

Silica - the next asbestos?



Contents

1.	Foreword: Jim Shannon MP	1
2.	Foreword: Patrick Heath-Lay	2
3.	Acknowledgements	3
4.	Summary of recommendations	4
5.	Executive summary	5
6.	Introduction	7
	UK construction industry	8
	What is silica?	8
	Where silica is found	9
	Exposure limits and measurement	10
	Policy context	10
	The UK legal framework	10
	What is silicosis?	11
	Lung disease in the UK	12
7.	The scale of the problem	13
	Incidence and co-morbidity with lung cancer	14
	Incidence of silicosis in younger workers	14
	Shortcomings in diagnosis	15
	A socio-economic issue?	15
8.	Awareness and understanding	17
9.	The clinical context	18
	The role of the GP and training	18
	Reskilling GPs to enable early diagnosis and effective treatment	19
	Occupational health surveillance and regulation	19
	The use of chest X-rays	20
	National screening programme	20
	The need for occupational health resource	21
	Respirable crystalline silica as a carcinogen	21

10.	Workplace exposure limits	22
	The UK's position	22
	The European and American picture	22
	Australia takes action	23
	Impact of reducing the Workplace Exposure Limit	24
11.	Regulation, compliance and risk control	25
	Current regulations and guidance	25
	Use of face masks	26
	What about compliance?	28
	Monitoring dust exposure	28
	Enforcement	29
	How is the risk controlled?	29
	The benefits of engineering controls and offsite manufacture	30
	Designing out exposure	30
	Offsite manufacture	30
	Dust extraction and water suppression	30
12.	Case study - a dusty career: Gordon Sommerville	31
13.	Timeline	33
14.	Glossary	35
15.	List of contributors	36

1. Foreword

We are delighted to launch this report in partnership with B&CE, following our extensive inquiry into the considerable challenges around silicosis and its impact on workers in the construction industry.

The All Party Parliamentary Group for Respiratory Health was brought together to raise awareness of the importance of respiratory health and to promote effective policy for improving treatments and outcomes for respiratory illnesses.

The inquiry has given us real insights into the outstanding work carried out in the construction industry and the hazards that are too often part of everyday life for those who work within it. We hope that the outcomes of the report will assist the Health and Safety Executive, the government and the construction industry to protect its workforce from preventable injury and illnesses.

The potential impact of silicosis is largely ignored by the media and the public. We are delighted that those who responded so generously to our call for evidence were able to offer crucial insight and opinion into the causes, treatment and management and most importantly the prevention of the disease.

Our hope is that the report will result in greater awareness and understanding of a chronic, disabling and entirely preventable life threatening illness.

We would particularly like to thank Patrick Heath-Lay, the CEO of B&CE and his team for their outstanding assistance in helping us to conduct the inquiry and produce this report.

Jim Shannon MP
Chair | APPG for Respiratory Health



“The inquiry has given us real insights into the outstanding work carried out in the construction industry and the hazards that are too often part of everyday life for those who work within it. We hope that the outcomes of the report will assist the Health and Safety Executive, the government and the construction industry to protect its workforce from preventable injury and illnesses.”

Jim Shannon MP

2. Foreword

Silicosis. A disease you may not have heard of, but, according to the HSE, exposure to silica forms the biggest risk to construction workers after asbestos. B&CE are therefore delighted to have worked with the All Party Parliamentary Group for Respiratory Health on this important inquiry.

B&CE is firmly rooted in the construction industry. We were founded in 1942, initially to provide, on a not for profit basis, a national holiday pay scheme that was effective for construction workers and hassle-free for employers. Since then, we've grown our membership and created additional financial products, including The People's Pension, now one of the UK's leading auto-enrolment scheme with nearly 5 million members. We remain a not for profit organisation owned by construction industry employers and trade unions, and in 2016 we acquired Constructing Better Health, committing to help improve health in the industry.

We first approached the All Party Group in early 2019 to discuss a range of respiratory conditions that are prevalent in the construction industry. Although great strides have been made in safety over the past 40 years, health has not been given equal weight, and construction workers are still 100 times more likely to die from a preventable occupational disease than from an accident. We also know that approximately 12,000 deaths in the industry each year are linked to exposure to dust and chemicals.

The evidence we received from contributors revealed that the UK lags other developed nations in terms of exposure limits to respirable crystalline silica, that the scale of silicosis in the construction industry remains unknown and that awareness of the risks is low amongst both workers and employers.

The aim of this report is to start a long-overdue conversation among and between Government, Parliament, health bodies and the construction industry about how to tackle this entirely preventable, often fatal, condition. I want to thank all the organisations and individuals who took the time to submit evidence, along with the officers of the APPG for their interest in and commitment to raising awareness of silicosis.

Patrick Heath-Lay
Chief Executive Officer | B&CE



Construction workers are still 100 times more likely to die from a preventable occupational disease than from an accident. We also know that approximately 12,000 deaths in the industry each year are linked to exposure to dust and chemicals.

Patrick Heath-Lay | B&CE

3. Acknowledgements

The All Party Parliamentary Group for Respiratory Health wishes to thank B&CE for its support in producing this report.

We are grateful to the following for their help and assistance in its production:

- Samantha Wilding, Health Policy & Public Affairs Lead, B&CE
- Pippa Dolman, Occupational Health Manager, B&CE
- Dirk Paterson, Director, The Corporate Comms Shop (supporting consultant)

In addition, we would like to thank Hugh McKinney, Policy Adviser to the APPG and Will Lane, Consultant for their continued support.

For additional copies of the report, please download at www.bandce.co.uk/silica-next-asbestos

4. Summary of recommendations

1. We recommend that silicosis is included as a reportable condition under the Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations (2013) for those who are still at work and exposed, and call on Government to similarly amend the Health Protection (Notification) Regulations 2010 to make silicosis notifiable through Public Health England, thereby creating a compulsory national silicosis register
2. We recommend that a targeted industry awareness campaign is developed and implemented for those at risk of developing silicosis
3. We recommend that a mechanism is introduced whereby workers are able to hold their own occupational health records so that the relationship between symptoms and exposures is considered
4. We recommend that occupational health services are introduced into GP surgeries to allow for occupational histories to be taken where work-related ill health is suspected
5. We recommend that Government introduces new health and safety regulations specifically relating to the control of respirable crystalline silica (RCS), to bring it into line with asbestos
6. We recommend that the NHS investigates the introduction of an appropriate screening programme for those exposed to RCS
7. We recommend that access to occupational health services is established for those industries generating RCS exposure
8. We recommend that the workplace exposure limit (WEL) for RCS in the UK is reduced from $0.1\text{mg}/\text{m}^3$ to $0.05\text{mg}/\text{m}^3$ in line with the 2003 recommended exposure standard from the Scientific Committee on Occupational Exposure Limits, and statutory monitoring requirements are introduced to ensure workers are not exposed above that limit
9. We recommend that the HSE introduces compulsory requirements for the effective use of masks, dust extraction and water suppression, along with annual reporting of inspection and compliance levels
10. We recommend that HSE resources are increased to raise the volume of on-site inspections of building contractors of all sizes.

5. Executive summary

Silicosis is the most common chronic occupational lung disease worldwide¹, estimated to affect thousands of workers every year². It is, however, entirely preventable.

Silicosis is caused by the inhalation of respirable crystalline silica (RCS). RCS is created when it is fractured through processes such as stonecutting and drilling and is the most toxic form of the substance. It increases the risks of tuberculosis, kidney disease, arthritis, Chronic Obstructive Pulmonary Disease, lung cancer and chronic bronchitis³.

Exposure to RCS is a particular risk in the construction industry.

The Health and Safety Executive (HSE) stated in their evidence that 'silica is the biggest risk to construction workers after asbestos'⁴. Construction remains a dangerous industry that includes risks such as exposure to noise, chemicals, vibrating tools and dust. An estimated 600,000 workers are exposed to silica in the UK⁵. IOSH estimate that in Europe as a whole, 81% of those exposed are employed in construction or in manufacturing products used in that industry⁶.

The scale of the problem is unknown.

There are approximately 1.36 million people employed in the UK construction industry⁷, with an additional 850,000 workers classified as self-employed⁸. A number of respondents provided evidence that many of these could be exposed to the dangers of RCS, but the precise number affected remains unclear. Under-reporting, the fragmented nature of the industry and poor diagnostic ability in the UK are all contributing factors. In addition, silicosis is no longer RIDDOR-reportable (RIDDOR was revised in 2013 following Government-commissioned reviews, and the subsequent recommendations were accepted), nor is it a notifiable disease under the Health Protection (Notification) Regulations 2010, which require the reporting of specific diseases to the HSE or Public Health England⁹.

Awareness and understanding of the risks of RCS exposure remains low amongst construction workers.

A number of respondents told us that there is a widespread lack of understanding amongst both construction workers and employers of the hazards presented by RCS. It was also acknowledged that tackling this effectively would require a multi-faceted approach which could include a national campaign, real life case studies, updated HSE guidance, compulsory health awareness and training.

There are difficulties in diagnosis due to pressure on GPs, and there is a need for a national screening programme.

GPs have a vital role to play in supporting the diagnosis, treatment and management of silicosis. However, construction workers presenting to their GP with breathing problems do not necessarily link their occupational exposure with their symptoms and a full occupational history is not always taken. Although the new GP training curriculum includes occupational respiratory disease and builds on increasing occupational health topics, respondents told us that there are GPs who may not have had the benefit of this training. Several clinicians suggested in their evidence that supporting GPs in taking occupational histories would identify potential cases early, but that linking job titles to potential exposures takes specific skills and experience.

Some respondents considered the value of a national screening programme for silicosis and suggested that this could be run in conjunction with existing occupational health services. This would provide benefits in terms of early identification, gaining true data on the number of cases and ensuring past results are available for comparison. Clinicians also agreed that some form of national occupational health service for industries exposed to RCS was more appropriate than increasing the burden on primary care.

1 M. Nola and S. Dotlic 'The Respiratory System' in Damjanov, I (ed) Pathology Secrets Philadelphia: Mosby Elsevier (2009) p203

2 F. K. Litow et al 'Occupational Interstitial Lung Diseases' American College of Occupational and Environmental Medicine Vol 57:11 (2015) pp1250-1254 Available at: https://journals.lww.com/aoem/FullText/2015/11000/Occupational_Interstitial_Lung_Diseases.16.aspx Last accessed 09/01/2020

3 American Thoracic Society Breathing in America: Diseases, Progress, and Hope chapter 13 2015 Available at: <https://www.thoracic.org/patients/patient-resources/breathing-in-america/resources/chapter-13-occupational-lung-diseases.pdf> Last accessed 12/12/2019

4 <http://www.hse.gov.uk/construction/healthrisks/cancer-and-construction/silica-dust.htm> Last accessed 12/12/2019

5 C. C. Leung, I. T. S. Yu and W. Chen Silicosis The Lancet 379:9830 (2012) p2008-2018 Available at: <https://www.sciencedirect.com/science/article/pii/S0140673612602359> Last accessed 12/12/2019

6 IOSH Respirable Crystalline Silica: The Facts. No Time To Lose (2015) available at: https://www.notimetolose.org.uk/wp-content/uploads/2018/03/Factsheet_Respirable_crystalline_silica_the_facts_MKT2730.pdf Last accessed 12/12/2019

7 <https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/articles/constructionstatistics/2018#employment-and-earnings> Last accessed 12/12/2019

8 <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/selfemploymentjobsbyindustryjobs04> Last accessed 12/12/2019

9 Great Britain Reporting of injuries, diseases and Dangerous Occurrences Regulations 1995 Elizabeth II (1995) London: The Stationary Office Available at: <http://www.legislation.gov.uk/uksi/1995/3163/schedule/3/made> Last accessed 12/12/2019

In the UK, the workplace exposure limit for RCS is double that of other developed nations.

