremolite and crocidolite exceeds the limit value.

The Arbeidsomstandighedenbesluit (*Labour Circumstance Agreement*) art. 4.44 states that the assessment, referred to in article 4.2, first clause, shows that if the air to which employees may be exposed in relation to the type of labour contains a sum of the concentration in asbestos fibres of the chrysotile type, referenced in article 4.46, first clause, and of the concentration in amphibole asbestos fibres actinolite, amosite, anthophyllite, tremolite and crocidolite as a fraction of the limit value, referenced in article 4.46, second clause, smaller than 1, working in Risk category 1 is permitted.

Batteryspray validation studies

Batteryspray has conducted various validations in compliance with applicable protocols in the Netherlands. The studies involved the following applications, gaskets, spacers, and compression seal gaskets.

Application	Gaskets	Spacer	Comp. Seal Gasket
Asbestos type	Chrysotile	Chrysotile	Chrysotile
Asbestos percentage	0-100%	30-60%	0-100%
Application	Gasket	Gasket	Gasket
Friability	Friable	Friable	Friable
Degree of adhesion ¹	No interior damage, no wear Severe exterior damage, severe wear	No interior damage, no wear Severe exterior damage, severe wear	No damage, no wear Minor damage and minor wear
Fixing methods	Wedged	Wedged	Wedged
Accessibility	Easy or hard to access	Easy or hard to access	Easy to access
Environmental situations	Internal and external	Internal and external	Internal
Permitted work day duration	8 hours per individual	8 hours per individual	8 hours per individual

¹ The extent to which gasket materials are reported as worn or damaged does not impact the level of exposure.

The removal method damages the gasket material to such an extent that the emission of asbestos fibres that would occur due to the extent of wear or prior damages is negligible compared to the emission of asbestos fibres which may potentially be released during removal.

Measurement strategy

Measurements were performed by two individuals, equipped with gold-plated filters attached to the lapels of their coveralls for personal exposure measurements.

The sampler-hood was attached to the dominant shoulder of either individual, with the opening facing down and into the breathing space (within 30 cm of the mouth).

Both individuals work opposite one another, and in such proximity that the space within which they work can be considered a single "breathing space", thus ensuring both belong to the same exposure group.

During the work activities, 2 stationary (STAT) measurements were continually conducted in direct proximity. These measurements also used gold-plated filters. Measurements were made with a discharge of approximately 8 litres per minute, set prior to and verified following the measurement.

For each measurement, the basis is that two persons perform the activities for at least 60 minutes per measurement (potential exposure time = 60 minutes).

The measurements were based on a context of equivalence, meaning the actions performed, distribution of labour, and duration were comparable.

Sampling and Analysis

Samples were gathered in compliance with provisions in NEN 2939 and with SCi548, meaning they used 25 mm disposable cartridges with an auxiliary filter equipped with a gold-plated sampling filter. Air measurements were conducted at relevant positions.

The personal exposure measurements were collected in the breathing spaces of the individuals concerned; the stationary measurements were collected at approximately 1.5 metres (breathing height of a standing individual) from the floor in direct proximity to the activities.

The samples provided through the PAS and STAT-measurements were analysed in compliance with ISO 14966 using scanning electron microscope technology.

During the analyses, the number of image fields counted ensured that, depending on SEM type, the upper limit of the 95% confidence interval of the sensitivity analysis of the SEM came to a maximum of 200 asbestos fibres/m³, in compliance with 10% of the limit value for professional exposure as defined in article 4.46 of the Arbeidsomstandighedenbesluit.

The final assessment was performed in compliance with NEN2990 at all times. Material samples were examined in compliance with NEN5896.

Results testing

Based on the tests in compliance with the test methodology from Sci-547 the conclusion is that the concentration of 2,000 asbestos fibres/m³ TWA 8 hours is not exceeded. The individual change of exceeding is calculated at 0%.

Figures 1 through 5 include an overview of the results of the personal exposure measurements, as well as the upper limits of the 90% confidence intervals. During work activity performance, the upper limit of the 90% confidence interval will be exceeded in approximately 5% of cases. Since the individual measurements take into account a worst-case approach, where the upper limits of the 95% confidence interval of the result of the analysis are used and these were never greater than the limit values for the individual measurements, it is not likely that the norm will be exceeded on workdays that involve any exceeding of the upper limit of the 90% confidence interval.

The results also include the 3 personal exposure measurements from the validation measurement dated 19 December 2014, which did not use the Multi Tool. These activities only used the hand gun as a control measure. Batteryspray has elected to include these measurements to increase the dataset, despite the fact that this leads to parameter increase, as the highest values encountered were found in two of these measurements.

