EAPA

Handling and Use of Respirable Crystalline Silica on the Asphalt Mixing Plant

A Good Practice Guide on Asphalt Workers Health Protection

- Second Edition -

EAPA Guidance Document

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Summary

In 2018, EAPA published a Guidance Document for the asphalt industry towards the protection of their workers from possible exposure to respirable crystalline silica (RCS) in the workplace. The objective of this guide was to give asphalt producers guidance on the practical application of a programme to manage RCS and RCS-containing products in the asphalt mixing plant. Since then, the European Network for Silica (NEPSI) published a great deal of new documents and the European regulatory framework has been also subjected to different updates. This Second Edition of the EAPA Guidance Document amends outdated information and includes the new updates.

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1. Introduction

This guide serves as a comprehensive resource from the asphalt industry, aimed at safeguarding workers from potential exposure to respirable crystalline silica (RCS) in the workplace. The primary objective is to offer practical guidance to asphalt producers on implementing a robust program for managing RCS risks, as well as safe practices for using products that contain crystalline silica at asphalt mixing plants. The asphalt industry stresses that employees should be protected against potential health effects caused by occupational exposure to respirable crystalline silica in the workplace. Therefore, efforts should be focused on minimising potential personal exposure to respirable crystalline silica. However, users, customers, workers, and readers are advised to consult occupational health professionals and other experts concerning all matters regarding control of respirable crystalline silica in each specific workplace.

This document refers mainly to the Documents issued by the signatories of the Social Dialogue Agreement on Workers' Health Protection through the Good Handling and Use of Crystalline Silica and Products Containing it, in the framework of art. 139 of the Treaty on European Union and with the support of the European Commission [1-4]. This document can be downloaded in different languages on the website of the European Network for Silica (NEPSI) www.nepsi.eu. Additionally, guidance is given from national associations like the Mineral Products Association (MPA) from UK [5].

While the focus is on the asphalt production environment, it should be noted that asphalt road works not related to production—such as sawing, drilling, grinding, and milling of pavements—are covered in other industry publications [6-8].

2. Asphalt industry in Europe

The European Asphalt Pavement Association (EAPA) is the European industry organisation representing manufacturers of bituminous mixes and asphalt as well as companies engaged in asphalt road construction and maintenance. EAPA has around 40 members and associate members. There are two types of members:

- Members (National Associations)
- Associated members (Companies located in Europe and other continents)

At this moment, the members (national industry associations) originate from 16 European countries: Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Norway, Slovenia, Spain, Sweden, The Netherlands, Turkey and United Kingdom.

In Europe, nearly 300 million tonnes of hot and warm mix asphalt were produced in 2022. Asphalt is a mixture of aggregates, sand, filler, the bitumen binder and occasionally several additives. Today more than 90% of the 5,5 million kilometres of roads in Europe are paved with asphalt materials.

Over the years, the asphalt mix has become a highly technical product, using strictly specified materials under rigorous quality assurance programmes; for instance the tolerance for the aggregates are often less than 5% for the shape, size, hardness, wear index, etc., while the variety of mix types is itself almost limitless: depending on its position in the road structure (base or surface course, for example), on its particular function (intensity of traffic, anti-skid properties, noise reduction, etc.), on climatic conditions (from freezing to high temperatures) and on the nature of raw materials locally available (limestone or granite quarries, types of bitumen etc.). It is a carefully engineered product in order to be successful in its use phase.

Nowadays, in Europe, there are approximately 4.000 asphalt mixing plants and over 10.000 companies producing asphalt and/or paving roads with asphalt.

3. Scope - respirable crystalline silica (RCS)

3.1 What is respirable crystalline silica?

By definition, respirable crystalline silica is the fraction of airborne crystalline silica dust that can penetrate the alveoli (gas exchange region) of the lung. In the case of crystalline silica dust, it is the respirable fraction of the dust that is of concern for its health effects. These particles are so small that they cannot be seen with the naked eye. Once airborne, respirable dust takes a very long time to settle. A single release of dust into the workplace air can lead to significant exposure. In fact, in situations where the air is constantly stirred up and where no fresh air is being in-

troduced, respirable dust may remain airborne in the workplace for days.

3.2 How does respirable crystalline silica get into the body?

Respirable crystalline silica enters the body when dust containing a proportion of crystalline silica is inhaled. When the particle size range of the dust is sufficiently small (such that the particles fall within the respirable fraction), the dust will travel deep into the lungs. It is at this point that respirable crystalline silica can cause health effects.