Workplace exposure limits (WELs) – the maximum allowed concentration in workplace air – for RCS exposure in the UK are out of step with many developed nations. The current limit in the UK is 0.1 mg/m³, compared to those in British Columbia (Canada), Finland, Italy and other countries where the limit is 0.05 mg/m³¹⁰. Various respondents asserted that retaining the existing WEL means that 2.5% of those exposed at that level will develop silicosis after 15 years. Paradoxically, the wider availability and use of power tools since the 1980s may have exacerbated the situation.

The HSE is under-resourced to support reductions in exposure and ensure compliance with the workplace exposure limit.

Many respondents felt that the current regulatory framework is not sufficient, and that silicosis needs its own specific regulations (as is the case with asbestos and lead). Current HSE guidance around respiratory protective equipment is not well-adhered to, with dust masks frequently misused. In addition, the current workplace exposure level is neither adhered to nor enforced. Some respondents called for the HSE to be appropriately resourced to incentivise firms to reduce exposure. Offsite manufacture can help design out exposure, but this needs time to mature and embed.

Regulation is currently ineffective.

The construction industry is dominated by small and micro businesses. There are 1.36 million people employed in construction and 90%+ are in firms of seven or fewer¹¹. Small businesses are both difficult to inspect and seldom have the infrastructure to put the required measures in place.

Added to this, many employers/contractors not only underestimate the extent of exposure, but also do not make control of exposure a priority. In its evidence, the HSE reports that for many common tasks involving high-powered tools, the levels of exposure may still be above an acceptable level even after engineering controls have been implemented.

While the HSE stated that the current regulatory framework is adequate, they also acknowledge that compliance is low. Many respondents suggested this is because the HSE lacks the resources to provide effective enforcement.

A number of respondents suggested that low prosecution levels are the result of too few inspections, rather than a high compliance level with exposure control measures.

Medical practitioners are under-trained and under-resourced to identify silicosis accurately.

A lack of awareness about lung disease and the construction industry, coupled with a lack of consultancy time, means that GPs may not be in a position to take adequate occupational health histories and consequently fail to accurately diagnose and treat silicosis.

The current guidance means that relatively advanced cases are missed, particularly in younger workers. This further reinforces the need for better compliance and prevention of exposure. Some clinicians, in their evidence, agreed that some form of mandated or national occupational health services for industries generating RCS exposure was more appropriate than increasing the burden on primary care.

All respondents acknowledged that any form of mandated or national occupational health service would be fundamentally challenged by the shortage of occupational health professionals in the UK.

There is currently no national compulsory register of silicosis.

Although Unite has recently set up a silicosis register, it is not compulsory. There have been various voluntary schemes for sharing information but there is a widespread need for a compulsory mechanism to register all cases of silicosis. We believe this could help with the identification of cases and contribute to increased awareness by health professionals.

¹⁰ IOSH Respirable Crystalline Silica: The Facts. No Time To Lose (2015) Available at: https://www.notimetolose.org.uk/wp-content/uploads/2018/03/Factsheet_Respirable_crystalline_silica_the_facts_MKT2730.pdf Last accessed 12/12/2019

¹¹ <https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/articles/constructionstatistics/2018#employment-and-earnings> Last accessed 12/12/2019

6. Introduction

This report summarises the results of the All-Party Parliamentary Group for Respiratory Health (APPG) and B&CE's joint inquiry into silicosis. It represents a six-month inquiry into the disease burden of silicosis, the diagnosis, treatment and management of the disease and the impact on patients' lives.

As part of this review, internationally recognised experts in fields relating to silicosis were invited to submit written evidence to the inquiry. These included leading clinicians, academics, trade associations, construction federations, campaigners and the regulator.

We received written submissions from 26 individuals and organisations. We are very encouraged that there has been such an impressive range of opinion and evidence and we hope that this report can increase the level of public knowledge and discussion surrounding silicosis, which appears to be currently lacking.

In expanding the availability of our findings, we hope to supplement the efforts of other organisations active in this field, such as the Health and Safety Executive (HSE), Institution of Occupational Safety and Health (IOSH) and the British Occupational Hygiene Society (BOHS). These organisations work tirelessly to raise awareness and promote good working practices to minimise the risks of silicosis and we commend their ongoing work.

Perhaps the most consistent points made by stakeholders are that we currently do not have a true picture of the disease and that there is a profound lack of awareness amongst construction workers about the risks. This paints a sombre picture, for while there is no cure for silicosis, it is an entirely preventable disease.

The inquiry investigated the following issues:

- the causes, symptoms and challenges of diagnosing silicosis in the construction industry
- the productivity and economic impact of the disease on the construction industry and the UK economy.

“Silica is the biggest risk to construction workers after asbestos”¹²

HSE

¹² <http://www.hse.gov.uk/construction/healthrisks/cancer-and-construction/silica-dust.htm> Last accessed 12/12/2019

UK construction industry

The construction industry contributed roughly 6% of GDP to the UK economy in 2018 and employed approximately 1.36 million people¹³. Over 90% of these companies employ seven people or less, and an additional 850,000 people are classed as self-employed¹⁴. The sector includes the following activities:

- Construction of buildings (residential and non-residential)
- Civil engineering (including utilities and infrastructure)
- Specialist activities (including trades such as plumbing, joinery, stonemasonry, demolition, etc).

Construction remains a dangerous industry that still faces risks such as exposure to noise, chemicals, vibrating tools and of course dust. Since the Health and Safety at Work etc Act 1974 there have been significant improvements in safety but work-related ill health remains a persistent problem. Construction workers are still 100 times more likely to die from a preventable occupational disease than from an accident and approximately 12,000 lung disease deaths annually are linked to past exposures at work¹⁵.

What is silica?

Silicon dioxide, commonly referred to as 'silica', is a natural substance found in stone, rocks and sand and is a major component of construction materials including concrete, bricks, tiles and mortar. Silicon dioxide is found naturally around the world, in the forms of minerals including quartz, tridymite and cristobalite. These forms of silicon dioxide have a crystal structure. Other forms, known as 'amorphous silica' (including silica gel and diatomaceous earth) are much less hazardous than the crystalline forms¹⁶.

RCS is most toxic when it is freshly 'fractured' through processes such as stonecutting, drilling and polishing. When broken down in this way, it is a fine enough dust to reach deep inside the lungs when inhaled. Silica dust particles are invisible to the naked eye in normal light¹⁷, so high concentrations can be inhaled without the worker being aware of it.

A wide range of construction trades are potentially exposed to RCS, including demolition, quarrying, potteries, masonry manufacture, slate mining, concrete manufacture, tunnelling, sandblasting, foundries and fireplace and worktop manufacture. In preparing this report, we received evidence from a number of construction federations, as well as individual companies and specialist groups representing tunnelling, stonemasonry and others.

Figures from IOSH show that roughly half million people are exposed to RCS at work in the UK. They estimate that in Europe as a whole, 81% of these are employed in construction or in manufacturing products used in that industry¹⁸.

It is also important to note that exposure to RCS can occur beyond the task of drilling or cutting. The dust can remain airborne after the task, be released from clothes, be made airborne again when disturbed (for example, by cleaning), and be released in leaks or spillages¹⁹.

According to the HSE, 'silica is the biggest risk to construction workers after asbestos'²⁰.

13 <https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/articles/constructionstatistics/2018#employment-and-earnings> Last accessed 12/12/2019

14 <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/selfemploymentjobsbyindustryjobs04> Last accessed 12/12/2019

15 HSE Summary Statistics for Great Britain(2019) Available at: <http://www.hse.gov.uk/statistics/overall/hssh1819.pdf>

16 IOSH Respirable Crystalline Silica: The Facts. No Time To Lose (2015) Available at: https://www.notimetolose.org.uk/wp-content/uploads/2018/03/Factsheet_Respirable_crystalline_silica_the_facts_MKT2730.pdf Last accessed 12/12/2019

17 IOSH Respirable Crystalline Silica: The Facts. No Time To Lose (2015) Available at: https://www.notimetolose.org.uk/wp-content/uploads/2018/03/Factsheet_Respirable_crystalline_silica_the_facts_MKT2730.pdf Last accessed 12/12/2019

18 IOSH Respirable Crystalline Silica: The Facts. No Time To Lose (2015) Available at: https://www.notimetolose.org.uk/wp-content/uploads/2018/03/Factsheet_Respirable_crystalline_silica_the_facts_MKT2730.pdf Last accessed 12/12/2019

19 IOSH Respirable Crystalline Silica: The Facts. No Time To Lose (2015) Available at: https://www.notimetolose.org.uk/wp-content/uploads/2018/03/Factsheet_Respirable_crystalline_silica_the_facts_MKT2730.pdf Last accessed 12/12/2019

20 <http://www.hse.gov.uk/construction/healthrisks/cancer-and-construction/silica-dust.htm> Last accessed 12/12/2019

Where silica is found²¹

The amounts of silica in various types of stone are detailed in Table 1:

Type of stone	Amount of silica present
Sandstone, gritstone, quartzite	More than 70%
Concrete, mortar	25-70%
Shale	40-60%
China stone	Up to 50%
Slate	Up to 40%
Brick	Up to 30%
Granite	Up to 30%
Ironstone	Up to 15%
Basalt, dolerite	Up to 5%
Limestone, chalk, marble	Up to 2%

Table 1: silica concentration in different types of stone

²¹ <http://www.hse.gov.uk/lung-disease/silicosis.htm> Last accessed 12/12/2019

Exposure limits and measurement

RCS is measured in terms of Workplace Exposure Limits (WELs), the maximum allowed concentration in workplace air, averaged over a specified period of time (time-weighted average). Two time periods are generally used: long-term (8 hours); and short-term (15 minutes). Short-term exposure limits are generally used for substances which have an immediate acute effect, such as carbon monoxide.

Measurement of exposure to RCS can be carried out by an occupational hygienist using sampling equipment (including a sampling pump, filters and flowmeter) worn by the worker throughout their shift. When analysed, the result is expressed as milligrams of RCS per cubic metre of air sampled (mg/m³).

The long-term WEL for RCS in Britain is currently 0.1 mg/m³. There is no short-term limit²² (see Section 10: Workplace Exposure Limits).

Policy context

In 1995, the International Labour Organisation (ILO)/World Health Organisation Joint Committee on Occupational Health launched the Global Programme for the Elimination of Silicosis (GPES) from the world by 2030²³. This made eliminating silicosis a priority for countries and placed it high on the occupational health agenda. The objective is to encourage every country to develop its own national silicosis elimination strategy, and to provide a knowledge base for countries that wish to launch a national programme.

The ILO suggests that 'at the national level, laws and regulations, enforcement of occupational exposure limits and technical standards, technical advisory services, an effective system of inspection, a well-organised reporting system, and a national action programme involving governmental agencies, industry and trade unions constitute the necessary elements of a sound infrastructure which is needed to prevent silicosis successfully'²⁴.

According to the ILO, the United Kingdom has a well organised prevention system²⁵. However, a national action plan and reporting system have not been put in place for silicosis in the UK, as many respondents highlighted. An ageing population and the growing pressures on the NHS mean that tackling the impact of silicosis will be an increasingly important challenge for policymakers in the years ahead.

Government policy in relation to silicosis and the dangers of silica dust is largely contained in HSE Codes of Practice and guidance. There has been very little parliamentary activity on this topic in past years. Silica is an ongoing threat with a potential long-term impact as great as asbestos – many construction tradespeople work with silica and are exposed to the dust every day.