The personal exposure measurements are supported by the results from the stationary measurements. The results of the stationary measurements create insight into the extent to which asbestos fibres disseminate. Based on the results from the stationary measurements, no unacceptable emission of asbestos fibres into the environment is expected.

The results were tested against section 4.4.2 of Sci-547. Based on this testing, a 12-month repeat measurement interval applies. Based on NEN-EN 689, a 24-month interval applies.

There is a working method that effectively controls the emission of asbestos, enabling a permissible scale-back to risk category 1, assuming that the methods of work and security documented in this application are used exclusively. Deviations from the work method or the use of any other flowing agent than Batteryspray may lead to different and possible unacceptable exposure levels.

The applied Batteryspray working method therefore makes it possible to safely remove gaskets, compression seal gaskets, and spacers in risk category 1.

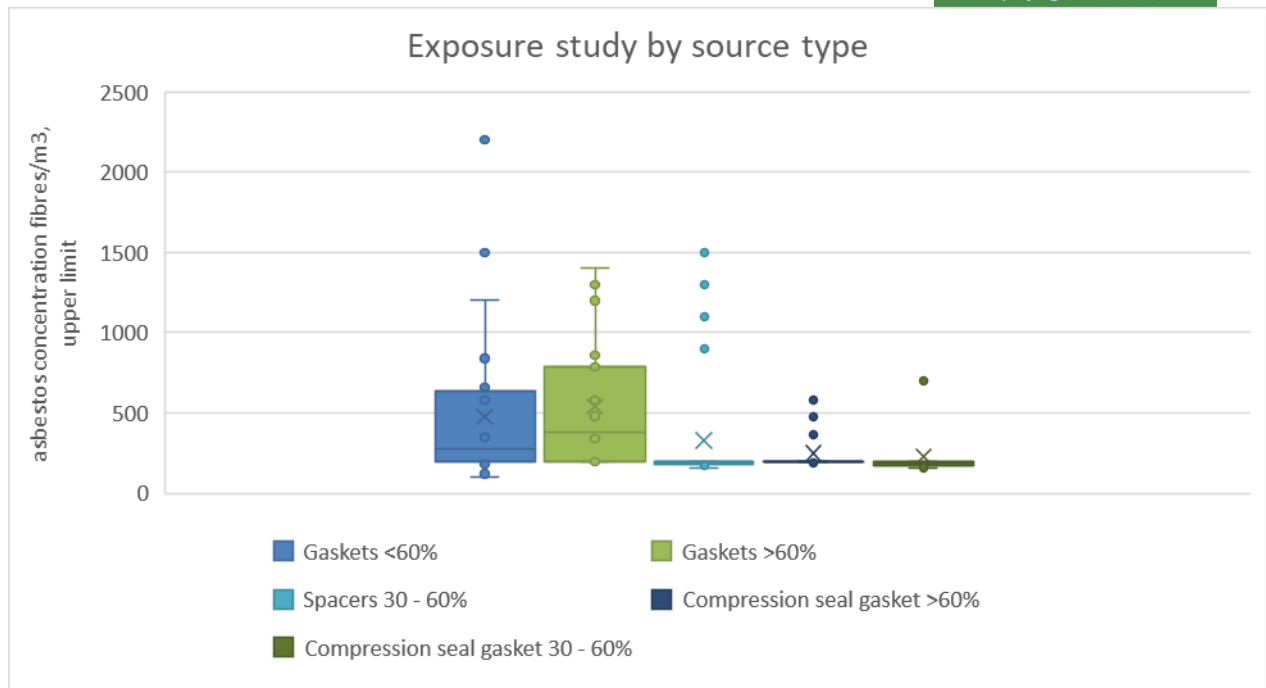


Figure 1 Exposure study by source type – including results without use of multitool