3.3 What are the known health effects associated to respirable crystalline silica exposure?

Workers are rarely exposed to pure crystalline silica. The dust they breathe in the workplace is usually composed of a mixture of crystalline silica and other materials.

Larger (non-respirable) particles are likely to settle in the main airways of the respiratory system and may be cleared by mucus action. However, when one experiences prolonged overexposure to respirable crystalline silica, the body's natural defence mechanisms may find it difficult to clear it from the lungs. This can, in the long term, lead to irreversible health effects, involving scarring of the innermost parts of the lungs, breathing difficulties and, in some cases, death.

The principal health effect associated to the inhalation of respirable crystalline silica is silicosis, a nodular progressive fibrosis, which is one of the most common types of pneumoconiosis and one of the world's oldest known occupational diseases. In addition, other inflammatory pathologies may also appear like scleroderma, systemic lupus erythematosus, or rheumatoid arthritis.

There is also sufficient information to conclude that the relative lung cancer risk is increased in persons with silicosis (and, apparently, not in employees without silicosis exposed to silica dust in quarries and in the ceramic industry). Therefore, preventing the onset of silicosis will also reduce the cancer risk. Since a clear threshold for silicosis development cannot be identified, any reduction of exposure will reduce the risk of silicosis.

In addition, the response of each individual can vary. The following factors can produce a significant effect (multiplicative factors):

- The nature and silica content of the dust
- The dust fractions
- The extent and nature of personal exposure (duration, frequency and intensity, which may be influenced by the working methods)
- Personal physiological characteristics
- Previous sensitisation of the respiratory airways by certain chemical agents
- Smoking habits

3.4 Where is respirable crystalline silica found?

Crystalline silica, in the form of the mineral quartz, is found in many different materials, with sandstone being almost pure quartz. Other forms of silica occur but are of little importance occupationally. The table below gives an indication of typical levels of "free" crystalline silica (or silica not combined with other elements, such as the case of Quartz) in certain mineral sources, but it must be noted that these figures do vary.

Table 1. Typical levels of "free" crystalline silica in certain mineral sources

Source	Typical content
Ball clay	5 – 50%
Basalt	Up to 5%
Natural Diatomite	5-30%
Dolerite	Up to 15%
Flint	Greater than 90%
Granite	Up to 30%
Gritstone	Greater than 80%
Iron ores	7 – 15%
Limestone	Usually less than 1%
Quartzite	Greater than 95%
Sand	Greater than 90%
Sandstone	Greater than 90%
Shale	40 – 60%
Slate	Up to 40%

Occupational exposure to respirable crystalline silica can occur in any workplace situation where airborne dust of the above-listed materials is generated.

This is the case for many industries relied to the asp-

halt industry e.g. quarrying, mining, mineral processing (e.g. drying, grinding, bagging and handling); stone crushing and dressing; construction work, including work with stone.

3.5 Occupational exposure limits

An occupational exposure limit value represents the maximum time-weighted average concentration of an airborne contaminant to which a worker can be exposed, measured in relation to a specified reference period, normally eight hours.

A European Binding Occupational Exposure Limit Value of 0.1 mg/m^3 is set for respirable crystalline silica in Directive 2017/2398. Member States must establish a corresponding national binding OEL value, which can be stricter but cannot exceed the Community limit value.

More information on OEL values in different countries can be found in Annex 1 and on the documents periodically updated by NEPSI (https://nepsi.eu/en/documents/).

4. General prevention principles

In the development of this Good Practices guide, the authors respected the prevention strategy, which is described in Council Directive 89/391/EEC [9] and in its transposition in the national laws.
Nine prevention principles are described and one must consider the following hierarchy in the preventive measures to be taken:

1. Avoiding risks
2. Evaluating the risks which cannot be avoided
3. Combating the risks at source
4. Adapting the work to the individual
5. Adapting to technical progress
6. Replacing the dangerous by the non-dangerous or the less dangerous
7. Developing a coherent overall prevention policy (including the provision of health surveillance of workers)
8. Giving collective protective measures priority over individual protective measures
9. Giving appropriate information, instruction and training to the workers

In the context where crystalline silica is handled in the workplace, examples of practical applications of the above principles are:

- **Substitution:** considering economic, technical and scientific criteria, replace a dust-generating process with a process generating less dust (e.g., use of a wet process instead of a dry process, or an automated process instead of a manual process).
- **Provision of engineering controls:** de-dusting systems (dust suppression, collection and containment) and isolation techniques
- **Good housekeeping practices.**
- **Work pattern:** establish safe working procedures, job rotation.
- **Personal protective equipment:** provide protective clothing and respiratory protective equipment.
- **Education:** provide adequate health and safety training to the workers, information and instructions specific to their workstation or job.