Silicosis has a significant impact on quality of life. Many people die with rather than because of the condition. As a result, as the HSE pointed out in their evidence, silicosis is not specifically identified as the cause of death in most cases. However, silicosis patients normally present with significant co-morbidities, which contribute to a substantial number of deaths in the UK.

The UK legal framework

Under Regulation 6 of the Control of Substances Hazardous to Health (COSHH) Regulations 2002, UK employers have a legal responsibility to carry out risk assessments where there is exposure to harmful substances (including RCS) and to implement control measures²⁶.

The Regulations require employers to control substances that are hazardous to the health of their workers and contractors. 'Dusts' are defined as substances hazardous to health and are included under the regulations which focus on preventing exposure at source; if it can't be prevented, controls should be applied until the risk of harm is 'as low as is reasonably practicable'²⁷. COSHH does not cover asbestos, as it has its own specific regulations.

22 HSE EH40/2005 Workplace Exposure Limits fourth edition (2020) available at <https://www.hse.gov.uk/pubns/priced/eh40.pdf> Last accessed 20/01/2020

23 National Programme for the Elimination of Silicosis (NPES) ILO http://www.ilo.org/safework/projects/WCMS_110469/lang--en/index.htm Last accessed 12/12/2019

24 National Programme for the Elimination of Silicosis (NPES) ILO http://www.ilo.org/safework/projects/WCMS_110469/lang--en/index.htm Last accessed 12/12/2019

25 http://www.ilo.org/safework/info/WCMS_108566/lang--en/index.htm Last accessed 12/12/2019

26 Great Britain The Control of Substances Hazardous to Health Regulations 2002 Elizabeth II (2002) London: The Stationary Office Available at: <http://www.legislation.gov.uk/uksi/2002/2677/contents/made> Last accessed 12/12/2019

27 <http://www.hse.gov.uk/coshh/basics/whatdo.htm> Last accessed 12/12/2019

According to the Regulations, with regard to RCS, employers are required to:

- Carry out a risk assessment
- Keep a record of the assessment (if they employ more than five people)
- Where practicable, consider substituting material with a lower RCS content
- Prevent or control exposure to RCS
- Explain the risks of RCS and how to avoid them
- Provide the worker with respiratory protective equipment²⁸.

In addition, if employers are exposing their workforce to hazards and risks (including RCS) where there is a disease associated with the substance, they are also obliged to provide health surveillance. Regulation 6 of the Management of Health and Safety at Work Regulations 1999 states that: 'Every employer shall ensure that his workers are provided with such health surveillance as is appropriate having regard to the risks to their health and safety which are identified by the [risk] assessment'²⁹. Health surveillance is required where there is a specific health condition caused by the hazardous substance, there is a valid test to identify the health condition and the workplace or working conditions mean that the condition may occur.

Silicosis is the world's oldest known occupational disease

Unite the Union

What is silicosis?

Silicosis is considered to be the most common chronic occupational lung disease worldwide estimated to affect thousands of workers every year^{30, 31}. It is a form of pneumoconiosis and is a progressive, degenerative respiratory condition which causes crippling health conditions and co-morbidities and can lead to death. Symptoms of silicosis were first described by Hippocrates in around 400 BC³², and the term silicosis was coined by Visconti in 1870³³.

It is a chronic occupational lung disease caused by the inhalation of RCS dust and is particularly prevalent amongst those who work with stone as part of their regular work. This includes construction workers, stonemasons, tilers, bricklayers, kitchen fitters and pavers.

Silicosis is caused by the body's immune system trying to remove the tiny particles of RCS, resulting in swelling and scarring of the lung tissue, known as fibrosis. This stops the lungs working properly and causes coughing, shortness of breath, weakness and ultimately, loss of mobility. The condition is progressive; even if the worker is no longer exposed, the effects of silicosis are irreversible and continue to develop.

Symptoms can take 10-20 years to emerge. After very heavy exposure, however, the condition can develop more quickly – after only a few months or years³⁴. As the condition gets worse, the symptoms increase. Ultimately, silicosis can be fatal if the lungs stop working properly, but there may be extensive damage to the lungs before any symptoms appear.

Even if silicosis is not the recorded reason for death, it causes significant co-morbidities. Silicosis increases the likelihood of developing other health issues such as chest infections, heart failure, arthritis, kidney disease, Chronic Obstructive Pulmonary Disease (COPD) and lung cancer³⁵.

28 Great Britain The Control of Substances Hazardous to Health Regulations 2002 Elizabeth II (2002) London: The Stationary Office Available at: <http://www.legislation.gov.uk/ukSI/2002/2677/contents/made> Last accessed 12/12/2019

29 Great Britain The Control of Substances Hazardous to Health Regulations 2002 Elizabeth II (2002) London: The Stationary Office Available at: <http://www.legislation.gov.uk/ukSI/2002/2677/contents/made> Last accessed 12/12/2019

30 F. K. Litow et al 'Occupational Interstitial Lung Diseases' American College of Occupational and Environmental Medicine Vol 57:11 (2015) pp1250-1254 Available at: https://journals.lww.com/joem/Fulltext/2015/11000/Occupational_Interstitial_Lung_Diseases.16.aspx Last accessed 09/01/2020

31 M. Nola and S. Dotlic 'The Respiratory System' in Damjanov, I (ed) Pathology Secrets Philadelphia: Mosby Elsevier (2009) p203

32 P. M. Tyler Department of the Interior United States Bureau of Mines Information Circular The Fertilizer Industries (1935) Available at: https://books.google.co.uk/books?id=QyEjU05ZrUC&pg=PP1&pg=PP1&dq=Department+of+the+Interior+United+States+Bureau+of+Mines+Information+Circular+The+Fertilizer+Industries+1935&source=bl&ots=IsjHQwXYVY&sig=ACfU3U03lcosIkCpJ_NolaGBN80zDhRxlw&hl=en&sa=X&ved=2ahUKEwixMSctuzIAhXROEEAHZq9AfIQ6AEwBXoECakQAQ#v=onepage&q=Department%20of%20the%20Interior%20United%20States%20Bureau%20of%20Mines%20Information%20Circular%20The%20Fertilizer%20Industries%201935&f=false Last accessed 12/12/2019

33 I. A. Greaves, Not-so-simple Silicosis: A Case for Public Health Action American Journal of Industrial Medicine Vol 37 (2007) pp245-251 Available at: <https://onlinelibrary.wiley.com/doi/abs/10.1002/%28SICI%291097-0274%28200003%2937%3A3%3C245%3A%3AAID-AJIM1%3E3.0.CO%3B2-2> Last accessed 12/12/2019

34 A. Seaton, et al Accelerated Silicosis in Scottish Stonemasons The Lancet 337:8737 (1991) p341-344 Available at: <https://www.sciencedirect.com/science/article/pii/S014067369190956P> Last accessed 12/12/2019

35 NHS (2018) Silicosis available at <https://www.nhs.uk/conditions/silicosis/> Last accessed 12/12/2019

Diagnosis is obtained by chest X-ray. The benefit gained from diagnosing the condition before symptoms develop is generally accepted by the WHO to outweigh the risk³⁶.

HSE figures tell us that over 500 construction workers died from silicosis³⁷ in 2005 but we do not have a true picture of the extent of the condition. This was highlighted in a number of submissions (See Section 7: The scale of the problem).

The tragedy of the health impact of silicosis on workers is that it is 'entirely preventable'³⁸. Yet the risk of silicosis remains a challenge in a number of UK industries. According to a study published by Loughborough University, the consequences of the disease costs employers in the construction industry about £1 million per year (excluding HSE prosecution costs, compensation claims and occupational cancer)³⁹.

In the absence of any effective or specific treatment for silicosis, the control of exposure to silica dust is the only way to protect workers' health. The prevention of silicosis depends on a range of preventive measures.

Lung disease in the UK

Overall costs to the NHS are hard to quantify given the lack of accurate data on the number of silicosis cases. However, silicosis will contribute to:

- 700,000 hospital admissions annually for lung disease⁴⁰
- 4,000 deaths per year from Chronic Obstructive Pulmonary Disease⁴¹
- The cost of all respiratory disorders to the economy of £11.1bn a year⁴² (0.6% of the UK's GDP in 2014). Of this, £10bn is direct cost to the NHS; the remainder is working time lost⁴³
- The NHS estimates that there are 2,000 – 4,000 new diagnoses of Interstitial Lung Disease (ILD) each year⁴⁴, of which a proportion will be due to silicosis.

Box 1: Unite's Silica Register

On 5th August 2019, Unite the Union launched an online register for workers who have been exposed to RCS to register their exposure. This will assist with future claims, as the register will identify when and where workers were exposed. Affected workers can complete a RCS questionnaire to join the register, available at <https://www.unitelegalservices.org/surveys/silica-dust-register>

36 World Health Organisation Early Detection of Occupational Diseases Geneva: WHO (1986) Available at: <https://apps.who.int/iris/bitstream/handle/10665/37912/924154211X.pdf;jsessionid=798C079FFBDC6AD2BCDE37ABC241F7B0?sequence=1> Last accessed 12/12/2019

37 HSE Occupational Cancer in Great Britain Norwich: HSE (2018) Available at: <https://www.hse.gov.uk/statistics/causdis/cancer.pdf> Last accessed 12/12/2019

38 Editorial: The world is failing on silicosis The Lancet 7:4 (2019) p283 Available at [https://www.thelancet.com/journals/lanres/article/PIIS2213-2600\(19\)30078-5/fulltext](https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(19)30078-5/fulltext) Last accessed 12/12/2019

39 Gibb, A., Drake, C. and Jones, W. (2018) Costs of occupational ill-health in construction. Loughborough University / ICE available at <https://www.ice.org.uk/ICEDevelopmentWebPortal/media/Documents/Disciplines%20and%20Resources/Briefing%20Sheet/Costs-of-occupational-ill-health-in-constructionformattedFINAL.pdf> Last accessed 12/12/2019

40 N. Snell et al Burden of lung disease in the UK: findings from the British Lung Foundation's "respiratory health of the nation" project European Respiratory Journal Vol 48 supp 60 (2016) Available at: https://erj.ersjournals.com/content/48/suppl_60/PA4913 Last accessed 12/12/2019

41 HSE Work related Chronic Obstructive Pulmonary Disease (COPD) Statistics in Great Britain (2019) Available at: <http://www.hse.gov.uk/statistics/causdis/copd.pdf> Last accessed 12/12/2019

42 British Lung Foundation and Pro Bono Economics Estimating the economic burden of respiratory illness in the UK (2014) Available at: https://www.probonoeconomics.com/sites/default/files/files/British%20Lung%20Foundation%20full%20report%2015032017_0.pdf Last accessed 12/12/2019 Last accessed 12/12/2019

43 British Lung Foundation and Pro Bono Economics Estimating the economic burden of respiratory illness in the UK (2014) Available at: https://www.probonoeconomics.com/sites/default/files/files/British%20Lung%20Foundation%20full%20report%2015032017_0.pdf Last accessed 12/12/2019 Last accessed 12/12/2019

44 NHS England Interstitial Lung Disease Service Adult, Service Specification, Schedule 2 NHS England (2018) Available at: <https://www.england.nhs.uk/wp-content/uploads/2018/08/Interstitial-lung-disease-service-adult.pdf> Last accessed 12/12/2019

7. The scale of the problem

“Longer working lives give the potential for higher cumulative silica exposures”

HSE

Respondents overwhelmingly told us that the true picture of silicosis in construction is unknown. It is not clear whether the number of cases is increasing over time, or whether it is better diagnosed. Several called for further clinical investigation into the true extent of the problem and a requirement to report newly diagnosed cases under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013, Surveillance of Work-related Diseases (SWORD) and The Health and Occupation Research network (THOR).

iOH (formerly AOHNP) told us that there is a risk that many of the 2.2 million individuals working in construction in the UK could be exposed to the dangers of RCS. Some evidence suggests that their families could also be at risk^{45,46} but precise numbers affected by the silicosis problem are unclear. Contributors cite under-reporting, the fragmented nature of the industry and poor diagnostic ability in the UK as factors which have limited the ability to pin down exactly how widespread the problem is.

