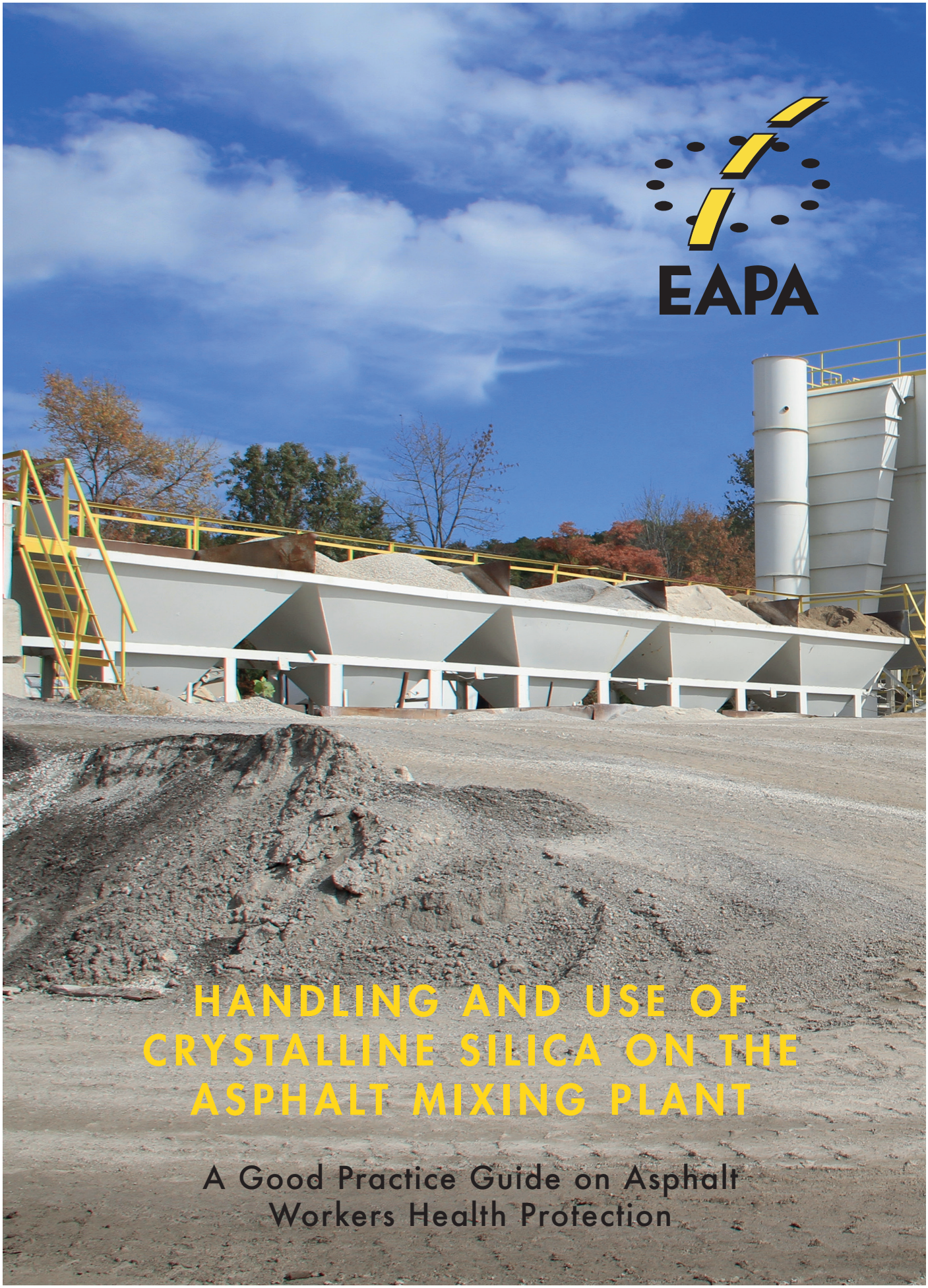


EAPA

HANDLING AND USE OF CRYSTALLINE SILICA ON THE ASPHALT MIXING PLANT

A Good Practice Guide on Asphalt Workers Health Protection

EAPA

©European Asphalt Pavement Association
Rue du Commerce 77
1040 Brussels,
Belgium
www.eapa.org
info@eapa.org
May 2018



LIST OF CONTENT

PAGE#

4 INTRODUCTION

5 ASPHALT INDUSTRY IN EUROPE

6 SCOPE - RESPIRABLE CRYSTALLINE SILICA (RCS)

8 GENERAL PREVENTION PRINCIPLES

9 RISK MANAGEMENT

10 ASPHALT FACILITY ACTIVITIES THAT GENERATE DUST

11 REDUCING EXPOSURE LEVELS – THE USE OF TASK SHEETS

13 BIBLIOGRAPHY

INTRODUCTION

This guide is a contribution of 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 is to give asphalt producers guidance on the practical application of a programme to manage respirable crystalline silica and guidance on the safe use of crystalline silica containing products in the asphalt mixing plant.

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 "Good Practice Guide" 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]. 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 [2].

Asphalt road works, not related to the production of asphalt, like sawing, drilling, grinding and milling of pavements are handled in other publications of the road construction industry [3,4,5].

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, India, the USA and Russia)

At this moment, the members (national industry associations) originate from 15 European countries: Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Norway, Slovenia, Spain, Sweden, Turkey and United Kingdom.