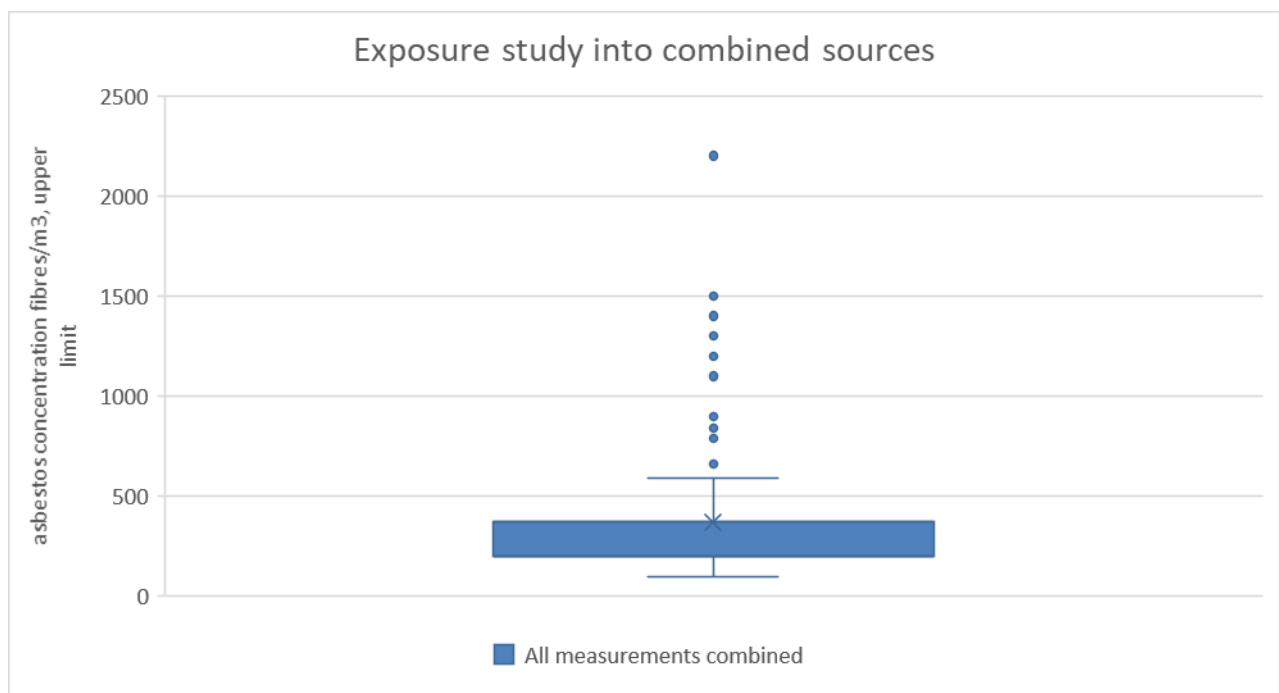


Figure 2 Exposure study into combined sources – including results without use of multitool