As a result, there are no clear figures on the prevalence of silicosis in the UK. In her evidence, Carol Sanders cites data that suggests there are around 600,000 RCS-exposed workers⁴⁷ and provided all are working within the current WEL, various estimates of the exposure-risk relationship extrapolate this to around 180,000 cases over a 45-year working lifetime⁴⁸.

While networks such as SWORD or THOR gather information on new cases, there is no requirement to report new cases to the networks, as they are voluntary. Silicosis is no longer a RIDDOR-reportable disease, nor is it notifiable under the Health Protection (Notification) Regulations 2010, which require doctors to report the diagnosis of specific diseases to Public Health England.

- **We recommend that the HSE includes silicosis as a reportable condition under the Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations (2013) for those who are still at work and exposed, and call on Government to similarly amend the Health Protection (Notification) Regulations 2010 to make silicosis notifiable through Public Health England, thereby creating a compulsory national silicosis register**

Unite the Union's Silica Register will help us to understand the number of workers exposed to RCS, however we are convinced of the need for a compulsory national scheme to register all cases of silicosis.

There is also no requirement for the condition to be recorded on the death certificates of those who die with silicosis, adding to the lack of clarity on the scale of the problem. Dr Gareth Walters and colleagues stated in their submission that there is a large number of retired workers with undiagnosed silicosis. A number of respondents suggest that future diagnoses are more likely in retired white men, as this demographic has historically had the highest exposures.

However, with the low levels of awareness about the risks of RCS, combined with increased exposure to it from the use of power tools, it is likely that the number of cases of silicosis will increase. In their evidence, a number of clinicians suggested that those who have been diagnosed present a longer-term burden on the NHS in terms of requiring ongoing monitoring by hospital specialists. This is due to progression after the exposure has stopped.

45 A. Pérez-Alonso, J. A. Córdoba-Doña and C. García-Vadillo Silicosis: Relevant Differences Between Marble Workers and Miners Archivos de Bronconeumología 15: 1 (205) p46-54 Available at: <https://www.archbronconeumol.org/en-silicosis-relevant-differences-between-marble-articulo-S1579212914003516> Last accessed 12/12/2019

46 Marble Institute of America Silicosis: An Industry Guide to Awareness and Prevention Marble Institute of America, Cleveland (2008) Available at: <https://www.ox.ac.uk/students/academic/guidance/skills/referencing?wssl=1> Last accessed 12/12/2019

47 C. C. Leung, I. T. S. Yu and W. Chen Silicosis The Lancet 379:9830 (2012) p2008–2018 Available at: <https://www.sciencedirect.com/science/article/pii/S0140673612602359> Last accessed 12/12/2019

48 Calculated by using Leung et al prevalence data (600,000 workers exposed) and OSHA data on lifetime risk from an exposure limit of 0.1mg/m3 over 45 years of 30%

Incidence and co-morbidity with lung cancer

The HSE told us that there are three main sources of statistical information on silicosis: 1) annual deaths with silicosis recorded as the underlying cause; 2) new cases assessed for Industrial Injuries Disablement Benefit (IIDB); and 3) reports of cases by physicians within the THOR network. Within IIDB, pneumoconiosis cases not identified as asbestosis or coal workers are likely to be silicosis so incidence is substantially underestimated, and it is likely that the incidence of silicosis is masked by lung cancer (see Section 9: The clinical context). The HSE told us that incidence could be higher than recorded in IIDB and THOR, as there are approximately 900 new cases of lung cancer each year due to past exposure to RCS in construction, granite and stone industries and various industrial processes. They went on to say that these are likely to have developed from highly exposed workers who were also developing silicosis.

HSE data from the 1990s showed 30% of general construction workers were exposed to more than 0.3 mg/m³ of RCS⁴⁹; this has improved in recent years due to developments in technology. However, approximately 500 UK construction workers are believed to die from RCS exposure each year⁵⁰.

Incidence of silicosis in younger workers

Several clinicians pointed to silicosis being recognised in younger workers. A report by Dr Nicol et al on cases of silicosis in six stonemasons, all of whom were under 40, highlighted that this is not always a disease of the older worker⁵¹. Previously, clinicians have associated silicosis with prolonged exposure to RCS over careers of twenty years or more.

Box 2: Is current health surveillance identifying cases?

A 38-year-old man had worked as a stonemason for 14 years. Initially, he wore a paper mask. Dust extraction systems were available, but not always used, and there was no water suppression. The respiratory protective equipment changed to rubber half-face masks, but their use was not enforced. There was no formal health surveillance and he never had a chest X-ray. After 14 years of work as a stonemason, he was made redundant.

The redundancy package involved a medical, where he was told his chest X-ray was abnormal. At this time, he did not experience cough or sputum production, but had become aware of breathlessness on climbing steep hills. He was an ex-smoker of four years with a 20 pack-year history*.

His lung function tests showed that his lung volumes were lower than normal, but blood tests were normal. Investigations were consistent with asthma. Despite this, his CT scan identified silicosis and progressive massive fibrosis.

*A pack year is 20 cigarettes per day for one year – so a 20 pack-year smoking history can be one pack a day for 20 years, or two packs a day for 10 years.

49 J. Chisholm Respirable Dust and Respirable Silica Concentrations from Construction Activities. *Indoor Built Environment* 1999; 8:94-106 Available at: <https://journals.sagepub.com/doi/abs/10.1177/1420326X9900800204> Last accessed 12/12/2019

50 <https://www.hse.gov.uk/construction/healthrisks/cancer-and-construction/silica-dust.htm> Last accessed 12/12/2019

51 L. M. Nicol et al Six cases of silicosis: implications for health surveillance of stonemasons *Occupational Medicine* 65 (2015) p220-225



Those with heavy silica exposure are rarely those at the top of the social scale

Dr Gareth Walters and colleagues

Shortcomings in diagnosis

In addition, Dr Gareth Walters and colleagues from the University Hospitals Birmingham NHS Foundation Trust told us that the UK ‘remains very bad’ at diagnosing silicosis, as the diagnosis depends on the identification of significant RCS exposure rather than simply finding radiological changes. In other words, the diagnosis cannot be made by a radiologist alone. The HSE commented that undiagnosed cases are only detected in post-mortem examinations. Tricia O’Neill from Skanska raised the concern that given the long latency period of the condition, we may only have a more accurate picture of silicosis incidence in the next ten to 15 years.

The problem is compounded by the nature of the industry. With so many workers employed by small or micro businesses, or self-employed, they are less likely to have access to an occupational health programme. The Health in Construction Leadership Group stated that as a result, large numbers of workers are at risk of not receiving an early diagnosis. In addition, respondents told us that there is no such thing as an ‘average construction worker’ as roles and exposures change regularly in an industry heavily dependent on sub-contracting in fragmented and project-focused workforces.

Loughborough University’s Construction Health and Safety Research Unit told us that those most at risk include general labourers, ground workers, bricklayers, stone masons and electricians, as well as those workers who may get secondary exposure.

A socio-economic issue?

Several respondents pointed to the ‘inevitable’ socio-economic bias of the condition, due to the prevalence of manual labourers with relatively low education and wages being those who are most at risk of exposure. Those in more senior, office-based roles will have lower exposure. Respondents also mentioned the increased risk of developing COPD if you are exposed to RCS and also smoke, as smoking is also more common amongst those in lower socio-economic groups.

Respondents agree that there is evidence to suggest a genetic susceptibility to developing both silicosis and lung cancer. Dr Peter Reid told us that there does not appear to be a gender bias to the condition, despite the difference in lung size between men and women.

8. Awareness and understanding

Poor awareness by ALL stakeholders has a detrimental effect on silica control, provision and use

Carol Sanders

A resounding theme from the evidence received was that there is widespread lack of understanding amongst both construction workers and employers (particularly small and micro firms) of the significance of the hazard presented by RCS. The lack of awareness amongst workers is around both actual exposure to RCS and also the danger that it poses to health. However, BOHS suggest that where workers receive information about their exposure and appropriate control measures, the exposure can drop by 20-30%. Several respondents highlighted the difference in how workers and employers view risk and disease prevalence, and how attitudes can also vary greatly between employers.

There was also acknowledgement from respondents that tackling this effectively would require a multi-faceted approach. Several respondents suggested an industry-wide campaign warning of the dangers of RCS, which could be led by the HSE, Public Health England, CITB or others. Such a campaign would help to incentivise employers and increase peer-to-peer pressure on individual workers. The gender-based reluctance to engage in health issues so prevalent in the male-dominated construction industry means that careful consideration of the style, mechanisms and channels for communicating would need to be taken into account. According to Dr Steven Boorman, responding on behalf of The Council for Work and Health, good initiatives using real-life case studies have been successful in encouraging engagement.

Other suggestions included requiring RCS exposure awareness in public sector projects, updated HSE guidance, compulsory health surveillance or information built into existing training courses. Several respondents suggested that Government should ensure its major projects demonstrate best practice in this area.

We believe that there is a justifiable case for a targeted industry awareness campaign and we support work to make this happen.

- **We recommend that a targeted industry awareness campaign is developed and implemented for those at risk of developing silicosis**

9. The clinical context

There are three types of silicosis⁵²:

- **Acute silicosis** is a rare, life-threatening complication caused by significant exposure to RCS over a short period of time. It causes the lungs to fill with fluid, severe shortness of breath, cough, weight loss and fatigue
- **Accelerated silicosis** occurs within a few years of very high exposure levels. The condition is associated with a number of auto-immune conditions such as systemic lupus erythematosus (SLE), commonly known as lupus
- **Chronic, simple silicosis** doesn't generally have a significant effect on life expectancy. It takes more than ten years of exposure to develop, and the inflammation and scarring occurs over a longer period of time, sometimes leading to heart failure and premature death⁵³.

The role of the GP and training

The demands on GPs' time often prevent them from being able to take a detailed occupational history. Consultation times in the UK are the lowest in the developed world⁵⁴. Workers presenting to their GP with breathing problems may not link their occupational exposure and their symptoms; sufficient time is needed to discuss the patient's occupational history and exposure.

The Royal College of General Practitioners report Fit for the Future states that over half of younger and a fifth of more experienced GPs feel that insufficient time with patients is affecting the quality of care they are able to give⁵⁵. Continuity of care is another problem, as despite evidence that this is a key factor which contributes to lower mortality rates, many patients will end up seeing multiple healthcare workers over the course of their treatment. This means that workers often have to repeat their symptoms each time they visit their GP⁵⁶.

Several respondents suggested improvements. The Health in Construction Leadership Group suggested that workers could hold their own occupational health records, either alongside or within their GP records, so that there is a record of exposure available. CECA suggested that occupational health teams send records to the worker's GP when the worker leaves the industry. However, this requires GPs to have the skills necessary to interpret the information provided. The new curriculum for GP training introduced in August 2019 includes a requirement to understand occupational respiratory disease in the context of general practice, which builds on increasing occupational health topics in core medical training⁵⁷.

- **We recommend that a mechanism is introduced whereby workers are able to hold their own occupational health records so that the relationship between symptoms and exposures is considered**

We welcome the introduction of the new training module in the new GP training curriculum and believe that, as it is rolled out, GPs will be better placed and informed on occupational respiratory disease.