Compliance with Member State Occupational Exposure Limits is just one part of the Risk Management process. You should additionally always ensure that you comply with the General Principles of Prevention, as defined in Council Directive 89/391/EEC [9].

5. Risk management

The risk management processes of Assessment, Control, Monitoring and Education make up the foundation of all European health and safety legislation. At each site, before commencing any work activity that may result in occupational exposure to respirable crystalline silica, employers must carry out a risk assessment to identify the source, nature and extent of that exposure. When the risk assessment identifies that workers may be exposed to respirable crystalline silica, then control measures should be put in place to control exposures.

The Directive 2004/37/EC (and its amendments) aims at the protection of workers against risks to their health and safety arising or likely to arise from exposure to carcinogens or mutagens at work, see Articles 4 and 5. Its obligations include:

- **Reduction and replacement:** the employer shall reduce the use of a carcinogen or mutagen at the place of work, in particular by replacing it, in so far as is technically possible, by a substance, preparation or process which is not dangerous or is less dangerous. This clause

may be difficult to deal with because crystalline silica is a naturally occurring substance, which is present in some materials and without a clear correlation between its content and the consequent produced RCS. The exposition to RCS depends on multiple factors that are difficult to assess.

- **Use of closed systems**: where the replacement is not technically possible the employer shall ensure that the carcinogen or mutagen is, in so far as is technically possible, manufactured and used in a closed system.
- Where a closed system is not technically possible, the employer shall ensure that the **level of exposure of workers is reduced** to as low a level as is technically possible. Exposure shall not exceed the limit value of a carcinogen as set out in Annex III of the Directive.
- The employer shall also apply the following **measures**:
  - Limitation of the RCS quantities at the place of work
  - Reducing the number of workers exposed or to be exposed to RCS
  - Design of work processes and engineering control measures in order to avoid or minimise the release of RCS
  - Evacuation of RCS at source, local extraction system or general ventilation
  - Use of existing appropriate procedures for the measurement of RCS. In this regard, it is important to emphasize the importance of measurements to better assess the risk before detailing the prevention measures. NEPSI published a monitoring protocol to measure exposure to RCS of workers employed at member companies of the NEPSI signatories [10]. This common basic methodology aims to help those sectors who do not have a standardized monitoring methodology in place and enable these sectors to collect RCS exposure data in a harmonized and representative way. Guidance is provided on measurement strategy, appropriate sampling and analytical methods, and data management. In addition, NEPSI, published an Excel data collection sheet that can be used to facilitate data collection [11].
  - Application of suitable working procedures and methods
  - Collective protection measures and/or individual protection measures
  - Hygiene measures, in particular regular cleaning of floors, walls and other surfaces, as well as personal showers, change of clothes, etc.
  - Information for workers
  - Demarcation of risk areas and use of adequate warning and safety signs (e.g., "no smoking")
  - Plans to deal with emergencies in case of high exposure
  - Means for safe storage, handling and transportation, in particular by using sealed and clearly and visibly labelled containers
  - Means for safe collection, storage and disposal of waste by workers, including the use of sealed and clearly and visibly labelled containers.

Since 2018, works involving exposure to respirable crystalline silica dust generated by a work process are included in the European Carcinogens and Mutagens at Work Directive (Directive 2017/2398). A European Binding Occupational Exposure Limit Value of 0.1 mg/m^3 is set in Annex III for respirable crystalline silica dust. The Directive recognises in its Recital 19 that NEPSI good practices [1] are "valuable and necessary instruments to complement regulatory measures and in particular to support the effective implementation of limit values". The mentioned documents integrate the obligations of the Carcinogens and Mutagens at Work Directive and provides recommendation on:

ASSESSMENT - How to assess whether there is a significant risk from exposure to respirable crystalline silica for the workforce. How to interpret the results, also related to limits.
CONTROL - How to decide what type of control and prevention measures should be put in place to treat the risks that are identified – i.e., to eliminate them, or to reduce them to an acceptable level.
MONITORING - How to monitor the effectiveness of the control measures in place. How to monitor workers' health.
TRAINING AND EDUCATION - What information, instruction and training should be provided to the workforce in order to educate them about the risks to which they may be exposed.