In Europe, approximately 280 million tonnes of hot and warm mix asphalt were produced in 2016. 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 made of asphalt material.

Along 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.

Now, in Europe there are approximately 4.500 asphalt mixing plants, more than 10.000 companies are producing and/or paving asphalt, 180.000 people working in the asphalt industry.

SCOPE - RESPIRABLE CRYSTALLINE SILICA (RCS)

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

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.

WHAT ARE THE KNOWN HEALTH EFFECTS ASSOCIATED TO RESPIRABLE CRYSTALLINE SILICA EXPOSURE?

The principal health effect associated to the inhalation of respirable crystalline silica is silicosis. Silicosis is one of the most common types of pneumoconiosis. Silicosis is a nodular progressive fibrosis caused by the deposition in the lungs of fine respirable particles of crystalline silica. When one experiences prolonged overexposure, the body's natural defence mechanisms may find it difficult to clear respirable crystalline silica from the lungs. An accumulation of dust can, in the long term, lead to irreversible health effects. These health effects involve scarring of the innermost parts of the lungs that can lead to breathing difficulties and, in some cases, death. Larger (non-respirable) particles are more likely to settle in the main airways of the respiratory system and may be cleared by mucus action.

Silicosis is one of the world's oldest known occupational diseases and is caused by the inhalation of respirable crystalline silica.

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.
The response of an individual is likely to depend on:

- 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
- Smoking habits

WHERE IS RESPIRABLE CRYSTALLINE SILICA FOUND?

Occupational exposure to respirable crystalline silica can occur in any workplace situation where airborne dust is generated, which contains a proportion of respirable crystalline silica.

This is the case for many industries relied to the asphalt industry e.g. quarrying, mining, mineral processing (e.g. drying, grinding, bagging and handling); stone crushing and dressing; construction work, including work with stone.

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.

Currently there are many different types of occupational exposure limit value, defined by individual Member States of the European Union, see Annex 3 of [1]. These limits are all different and, in addition, cannot be compared directly.

There is currently no European Union occupational exposure limit for respirable crystalline silica, but a threshold of 0,1 mg/m^3 is discussed in the European Institutions and may soon be reality.

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 [6] 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: taking into account 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 [6].

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.

In the "Good Practice Guide" of NEPSI [1] basic risk management techniques are explained that should be applied to the specific workplace situations where persons may be exposed to respirable crystalline silica.

Guidance will be given 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.

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 production 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 pavement mix facility activities that may require exposure assessment to identify and control sources of airborne silica-laden dust:

STOCKPILING AND HANDLING

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

LOADING AND TRANSPORT

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

SCREENING, CRUSHING AND MILLING OF RAP (OR AGGREGATE)

- All dry processes
- Low risk in wet milling process

MAINTENANCE / REPAIR

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.

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.

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 (figure 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 sludge from an extraction unit
2.1.17.	Supervision
2.1.18.	Systems of packaging
2.1.19.	Training
2.1.20.	Working with contractors

Figure 1: General guidance sheets [1].

Furthermore, some Specific Task Sheets for selected asphalt facility activities listed in figure 2 and provided in "Good Practice Guide" of NEPSI, Annex 1 [1] should be applied if appropriate.

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
2.2.8.	Drying minerals
2.2.16.	Grinding of minerals
2.2.19.	Jumbo bagging
2.2.22.	Mixing of materials
2.2.23.	Periodic and continuous drying
2.2.29.	Screening

Figure 2: Specific Task Sheets for asphalt facilities activities [1].

BIBLIOGRAPHY

[1] "Good Practice Guide on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products Containing" 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 (www.nepsi.eu).
EAPA Document HSE-17-973

[2] MPA Issues Guidance Document on Working with Respirable Crystalline Silica Members' Briefing, No: 06/2017, 30 March 2017, Mineral Products Association (MPA), UK.
EAPA Document HSE-17-N965

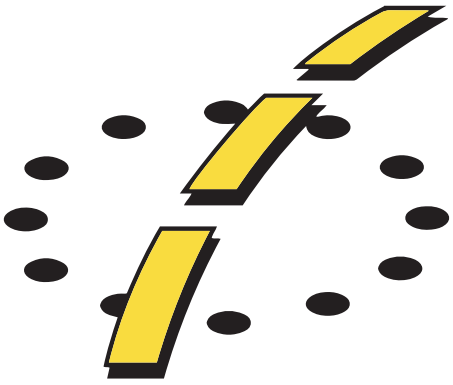
[3] "Best practice engineering control guidelines to control worker exposure to respirable crystalline silica during asphalt pavement milling", Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2015–105.
EAPA Document HSE-18-N990

[4] Association of European Road Milling Enterprises (VESF)
https://vesf-ev.com, Presentation at EAPA HSE Committee on 4 November 2016.
EAPA Document HSE-16-N943

[5] Guide: Preventing Dust Hazards in the Public Works Sector, Version 25 July 2016, Routes de France
EAPA Document HSE-17-N978

[6] "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).

Note: All EAPA Documents can be downloaded by EAPA Members from the "Members Only" area on the EAPA Website on www.eapa.org.



EAPA

EUROPEAN ASPHALT PAVEMENT ASSOCIATION

Rue du Commerce 77
B-1040 Brussels, Belgium

Phone +32 2 502 5888
E-mail info@eapa.org
Web www.eapa.org