52 <https://medlineplus.gov/ency/article/000134.htm> Last accessed 12/12/2019

53 G. S. Cooper, F. W. Miller and D. R. Gormley Occupational Exposures and Autoimmune Diseases International Immunopharmacology 2:2-3 (2002) 303-313 Available at: <https://www.ncbi.nlm.nih.gov/pubmed/11811933> Last accessed 12/12/2019

54 G. Irving et al International variations in primary care physician consultation time: a systematic review of 67 countries BMJ Open, 2017 Available at: <https://bmjopen.bmj.com/content/bmjopen/7/10/e017902.full.pdf> Last accessed 12/12/2019

55 Royal College of General Practitioners Fit for the future: a vision for general practice London: Royal College of General Practitioners (2019) Available at: <https://www.rcgp.org.uk/-/media/Files/News/2019/RCGP-fit-for-the-future-report-may-2019.ashx?la=en> Last accessed 12/12/2019

56 D. J. Pereira Gray, et al, Continuity of care with doctors—a matter of life and death? A systematic review of continuity of care and mortality. British Medical Journal, 2017 Available at: <https://bmjopen.bmj.com/content/8/6/e021161> Last accessed 12/12/2019

57 Royal College of General Practitioners (2019) The RCGP Curriculum: The Curriculum Topic Guides available at: <https://www.rcgp.org.uk/-/media/Files/GP-Training-and-exams/Curriculum-2019/Curriculum-Topic-Guides-300819.ashx?la=en> Last accessed 12/12/2019

“In over 2500 referrals to our service of patients with confirmed occupational lung disease, we have yet to see a complete occupational history in any GP referral”

Dr Gareth Walters and colleagues

Reskilling GPs to enable early diagnosis and effective treatment

Several respondents commented that GPs lacked sufficient awareness of occupational health and specifically in lung disease risks linked to the construction industry, with some suggesting that this leads to misdiagnoses. Dr Gareth Walters and colleagues assert that poor occupational history taking demonstrates that there is a need for GP education and training in work-related ill health. Dr Peter Reid stated in his evidence that taking an occupational history would identify potential cases in the early stages, which would give an opportunity to reduce or stop exposure, which in turn could prevent a worsening of the condition and allow protection of other workers. Dr Gareth Walters and colleagues made the point that it takes specific skills, knowledge and experience to be able to link a job title with potential exposures, and therefore link symptoms to exposures during working life.

- **We recommend that occupational health services are introduced into GP surgeries to allow for occupational histories to be taken where work-related ill health is suspected**

While occupational lung disease is a core component of respiratory physician training, access to specialists usually comes via the GP. However, GPs often fail to diagnose silicosis. Tricia O'Neill from Skanska pointed out that levels of training and understanding in work-related lung disease are low.

In his evidence, Dr Peter Reid offered the example of sarcoidosis, which, whilst uncommon, is familiar to most chest physicians training in the UK and may lead to silicosis being misdiagnosed: 'The radiological appearances of sarcoidosis and silicosis are similar. Greater familiarity with sarcoid may lead to that diagnosis being preferred.'

Dr Reid goes on to say that failure to correctly diagnosis silicosis often leads to inappropriate and ineffective treatment. One example is the prescription of high doses of oral steroids which, as well as being ineffective, also places the patient at risk of adverse side effects.

Occupational health surveillance and regulation

Under the Control of Substances Hazardous to Health Regulations (2002), occupational health surveillance is required for those exposed to RCS⁵⁸. Current HSE guidance requires an annual symptom questionnaire and lung function test, but small studies show that there are no symptoms and no changes in the early stages of the disease⁵⁹. Several respondents questioned the value of annual testing, particularly as it can miss some people with advanced disease. Both Carol Sanders and Robert Bradford from Bam Nuttall felt that a specific set of silica regulations (similar to asbestos) were justified given the health risks and lack of awareness of these risks.

- **We recommend that Government introduces new health and safety regulations specifically relating to the control of RCS, bringing it into line with asbestos**

⁵⁸ Great Britain The Control of Substances Hazardous to Health Regulations 2002 Elizabeth II (2002) London: The Stationary Office Available at: <http://www.legislation.gov.uk/uksi/2002/2677/contents/made> Last accessed 12/12/2019

⁵⁹ L. M. Nicol et al Six cases of silicosis: implications for health surveillance of stonemasons Occupational Medicine 65 (2015) p220-225

The use of chest X-rays

The HSE also recommends (but does not require) a baseline chest X-ray on entry to the industry. Thereafter, chest X-rays are required every three years from 15 years of exposure onwards. To date there has not been a review of the efficacy of the current requirements for chest X-rays. Professor Paul Cullinan and colleagues have suggested that a review of the efficacy of chest X-rays to identify silicosis would be useful. Such a review would ensure that radiologists consider silicosis when they are reading chest X-rays.

Dr Peter Reid commented that although there is limited clinical evidence that a baseline chest X-ray would be beneficial, it would be appropriate for the HSE to recommend this, as the radiation dose is low. Tricia O'Neill from Skanska stated that this would enable a comparison for future chest X-rays, and would also reinforce to the worker and employer the risk to respiratory health if RCS exposure is not adequately controlled and protective measures are not followed.

National screening programme

Currently there is no national or industry-wide screening programme for silicosis. Although there is no current curative treatment for silicosis, it is possible to manage the symptoms in order to improve quality of life. Consequently, respondents were asked to consider the value of targeted screening. The benefits of this include:

- Identifying workers with early disease to allow participation in clinical studies
- Gaining accurate data on the number of cases to better understand the scale of the problem
- Understanding which groups of workers are most at risk
- Allowing for health interventions such as smoking cessation programmes, as smokers who are exposed to RCS are at an increased risk of developing Chronic Obstructive Pulmonary Disease (COPD)
- Enabling treatment to reduce symptoms and interventions to improve long term health
- Ensuring that past results are available for comparisons to identify those whose lung function is deteriorating faster than normal.

Any new screening programme could be run in conjunction with occupational health services, provided that all parties are able to input data and follow the same guidelines for onward referral of suspected silicosis cases.

- **We recommend that the NHS investigates the introduction of an appropriate screening programme for those exposed to RCS**

NHS England is currently conducting trials using low dose Computerised Tomography (CT) scans as a possible screening test for lung cancer for smokers and those who used to smoke. Studies in America have shown that use of low dose CT screening for lung cancer in high risk populations (those over 55 with a significant smoking history) reduced the number of deaths by early detection of the disease⁶⁰.

There were differing views in the evidence from respondents on this point. Professor Paul Cullinan and colleagues pointed out that there is insufficient evidence that low-dose computerised tomography scanning is appropriate to identify silicosis, or silica-related lung cancer. However, Dr Peter Reid suggested the technique is considerably more sensitive at detecting the presence of nodules and Progressive Massive Fibrosis, which may be missed on chest X-rays. Dr Reid suggested that the detection of enlarged lymph nodes could be used as an early warning sign for the development of silicosis.

We accept that the scientific evidence justifies an appropriate screening programme for silicosis and the outcomes of the current NHS England trial could inform further work towards this.

60 S. A. Kovalchik et al Targeting of Low-Dose CT Screening According to the Risk of Lung-Cancer Death New England Journal of Medicine Vol 369 (2013) pp 245-254 Available at: <https://www.nejm.org/doi/full/10.1056/NEJMoa1301851> Last accessed 12/12/219

The fundamental problem in the UK is a lack of qualified occupational health provision for all workers... Unlike many European countries, most UK workers do not have access to occupational health services

Dr Gareth Walters and colleagues

The need for occupational health resource

Clinicians who responded were in agreement that some form of mandated or national occupational health service for industries generating RCS exposure was more appropriate than increasing the burden on primary care.

- **We recommend that access to occupational health services is established for those industries generating RCS exposure**

While this could be delivered via the NHS, the majority of those exposed are working in private companies, and a significant number of occupational health professionals work outside the NHS. All respondents acknowledged that any form of mandated or national occupational health service would be fundamentally challenged by the significant shortage of occupational health professionals in the UK⁶¹.

Loughborough Construction OSH research group suggests this is in part due to a lack of exposure of pre-registration clinicians to occupational health placements. They go on to say that it is further hindered by the number of occupational health professionals working in the private sector, where securing funding for specialist courses is challenging.

Respirable crystalline silica as a carcinogen

RCS was first classed as a human carcinogen by the International Agency for Research on Cancer in 1997⁶². Since this time there have been many studies reviewing the evidence base and following up large silica-exposed cohorts^{63,64}.

It is now clear that there is a dose-response relationship between silica exposure and cancer risk, and a cumulative exposure level of over 1.8mg/m³ significantly increases the risk.

A cumulative exposure level of 6mg/m³ doubles the risk⁶⁵. To put this into context, at the current UK WEL of 0.1mg/m³ per eight-hour shift, workers could reach a cumulative exposure level which puts them at significant risk of lung cancer in just 18 working days and doubles their risk in just 60 working days. It is now thought that the inflammatory process of silicosis needs to be present to increase the cancer risk, although the evidence is unclear⁶⁶. This is partly due to concerns that the changes in chest X-rays of those with silicosis are not identified in around half of those with the disease⁶⁷.

The HSE has recently undertaken a consultation exercise, which would implement EU Directive 2017/2398⁶⁸. This proposed (among other changes not relevant to this report) introducing a carcinogen notation for RCS. In the revised EH40/2001 Workplace Exposure Limits⁶⁹, RCS is now classified as a carcinogen when generated as part of a work process.

61 <https://www.som.org.uk/som-response-government-consultation-health-everyones-business> Last accessed 12/12/2019

62 WHO IARC Monographs on the evaluation of carcinogenic risks to humans: Silica and some silicates Vol 42 (1987) Available at: <https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Silica-And-Some-Silicates-1987> Last accessed 12/12/2019

63 K. Steenland et al Pooled exposure-response analyses and risk assessment for lung cancer in 10 cohorts of silica-exposed workers: an IATC multicentre study Cancer Causes & Control Vol 12 (2001) pp 773-784 Available at: <https://link.springer.com/article/10.1023/A:1012214102061> Last accessed 12/12/2019

64 Y. Liu et al Exposure-response analysis and risk assessment for lung cancer in relationship to silica exposure: A 44 year cohort study of 34,018 workers American Journal of Epidemiology vol 178 (2013) pp1424-1433 Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4522915/pdf/nihms710075.pdf> Last accessed 12/12/2019

65 Y. Lacasse et al. Dose-response meta-analysis of silica and lung cancer. Cancer Causes Control Vol 20 (2009) pp925-933 Available at: <https://link.springer.com/article/10.1007/s10552-009-9296-0> Last accessed 12/12/2019

66 T. Sato, T. Shimosato and D. M. Klinman Silicosis and lung cancer: current perspectives Lung Cancer: Targets and Therapy Vol 9 (2018) pp 91-101 Available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6207090/pdf/ltt-9-091.pdf> Last accessed 12/12/2019

67 T. Sato, T. Shimosato and D. M. Klinman Silicosis and lung cancer: current perspectives Lung Cancer: Targets and Therapy Vol 9 (2018) pp 91-101 Available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6207090/pdf/ltt-9-091.pdf> Last accessed 12/12/2019

68 HSE CD287 – Carcinogens and Mutagens – Revision of limit values in EH40/2005 'Workplace Exposure Limits'(2019) Available at https://consultations.hse.gov.uk/hse/carcinogens-mutagens-revision-of-limit-values/user_uploads/cd287.pdf Last accessed 12/12/2019

69 HSE EH40/2005 Workplace Exposure Limits fourth edition (2020) available at <https://www.hse.gov.uk/pubns/priced/eh40.pdf> Last accessed 20/01/2020

10. Workplace exposure limits

“While the health and safety community widely consider RCS to be the next asbestos, we do not appear to be changing the approach. It is all very well to reduce the workplace exposure limit, but we should be aiming to stop exposing employees to RCS in the first place”

iOH

Silica is measured in terms of Workplace Exposure Limits (WELs): the maximum allowed concentration in workplace air of RCS, averaged over a specified period of time (Time-Weighted Average). Two time periods are generally used: long-term (8 hours); and short-term (15 minutes). Measurement of exposure to silica dust can be carried out by an occupational hygienist using sampling gear (including a sampling pump, filters and flowmeter) worn by the worker throughout their shift. When analysed, the result is expressed as milligrams of RCS per cubic metre of air sampled (mg/m^3). The current long-term WEL for RCS in Britain is $0.1 \text{ mg}/\text{m}^3$ (there is no short-term limit).