6. Asphalt facility activities that generate dust

The following list shows potential processes generating fine particles which could result in respirable crystalline silica exposure for workers during the life cycle of asphalt mixtures. Employers are required to understand potential silica-bearing dust exposures, that may be generated by activities associated with asphalt mix facilities. Because silica dust is inherent in both aggregate and native soils, any activity that creates dust can potentially generate respirable crystalline silica. The non-exhaustive list below shows asphalt-related activities that may require exposure assessment to identify and control sources of airborne silica-laden dust:

6.1 Stockpiling and handling

- Windblown dust from stockpiles
- Vehicle movements around stockpiles
- Handling of fines

6.2 Loading and transport

- Vehicle loading (free-fall of materials)
- Vehicle movement
- Conveyor transport
- Activities near or on unpaved roads and trails

6.3 Screening, crushing and milling of rap (or aggregate)

- All dry processes
- Low risk in wet milling process

6.4 Maintenance of asphalt production facilities

Activities requiring dismantling/opening/access to equipment, or entry into dusty process e.g. drying drum, baghouse.

Cleaning activities (e.g. sweeping, booming) involving entry into dusty process areas (e.g. mixing drum, silos, conveyers, aggregate hoppers, bins) done using e.g. a dry brush or compressed air.

6.5 Maintenance of asphalt pavements

Potential processes generating fine particles which could result in respirable crystalline silica exposure during the maintenance of asphalt pavements (Non-exhaustive list) for SAWING, GRINDING, DRILLING and MILLING are covered e.g., by Routes de France or NIOSH [3,5] and VESF [4] best guidance documents.

7. Reducing exposure levels – the use of task sheets

In the "Good Practice Guide" of NEPSI [1] task sheets (Annex 1) are provided to identify appropriate control measures that will assist employers in reducing exposure levels for selected work activities at an asphalt mixing plant. This given sheets are only examples and the activities presented there are non-exhaustive.

When deciding which task sheet(s) to apply, priority should be given to the most significant sources of exposure to respirable crystalline silica in the workplace.

Depending on the specific circumstances of each case, it may not be necessary to apply all the control measures identified in the task sheets to minimise exposure to respirable crystalline silica i.e., to apply appropriate protection and prevention measures.

Please refer to the guidance sheets provided in "Part 2: Task Manual" of the "Good Practice Guide on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products Containing it" [1] on
http://www.nepsi.eu/good-practice-guide

First, the General Guidance Sheets should be applied if appropriate (Table 2).

Furthermore, some Specific Task Sheets for selected asphalt facility activities listed in Table 3 and provided in "Good Practice Guide" of NEPSI, Annex 1 [1] should be applied if appropriate.

Finally, new management task guidance sheets are also available in [1].

Note: Regarding Activity number 2.3.2, it can be mentioned that "Real time dust monitoring" can be planned better than "Real time RCS monitoring". The sensors used are generally based on algorithms. The use of such tools should be validated by competent authorities.

Table 2: General guidance sheets [1]

NUMBER	ACTIVITY
2.1.1	Cleaning
2.1.2	Design of buildings
2.1.3	Design of control rooms
2.1.4	Design of ducting
2.1.5	Design of dust extraction units
2.1.6.	Dust monitoring
2.1.7.	General indoor storage
2.1.8.	General outdoor storage
2.1.9.	General ventilation
2.1.10.	Good hygiene
2.1.11.	Handling and transport systems
2.1.12.	Laboratory work
2.1.13	Local exhaust ventilation
2.1.14.	Maintenance, service & repair activities
2.1.14.(a)	Dry cutting of slits using electric wall chasers
2.1.14.(b)	Dry cutting and grinding applications using hand-held angle grinders/cutters
2.1.14.(c)	Dry grinding of concrete using electric concrete surface grinders
2.1.14.(d)	Dry sanding activities using hand-held electric power tools
2.1.14.(e)	Wet processing of mineral workpieces containing crystalline silica using hand-held power tools
2.1.15.	Personal protective equipment
2.1.16.	Removing dust or
2.1.17.	Supervision sludge from an extraction unit
2.1.18.	Systems of packaging
2.1.19.	Training
2.1.20.	Working with contractors