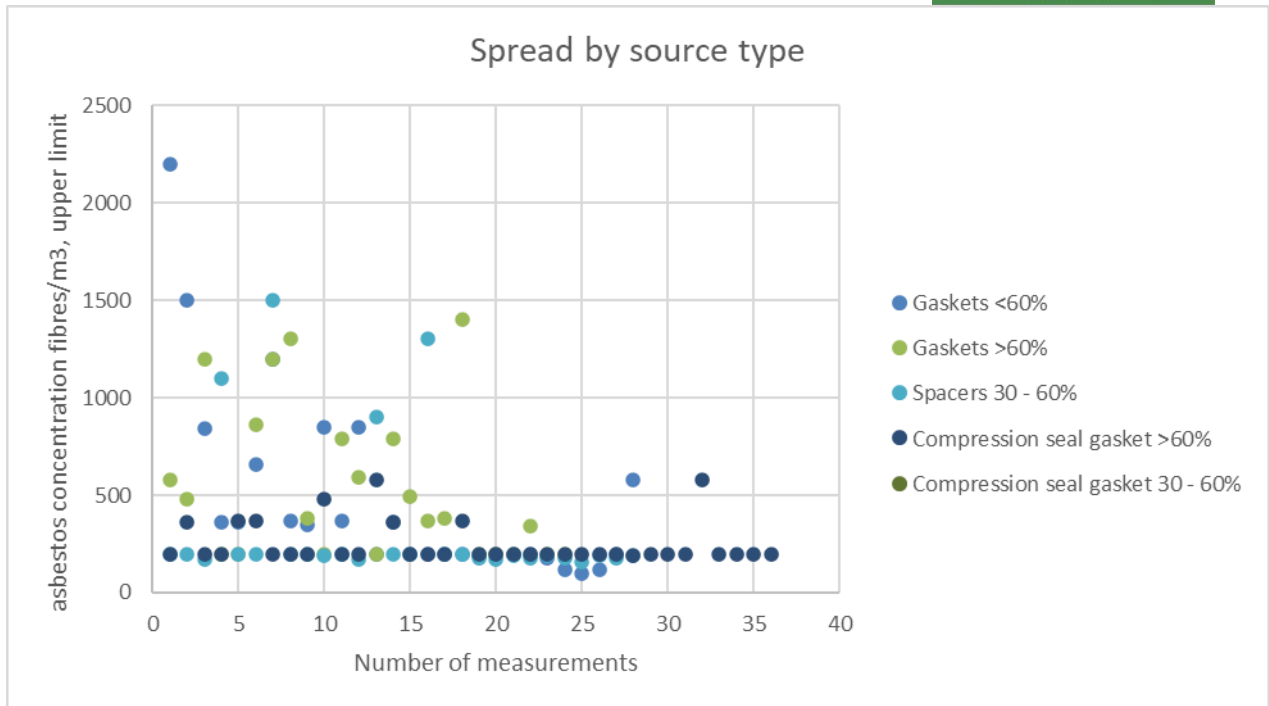


Figure 3 Spread by source type – including results without use of multitool

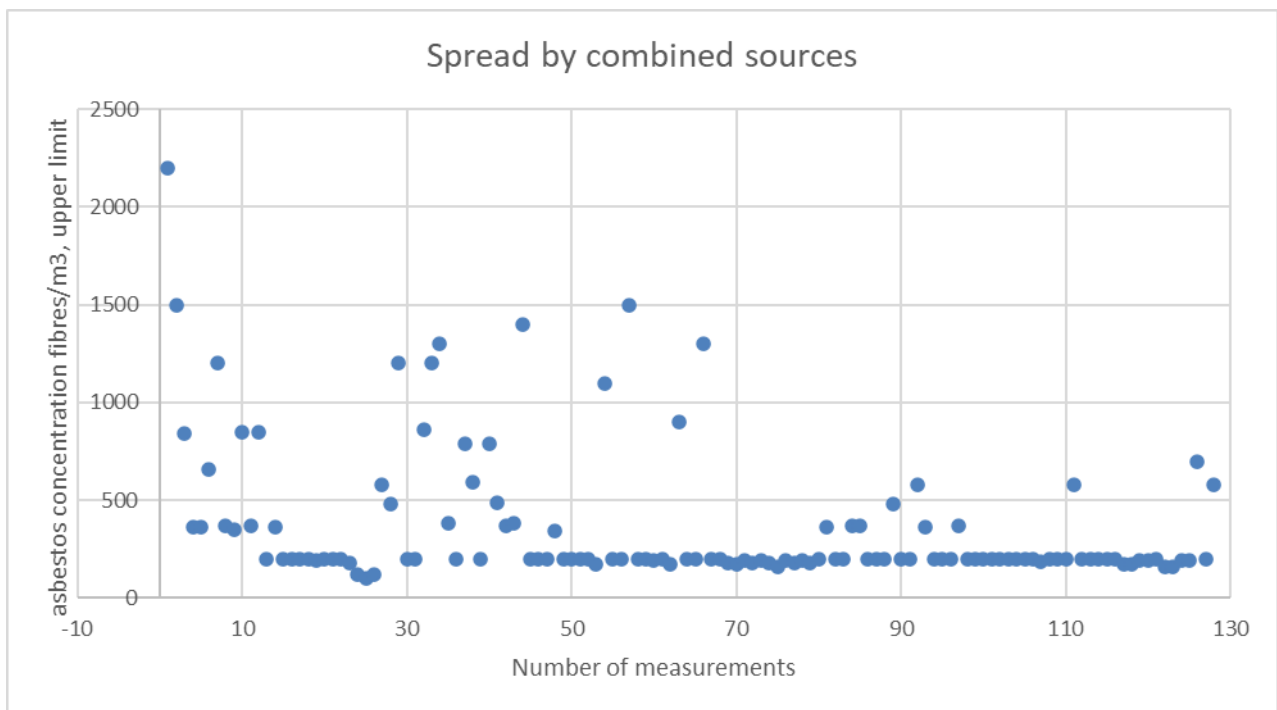


Figure 4 Spread by combined sources – including results without use of multitool

Description	Number of measurements	LOG GM	LOG GSD	GM	GSD	Min	P25	P50	P75	P90	Max
Gasket <60%	28	5,99	0,76	400	2,15	100	200	275	600	1230	2200
Gasket >60%	24	6,13	0,72	458	2,05	196	200	380	790	1250	1400
Spacers 30-60%	29	5,60	0,74	271	2,09	160	180	200	200	1100	1500
Compression seal gasket >60%	36	5,46	0,34	235	1,40	188	198	199	200	403	581
Compression seal gasket 30 - 60%	11	5,32	0,42	205	1,51	160	170	190	195	600	700
All measurements combined	128	5,64	0,65	282	1,92	100	197	200	200	851	2200

Figure 5 Calculation of all PAS measurements – including results without use of multitool



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