The UK's position

A number of respondents to our inquiry pointed out that several developed countries legislate for significantly lower permissible amounts of exposure (CECA) than the UK. Currently, British Columbia (Canada), Finland, Italy, Mexico, Portugal and the United States have WELs of $0.05 \text{ mg}/\text{m}^3$ or less (see Box 3).

Unite the Union told us they were members of the Advisory Committee on Toxic Substances (ACTS) in 2004–05, opposing the 0.1 standard, which represented a 2.5% risk of developing cancer. A limit of no more than $0.05 \text{ mg}/\text{m}^3$ was proposed by the trade union side of the ACTS but a new exposure limit of 0.1 was set by the Health and Safety Commission (now the HSE) in 2006. It's worth noting, however, that employers are expected to keep exposures below this level.

The European and American picture

The European Commission set up its Scientific Committee on Occupational Exposure Limits (SCOEL) in 1995, to 'evaluate the potential health effects of occupational exposure to chemicals'⁷⁰. The SCOEL recommended an official exposure standard below 0.05 in 2003⁷¹.

In addition, Unite told us that they participated in the European Network on Silica (NEPSI) and were party to the European-wide Social Dialogue Agreement on Silica, signed in 2006, which covers materials such as aggregates, cement, ceramics, glass, industrial minerals and other stone-related products. The SDA's principles include compliance with national and EU law, including national WELs. However, values are still set by each individual country⁷².

The United States' Occupational Safety and Health Administration introduced new standards regulating exposure to RCS in the workplace, setting the exposure limit at $0.05 \text{ mg}/\text{m}^3$ in 2016⁷³. The OSHA estimated that this would provide average net benefits of \$2.8–4.7 billion, annually, over the next 60 years⁷⁴. The American Conference of Governmental Industrial Hygienists has gone further, recommending a limit of $0.025 \text{ mg}/\text{m}^3$ ⁷⁵.

⁷⁰ <https://ec.europa.eu/social/main.jsp?catId=148&langId=en&intPagId=684> Last accessed 12/12/2019

⁷¹ SCOEL Recommendation from the Scientific Committee on Occupational Exposure Limits for Silica, Crystalline (respirable dust) (20013) Available at <https://ec.europa.eu/social/BlobServlet?docId=6934&langId=en> Last accessed 12/12/2019

⁷² https://www.nepsi.eu/sites/nepsi.eu/files/content/editor/agreement_-_english.pdf Last accessed 12/12/2019

⁷³ S. D. Szymendera Respirable Crystalline Silica in the Workplace: New Occupational Safety and Health Administration (OSHA) Standards (2018) Available at: <https://fas.org/sgp/crs/misc/R44476.pdf> Last accessed 12/12/2019

⁷⁴ T. Lee et al Silica Measurement with High Flow Rate Respirable Size Selective Samplers: A Field Study Annals of Occupational Hygiene 60 (3) (2016) p334–347 Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4779386/> Last accessed 12/12/2019

⁷⁵ P. Gottesfeld International silica standards: countries must update exposure limits. Industrial Safety & Hygiene News (2018) Available at: <https://www.ishn.com/articles/109495-international-silica-standards-countries-must-update-exposure-limits> Last accessed 12/12/2019

Box 3: Silica WELs around the world

- Australia recently cut from 0.1 to 0.05 mg/m³
- Canada (British Columbia): 0.025 mg/m³
- Finland, Ireland, Italy, Portugal: 0.05 mg/m³
- Netherlands: 0.075 mg/m³
- Poland: 0.3 mg/m³
- United Kingdom: 0.1 mg/m³
- United States of America: 0.05 mg/m³.

“From a clinician’s perspective this is worse than asbestos, because asbestos affects people at the end of their working life and into retirement... this particular disease is affecting young workers, people with dependent children, with wives and a whole working life expectation before them”⁷⁶

Dr Graeme Edwards, Brisbane physician

Australia takes action

Stonemasons in Australia have launched a national class action against three of the largest stone worktop manufacturers over silica dust exposure. The charge is that the three companies did not adequately communicate the severe safety risks or make clear the necessary precautions.

An audit of the stonecutting industry in Queensland identified over 550 workplace breaches⁷⁷. The Queensland government put a screening programme in place, screening 799 workers, of whom 98 have been found to have the disease⁷⁸. The cost of the screening was paid by WorkCover Queensland, a statutory body providing workers’ compensation insurance.

The Australian federal government announced the establishment of a National Dust Disease Taskforce in July 2019, to develop a national approach to prevention, early identification, control and management of dust diseases. The Taskforce has been asked to provide interim advice by the end of 2019, and a final report by 31 December 2020⁷⁹.

The Taskforce is chaired by the Chief Medical Officer of Australia, and includes experts on respiratory disease, occupational health, regulatory practice, policy and industry practice from a diverse range of medical, research and industry backgrounds⁸⁰. In addition to this Taskforce, a national dust diseases register will also be established.

In September 2019, the state of Queensland finalised a new code of practice for the stone ‘benchtop’ (worktop) industry, developed in conjunction with 23 organisations (including unions, trade associations and technical experts)^{81, 82}. The code will apply to manufacturing, installation, maintenance and removal of both engineered and natural stone benchtops.

76 ABC News Silicosis death dust audit reveals ‘major epidemic worse than asbestos’ (2019) Available at: <https://www.abc.net.au/news/2019-02-21/silicosis-death-dust-audit-reveals-major-epidemic-worse-asbestos/10830452> Last accessed 12/12/2019

77 ABC News Silicosis death dust audit reveals ‘major epidemic worse than asbestos’ (2019) Available at: <https://www.abc.net.au/news/2019-02-21/silicosis-death-dust-audit-reveals-major-epidemic-worse-asbestos/10830452> Last accessed 12/12/2019

78 The world is failing on silicosis. The Lancet, Vol. 7 2019 Available at: [https://www.thelancet.com/journals/lanres/article/PIIS2213-2600\(19\)30078-5/fulltext](https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(19)30078-5/fulltext) Last accessed 12/12/2019

79 <https://www.health.gov.au/news/taskforce-to-tackle-silicosis-and-other-dust-diseases> Last accessed 12/12/2019

81 Office of Industrial Relations Workplace Health and Safety Queensland Managing respirable crystalline silica dust exposure in the stone benchtop industry Code of Practice 2019 Available at: https://www.worksafe.qld.gov.au/_data/assets/pdf_file/0005/181940/Managing-respirable-crystalline-silica-dust-exposure-in-the-stone-benchtop-industry-Code-of-Practice-2019.pdf Last accessed 12/12/2019

82 IOSH Australia finalises new code to eliminate silicosis (2019) Available at: <https://www.ioshmagazine.com/article/australia-finalises-new-code-to-eliminate-silicosis> Last accessed 12/12/2019

Impact of reducing the Workplace Exposure Limit

Various respondents asserted that retaining the current WEL means that 2.5% of those exposed at that level will develop silicosis after 15 years. Carol Sanders asserts that if the WEL was cut to 0.05 mg/m³, in line with the United States and the overall EU level, over 200 deaths would be prevented over the next 40 years, lowering estimated cases from over 800 to around 600 per year.

Respondents also told us that it is important to note that the risk of silicosis still occurs at and below the current UK WEL.



Wider availability of power tools may have made the situation worse

HSE

The wider availability and use of power tools since the 1980s may have exacerbated the situation. Although improving productivity, they also generate dust and which can lead to exposures above the WEL (see Section 12: Case study).

The HSE, Paul Bussey and the BOHS told us that many employers/contractors not only underestimate the extent of exposure, but also do not consider control of exposure a priority. They also said that for many common tasks involving high-powered tools, the levels of exposure may still be above an acceptable level even after 'engineering controls' have been implemented. The HSE's 2009 Silica Baseline Survey looked at businesses conducting construction activities with high risks of RCS exposure⁸³. The report concluded that not only had power tools possibly made the situation worse, but that employers hadn't made implementing exposure control a priority.

We believe that exposure limits are an essential component of workplace safety and we welcome the work that has been undertaken over many years on this. Further reductions to bring UK working practices into line with recommended and accepted international standards makes sense, and we hope that this will be considered as a matter of urgency.

- **We recommend that the workplace exposure limit (WEL) for RCS in the UK is reduced from 0.1mg/m³ to 0.05mg/m³ in line with the 2003 recommended exposure standard from the Scientific Committee on Occupational Exposure Limits, and statutory monitoring requirements are introduced to ensure workers are not exposed above that limit**

83 HSE Silica Baseline Survey RR869 (2009) available at: <http://www.hse.gov.uk/research/rrpdf/rr689.pdf> Last accessed 12/12/2019

11. Regulation, compliance and risk control

“It is unacceptable that a preventable occupational disease such as silicosis continues to threaten the health of so many people worldwide”

The Lancet

Box 4: In the UK alone, there are:

- 600,000 silica exposed workers⁸⁴
- Nearly 800 people die per year from lung cancer caused by silica exposure at work⁸⁵
- 4,000 deaths per year from COPD attributable to occupational exposure⁸⁶
- 74,000 cases of COPD preventable over 25 years through improved control of occupational silica exposure⁸⁷.

Current regulations and guidance

The HSE, as the UK's health and safety regulator, has responsibility for ensuring that those who create the risk are controlling it. RCS comes under the Control of Substances Hazardous to Health Regulations (2002), and has a WEL set out in EH40⁸⁸. In their response, the HSE explained that the regulations promote compliance by working with industry in providing information and guidance and by enforcement action. While the HSE states that the current regulatory framework is adequate, they also acknowledge that compliance is low. Many respondents suggest this is because the HSE is underfunded to provide the enforcement that it should.

Carol Sanders quotes HSE-funded research which shows that compliance rates are estimated to be 33%⁸⁹. She estimates that if the level of compliance were to be raised to 90% it would save 700 lives. Equally, if the workplace exposure levels were to be reduced from 0.1 mg/m³ to 0.05mg/m³ it would prevent 200 deaths between now and 2060. 0.05 mg/m³ is the 2003 recommended exposure standard from the Scientific Committee on Occupational Exposure Limits⁹⁰. In the US a limit of 0.05mg/m³ has been adopted (see Section 10: Workplace Exposure Limits).