Table 3: Specific task sheets for asphalt facilities activities [1]

NUMBER	ACTIVITY
2.2.1(a)	Bag emptying – small bags
2.2.1	(b) Bag emptying – bulk bags
2.2.3.(a)	Bulk road tanker loading
2.2.3.(b)	Bulk loading
2.2.4.(a)	Bulk road tanker unloading (blowing off)
2.2.4.(b)	Bulk unloading
2.2.6	Crushing of minerals/raw materials
2.2.8	Drying minerals/raw materials
2.2.16	Grinding of minerals/raw materials
2.2.18	Jumbo bagging
2.2.21	Mixing of materials
2.2.22	Periodic and continuous drying
2.2.26(a)	Weighing out small quantities
2.2.26(b)	Weighing out of bulk materials
2.2.27	Using water/additives on the roads or open surfaces to reduce dust levels
2.2.28	Screening
2.2.32	Transport systems for fine dry silica products
2.2.43	Quarry mobile equipment – excavation and haulage
2.2.44	Quarry mobile processing plant

Table 4: Management task guidance sheets [1]

NUMBER	ACTIVITY
2.3.1	Dust monitoring
2.3.2	Real time dust* monitoring
2.3.3	Supervision
2.3.4	Training
2.3.5	Working with contractors

8. References

[1] European Network for Silica (NEPSI). Good Practice Guide on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products containing it. Version updated in October 2020. https://guide.nepsi.eu/

[2] European Network for Silica (NEPSI). Good Practices – A Guide for SMEs. https://toolkit.nepsi.eu/wp-content/uploads/2020/12/NEPSI-Good-Practices-a-Guide-for-SMEs.pdf

[3] European Network for Silica (NEPSI). Agreement on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products containing it (2006). https://toolkit.nepsi.eu/wp-content/uploads/2020/12/Agreement-English.pdf

[4] European Network for Silica (NEPSI). The NEPSI Agreement Guide. https://toolkit.nepsi.eu/wp-content/uploads/2020/12/NEPSI-Agreement-Guide.pdf

[5] MPA Issues Guidance Document on Working with Respirable Crystalline Silica Members' Briefing, No: 06/2017, 30 March 2017, Mineral Products Association (MPA), UK.EAPA

[6] "Best practice engineering control guidelines to control worker exposure to respirable crystalline silica during asphalt pavement milling", Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2015–105.

[7] Association of European Road Milling Enterprises (VESF) https://vesf-ev.com, Presentation at EAPA HSE Committee on 4 November 2016.

[8] Guide: Preventing Dust Hazards in the Public Works Sector, Version 25 July 2016, Routes de France

[9] "Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work. (http://eur-lex.europa.eu).

[10] European Network for Silica (NEPSI). Respirable Crystalline Silica Monitoring Protocol. June 2021 https://acrobat.adobe.com/id/urn:aaid:sc:EU:11c4cb58-5626-48fd-a52f-7865bad102fc

[11]] European Network for Silica (NEPSI). Data Collection Sheet. https://nepsi.eu/wp-content/uploads/2022/10/2021_nepsi_rcs_collection_sheet.xlsx

Annex 1: Occupational Exposure Limits in mg/m3 8 hours TWA – Respirable dust – in EU 271 + Norway, Switzerland, Turkey

Country/Authority	(inert) dust INHALABLE	(inert) dust RESPIRABLE	Quartz	Cristobalite	Tridymite	Diatomaceous earth	Amorphous silica	Fused silica	Kaolin	Mica	Talc
Austria	10	5	0,05	0,05	0,05			0,15			2
Belgium	10	3	0,1	0,05	0,05	3	2	0,1	2	3	2
Bulgaria		4	0,07	0,07	0,07	1[2]					3
Cyprus		/	10k/Q[3]	/	/	/	2	/	/	/	/
Czech Republic			0,1	0,1	0,1			4		2	2
Denmark	10	5	0,1	0,05	0,05	1,5		0,1	2		
Estonia			0,05	0,05	0,05		2				
Finland	10	/	0,05	0,05	0,05	5					2
France	10	5	0,1	0,05	0,05				10		
Germany	10	0,5[4]	0,05[5]	0,05[5]	0,05[5]	0,3[6]	4[7]	0,3[8]	/	/	/
Greece	10	5	0,1	0,05	0,05						2
Hungary			0,1	0,1	0,1						2
Ireland	10	4	0.1	0.1	0.1		2,4	0,08	2	0,8	0,8
Italy	10	3	0.1	0.1	0.1			0,1	2	3	2
Lithuania		10	0,1	0,05	0.05						1
Luxembourg	10	6	0,15	0,15	0,15			0,3			2
Malta[9]		/	/	/	/						
Netherlands	10	5	0,075	0,075	0,075					2,5	0,25
Norway	10	5	0,1	0,05	0,05	1,5	1,5			3	2
Poland	2	0,3	0,1	0,1	0,1	2	2	1	10		1
Portugal	10	5	0,025	0,025	0,025			0,1	2	3	2
Romania		10	0,1	0,05	0,05				2	3	2
Slovakia	10		0,1	0,1	0,1		2			2	2
Slovenia			0,1	0,1	0,1			0,3			2
Spain	10	3	0,05	0,05	0,05			0,1	2	3	2
Sweden		5	0,1	0,05	0,05						1
Switzerland		6	0,15	0,15	0,15		0,3	0,3	3	3	2
UK	10	4	0,1	0,1	0,1	1,2	2,4	0,08	2	0,8	1
Turkey			10 mg/ m^3/ $\%SiO_2$ + 2								