- **We recommend that the workplace exposure limit (WEL) for RCS in the UK is reduced from 0.1mg/m³ to 0.05mg/m³ in line with the 2003 recommended exposure standard from the Scientific Committee on Occupational Exposure Limits, and statutory monitoring requirements are introduced to ensure that workers are not exposed above that limit**

84 C. C. Leung, I. T. S. Yu and W. Chen Silicosis The Lancet 379:9830 (2012) p2008–2018 Available at: <https://www.sciencedirect.com/science/article/pii/S0140673612602359> Last accessed 12/12/2019

85 IOSH Respirable Crystalline Silica: The Facts. No Time To Lose (2015) Available at: https://www.notimetolose.org.uk/wp-content/uploads/2018/03/Factsheet_Respirable_crystalline_silica_the_facts_MKT2730.pdf Last accessed 12/12/2019

86 HSE Work related Chronic Obstructive Pulmonary Disease (COPD) Statistics in Great Britain (2019) Available at: <http://www.hse.gov.uk/statistics/causdis/copd.pdf> Last accessed 12/12/2019

87 N. Warren Current picture of health risks and exposure to respirable crystalline silica in Great Britain (2017) HSE Workplace Healthy Lungs Summit held at the QEII Centre London 22nd November 2017 [presentation slides]

88 HSE EH40/2005 Workplace Exposure Limits fourth edition (2020) available at <https://www.hse.gov.uk/pubns/priced/eh40.pdf> Last accessed 20/01/2020

89 Imperial College London for the HSE Predicting the burden of occupational cancer in Great Britain – Methodology (2011) Available at: <https://www.hse.gov.uk/research/rpdf/rr849.pdf> Last accessed 12/12/2019

90 SCOEL Recommendation from the Scientific Committee on Occupational Exposure Limits for Silica, Crystalline (respirable dust) (20013) Available at <https://ec.europa.eu/social/BlobServlet?docId=6934&langId=en> Last accessed 12/12/2019

Many respondents agreed that the current regulatory framework is insufficient. Carol Sanders and Robert Bradford from Bam Nuttall suggest that in order to improve awareness and control of the risks posed by RCS, the condition needs to have a specific set of regulations similar to those covering asbestos and lead. This could include staged diagnosis levels (similar to the way hand arm vibration syndrome is staged). CECA suggest that this could give employers greater understanding of the severity of disease, and therefore whether a worker could continue to be exposed.

- **We recommend that Government introduces new health and safety regulations specifically relating to the control of RCS, to bring it into line with asbestos**

Paul Bussey suggests that changes to the National Building Standard to include requirements for dust mitigation when silica-containing materials are specified would be beneficial. In addition, the Construction (Design and Management) Regulations (2015) could be more specific in terms of targets.

I have never encountered fully effective protection where tight fitting facepieces have been selected

Peter Crosland | Civil Engineering Director | National CECA

Box 5: Respiratory Protective Equipment (RPE) Explained:

- **Disposable face masks** are available as either nuisance dust masks without filters which offer little or no protection, or filtering facepieces which are designed for specific tasks.
- **Filtering facepieces** rely on a good seal, so must be fitted to the individual worker to ensure that there is a good seal, and that air is breathed in only via a filter – these give a high level of protection provided that the fit is good. Because of the differences in face shape, not all facepieces are suitable for all workers – once size doesn't fit all. The fit of masks is affected by stubble and facial hair, and therefore workers must be clean shaven when using these.
- **Air hoods** are loose fitting hoods which use battery power or compressed air to continuously feed clean air into the hood, pushing contaminants out through any gaps. Therefore, they don't need a tight seal around the face.

Use of face masks

CECA and other respondents suggested that the current HSE guidance around respiratory protective equipment isn't seen as practical, as it is felt to be too prescriptive and therefore adherence is low⁹¹.

Indeed, a number of respondents told us that dust masks are frequently misused and abused, so they offer inadequate protection as a primary exposure control. The current fashion for facial hair and stubble prevents a seal, compounding the problem; there is a lack of understanding of the importance of a good fit. Even when face fit masks are used, the smallest variation in the seal around the mask can cause dangerous inhalation of silica. Robert Bradford from Bam Nuttall told us that ill-fitting masks are particularly dangerous as the body's natural defences (such as coughing and sneezing) stop functioning.

Arco estimate that 50% of respiratory protective equipment doesn't offer the anticipated levels of protection due to poor fit. Robert Bradford from Bam Nuttall and others suggest that the use of loose-fitting masks such as air-fed hoods would lead to better protection.

- **We recommend that the HSE introduces compulsory requirements for the effective use of masks, dust extraction and water suppression, along with annual reporting of annual inspection and compliance levels**

There is also a need for more collaboration between healthcare workers and occupational hygiene. This would increase awareness of the risks, and help occupational health practitioners to understand the exact exposures from a given process or site. The BOHS suggest that while this is starting to happen within construction, it should be included in HSE guidance.

Box 6: HSE taking enforcement action for RCS exposure

In March 2018, following an unannounced inspection, the HSE prosecuted a landscaping company for not providing adequate controls when exposing workers to RCS. The HSE inspector served a Prohibition Notice to prevent further works. An Improvement Notice was then served so that the company put control measures in place to protect the workers, but further inspection found that the work was continuing without these in place. The company pleaded guilty to breaching Regulation 7(1) of COSHH, and not complying with Section 33(1) of the HSAWA. They were fined £20,000 with costs of £3,000⁹².

⁹¹ HSE Respiratory protective equipment at work: a practical guide (2013) Available at: <http://www.hse.gov.uk/pUbns/priced/hsg53.pdf> Last accessed 12/12/2019

⁹² <https://press.hse.gov.uk/2019/07/09/company-fined-after-employees-exposed-to-respirable-crystalline-silica/> Last accessed 12/12/2019

**“The industry creates this risk
It now needs to acknowledge
it, own it and deal with it”**

IOSH, cited by the HSE

What about compliance?

Paul Bussey noted that compliance is generally poor, while others told us that the current workplace exposure level is not being adhered to nor enforced. This assertion is supported by the HSE's own silica baseline study, which found that half those in stone-working could be exposed above the workplace exposure level, and 20% were potentially exposed to levels of 0.3mg/m³.

Respondents suggested that low levels of compliance could be the result of a number of issues:

- Workers generally don't believe there is a risk (see Section 8: Awareness and understanding). IOSH reports that only 15% of employers surveyed believe workers fully understand the risks, and that 56.6% reported workers had no awareness of the risks⁹³
- Each contractor interprets the compliance requirements differently
- Only 18% of the UK workforce have access to occupational health services and coverage is lower amongst SMEs, so only a small proportion of construction workers will have adequate health surveillance (Loughborough Construction OSH Research Group)
- The latency of the disease means that there is no immediate reaction based on immediate perceived impact of the condition (Tricia O'Neill from Skanska)
- Contractors underestimate the levels of dust inhalation (Paul Bussey) and also underestimate the hazard that RCS dust represents (Robert Bradford from Bam Nuttall)

- Dust control is a low priority for construction employers (HSE) which is dominated by small and micro businesses
- There is little disincentive because the enforcement for non-compliance is low. There are low levels of prosecutions and enforcement actions (Robert Bradford from Bam Nuttall).

Monitoring dust exposure

In order to make sure that the WEL is adhered to, Arco state that dust monitoring is vital. Technology advances mean that new methods of real-time exposure level monitoring are now possible. Knowing what the actual exposure levels are is important as exposure will depend on the actual task (e.g. cutting concrete is higher risk than breaking concrete, and the actual exposures depend on the concrete mixture). Some respondents expressed concern that dust measurements aren't required, however some made the point that without measuring exposure it is impossible to prove that exposure levels are within the WEL.

The new Code of Practice for Tunnelling was published by the British Standards Institute in November 2019 and has been updated to include real time dust monitoring and control⁹⁴. This requires the use of new technology which is just becoming available and gives an instantaneous measurement.

⁹³ IOSH Construction Dust: An Industry Survey Wigston: IOSH (2014)

⁹⁴ <https://www.bsigroup.com/en-GB/about-bsti/media-centre/press-releases/2019/february/bsti-calls-for-input-to-develop-a-revision-to-bs-61642011-code-of-practice-for-health-and-safety-in-tunnelling-in-the-construction-industry/> Last accessed 12/12/2019

Enforcement

Several respondents called for the HSE to be appropriately resourced to incentivise firms to reduce exposure by greater enforcement action, which has been constrained by a challenging national financial situation over the last few years. There was also a suggestion that low levels of prosecutions could be the result of fewer inspections rather than a high compliance level with exposure control measures. Paul Bussey suggested diverting income from Fee for Intervention (the charge made by the HSE for identifying breaches and taking enforcement action to put things right) to enforcement activities⁹⁵. Robert Bradford from Bam Nuttall stated that reducing exposure is more important than health surveillance to identify subsequent diseases, leading to the conclusion that it is more important to increase education in order to prevent exposure in the first place.

- **We recommend that HSE resources are increased to raise the volume of on-site inspections of building contractors of all sizes**

The use of health surveillance is akin to putting a sticking plaster on a cut – the damage has already occurred

Robert Bradford | Bam Nuttall

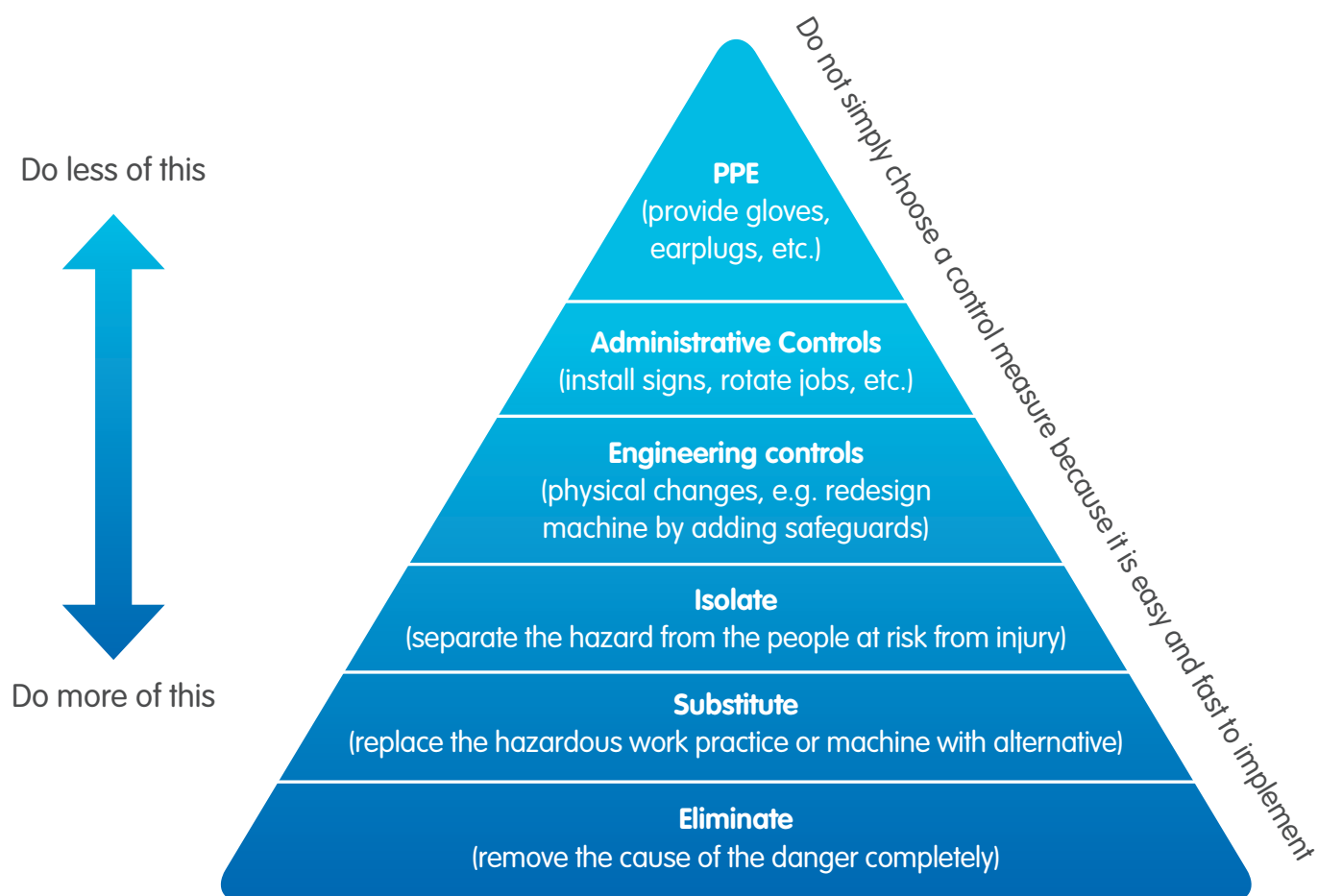
How is the risk controlled?