1 Missing information for Croatia and Latvia. As of 16 January 2018, a European Binding Occupational Exposure Limit is set for respirable crystalline silica dust at 0.1 mg/m^3 in Directive 2017/2398.
2 Inhalable fraction
3 Q : quartz percentage – K=1
4 Defined for a density of 1 g/cm^3, i.e. for minerals with a common density of 2,5 g/cm^3, a calculated OEL of 1,25 mg/m^3 applies.
5 Assessment criterion (reference value).
6 Respirable fraction for calcinated Kieselgur
7 Inhalable fraction.
8 Respirable fraction.
9 When needed, Maltese authorities refer to values from the UK for OELVs which do not exist in the Maltese legislation.

Country	Adopted by/Law denomination	OEL Name (if specific)
Austria	Verordnungen BGBl. II 382/2020	Maximale ArbeitsplatzKoncentration (MAK)
Belgium	Ministère de l'Emploi et du Travail	
Bulgaria	Ministry of Labour and Social Policy and Ministry of Health (2003)	Limit Values
Cyprus	Department of Labour Inspection. Control of factory atmosphere and dangerous substances in factories.	
Czech Republic	Governmental Directive	Přípustný expoziční limit (PEL) (=Permissible exposure limit)
Denmark	Direktoratet fot Arbeidstilsynet	Threshold Limit Value
Finland	National Board of Labour Protection	Occupational Exposure Standard
France	Ministère du Travail	Valeur limite de Moyenne d'Exposition
Germany	Bundesministerium für Arbeit und Soziales (BMAS)	Arbeitsplatzgrenzwert (AGW)
Greece	Legislation for mining activities	
Ireland	Code of Practice for the Safety, Health & Welfare at Work (CoP)	
Italy	Decreto Legislativo 1 giugno 2020 n. 44	
Lithuania	Dėl Lietuvos higienos normos	Ilgalaikio poveikio ribinė vertė (IPRV)
Luxembourg	Bundesministerium für Arbeit	Maximale ArbeitsplatzKonzentration (MAK)
Malta	OHSA – www.ohsa.org.mt	OELVs
Netherlands	Ministerie van Sociale Zaken en Werkgelegenheid	Publieke grenswaarden http://www.ser.nl/en/oel_database.aspx
Norway	Direktoratet for Arbeidstilsynet	Administrative Normer (8hTWA) for Forurensing I ArbeidsmiljØet
Poland	Regulation of the Minister of Labour and Social –	Limit values
Portugal	Instituto Portuges da Qualidade, Hygiene & Safety at Workplace	Valores Limite de Exposição (VLE)
Romania	Government Decision regarding workers' health surveillance. Government Decision regarding carcinogenic agents (in Annex 3: Quartz, Cristobalite, Tridymite).	OEL
Spain	Instrucciones de Técnicas Complementarias (ITC)	Valores Limites
Sweden	National Board of Occupational Safety and Health	Yrkeshygieniska Gränsvärden
Switzerland		Valeur limite de Moyenne d'Exposition
United Kingdom	Health & Safety Executive	Workplace Exposure Limits (WEL)

Source: NEPSI and IMA-Europe.
https://nepsi.eu/wp-content/uploads/2022/10/oel_full_table_september_2020_europe.pdf

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