There are two key ways to control exposure to RCS, including:

- Designing out its use in the first place
- Implement engineering controls: e.g. enclosures; hoods; local exhaust ventilation to extract the contaminated air; use water suppression on fixed machinery; localised ventilation on the tool; suppress the dust using water spray systems.

If RCS exposure cannot be controlled by these methods, workers should use respiratory protective equipment. This, however, should be considered as the last resort. Health surveillance should be arranged for any workers exposed to RCS.

⁹⁵ <http://www.hse.gov.uk/fee-for-intervention/what-is-ffi.htm> Last accessed 12/12/2019



The benefits of engineering controls and offsite manufacture

Many respondents agreed that while a reduction in the current workplace exposure level would be helpful, ultimately, we have to stop exposure completely. The overall view was that there is no safe exposure level for RCS, similar to the now-accepted position on asbestos.

Designing out exposure

A number of respondents were clear that designing out the need for exposure by using offsite manufacture can help. This depends on manufacturers having up to date processes and making sure that sufficient planning has been done to prevent cutting on site (e.g. chasing out concrete for wiring). CECA suggest that as more people require bespoke cuts to be made and the demand for these increases, the costs of offsite manufacture will reduce. Nigel Roper from Concrete Repairs Ltd asserted that designing out the need to make cuts to key materials (such as the perimeter of concrete repairs) onsite would significantly reduce exposure.



Good design is the cornerstone of reducing exposure to silica dust

BOHS

Offsite manufacture

The HSE made the point that offsite manufacturing methods offer significant potential to reduce RCS exposure but will take time to mature and embed.

Dr Steven Boorman asserted that offsite manufacture is the future, as cutting in controlled conditions is considered to be the most effective way to reduce exposure. Paul Bussey and CECA suggested that if offsite manufacture cannot be achieved, then cutting on site with the right engineering controls is the next best solution. On the other hand, CECA also pointed out that there are some limitations to this practice; drilling and blasting rock, for example, cannot be achieved offsite.

BOHS made the point that it is important to obtain evidence from occupational hygienists where they have measured before and after implementation of engineering controls. This process results in additional case studies which will further support exposure reduction. BOHS asserts that good design is the cornerstone of reducing exposure.

RVT Group told us that while offsite manufacture will reduce dust on site, dust in manufacturing facilities needs to be controlled. Additionally, for renovation and refurbishment, offsite manufacture is not always possible.

Dust extraction and water suppression

Respondents told us that there is a wealth of evidence that engineering controls (specifically water suppression and use of local exhaust ventilation) can be effective in reducing exposures by 90%. However, the BOHS goes on to say that compliance levels with appropriate controls are unknown. Paul Bussey suggests that the hiring of dust extraction equipment and/or water suppression equipment with drills, saws, etc should be compulsory.

RVT Group commented that while there is a range of extractors available, there is little understanding of how to use these to reduce exposure, as there is poor understanding of how they work. The HSE reports that dust extraction is only being reported by 22% of respondents in their survey on 'The effectiveness of HSE's regulatory approach', though this is up from 4% in 2009⁹⁶. Several respondents, including the RVT Group, questioned whether dust extractors would be made to a sufficient enough quality to make any real impact.

There is still a reliance on respiratory protective equipment which does not always give the expected level of protection. Concern was raised that since the drive to reduce dust exposure by using respiratory protective equipment started, the cost of this equipment has increased without a corresponding increase in quality. The Drilling and Sawing Association assert that respiratory protective equipment is seen as a cost to employers, despite it being zero-rated for VAT and tax deductible as a business expense.

⁹⁶ HSE The effectiveness of HSE's regulatory approach: The construction example London: HSE (2016) Available at: <https://www.hse.gov.uk/research/rrhtm/rr1082.htm> Last accessed 12/12/2019

12. Case study - a dusty career: Gordon Sommerville

In the early 1980s, I worked for a company with stone and asbestos removal divisions. Even then the asbestos removal guys wore respirators and coveralls supplied by the company; the coveralls would be bagged at the end of each shift and they all worked from a decontamination unit which usually included a shower.

The guys who worked for the stone division were not supplied with any respiratory protection. They would only wear coveralls if they supplied them themselves, they had no changing facilities and they went home in the dusty clothes they wore to work.

No one ever mentioned that dust was dangerous

Gordon Sommerville

In the late 1980s, I worked for a highly regarded company who took employee health very seriously; they built a state-of-the-art stone cutting shed. The shed had the most modern local exhaust ventilation system, air points for compressed air, 110v outlets for power tools and even wall heaters.

We were informed that the exhaust system would keep us safe even though power tools were being used more often. Power tools were necessary, but dust wasn't taken seriously.

The system would be turned off at break times due to the noise. When we came back through half an hour later the dust on the floor would be an inch or so deep, the same when we arrived the next morning. All this dust was simply dry swept and thrown in the skip. Respirators were never supplied or mentioned. But this was the only company I have worked for who would send employees for a lung function test.



On site during the 1980s and 1990s power tools had become a necessity; their use increased production by 100 plus percent. The guys doing restoration works and repairs would spend days on end cutting into walls with angle grinders with no respiratory protection whatsoever. Most thought the clouds of dust they were producing were only a 'nuisance'.

Workers carrying out alterations and structural repairs on the other hand, might pick up a paper mask now and again. As much of this work might be internal (therefore enclosed) they usually could not see (never mind breathe) and would more often than not be removing many different materials such as asbestos, various plasters, brickwork, concrete blocks and stone.

The majority of tradespeople at that time were self-employed. Many did not see the point of investing in a respirator and most saw the purchase of a mask as a waste of money: just another object to kick about in the back of the van. And due to the long latency of many dusty diseases most did not care. The attitude of many, including myself, was one of "it will never happen to me "

People started to get ill and die from dust related illness in the 1990s.

By the late nineties, stone workers were starting to notice that dust could make you very ill very quickly and rumours of strange illnesses started to circulate. But trades such as bricklayers, plasterers, roofers and labourers who would be working under the same conditions were oblivious to the dangers.

By the early 2000s, many in the stone industry knew of at least one colleague who had become ill or died due to a disease caused by dust.

Today, colleges teach stoneworkers of the dangers, the HSE runs awareness campaigns and larger companies will supply employees with respiratory protection. But still the danger of dust has not filtered through to most and ignorance is still the major cause of dust diseases.

About Gordon

Gordon has worked in the construction industry since leaving school in 1976. He attended Telford College in Edinburgh where he gained City and Guilds qualifications in Masonry, Advanced Craft Masonry (Faulds Prizewinner), City and Guilds 600 (With Distinction) and the National Progression Award in the conservation of masonry. He is a stonemason and builder by trade and is skilled in all aspects of masonry including stone carving, restoration, conservation, conversion and structural alteration works to new build projects.

Gordon worked for several large companies before becoming self-employed and has run his own business since 1992. He had to leave his chosen and much-loved profession due to ill health in 2014.

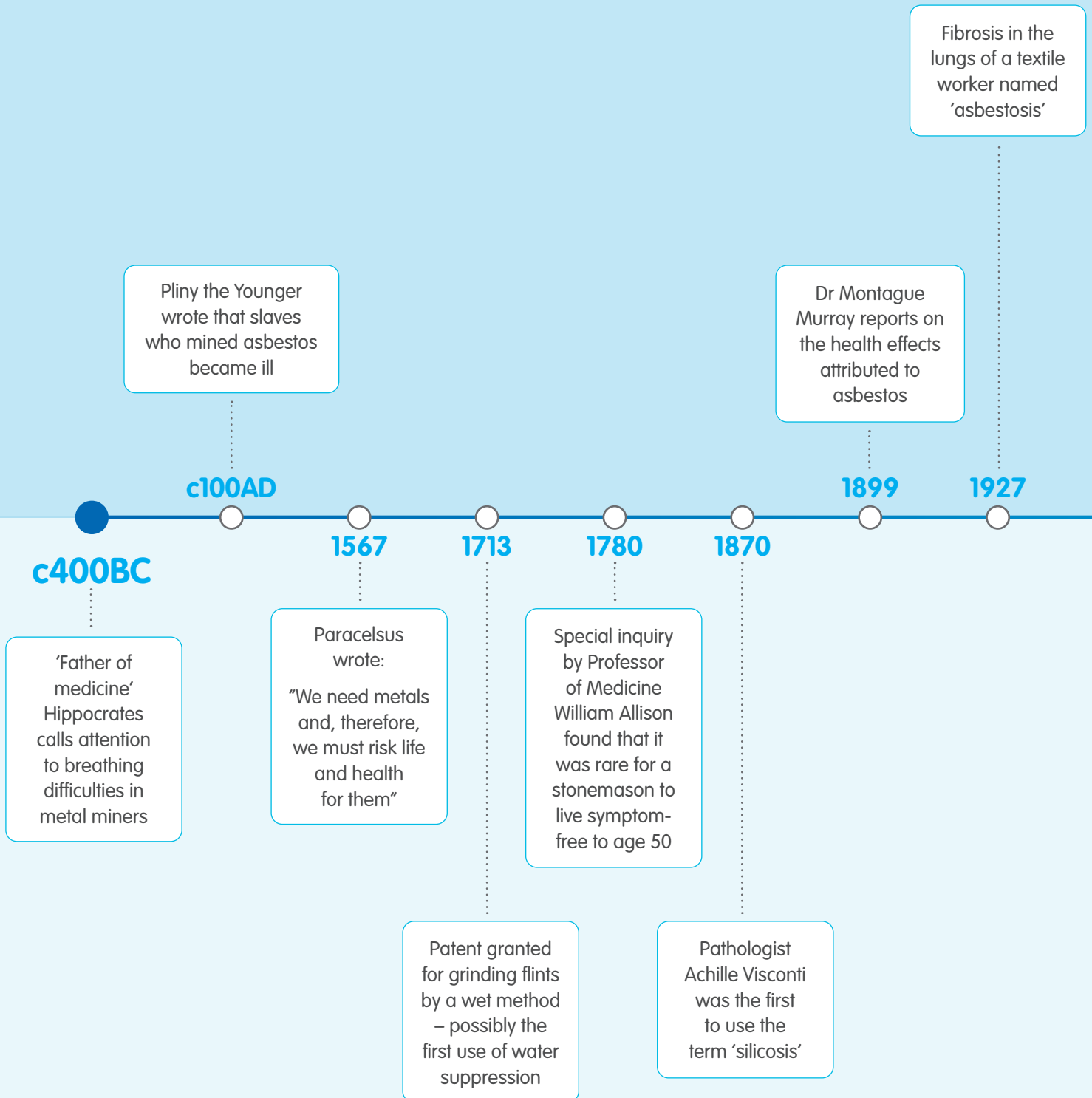
Gordon is 59 years old, married with two grown up children, three grandchildren, a cat and a dog.

**Power tools were necessary,
but dust wasn't taken seriously.**

Gordon Sommerville

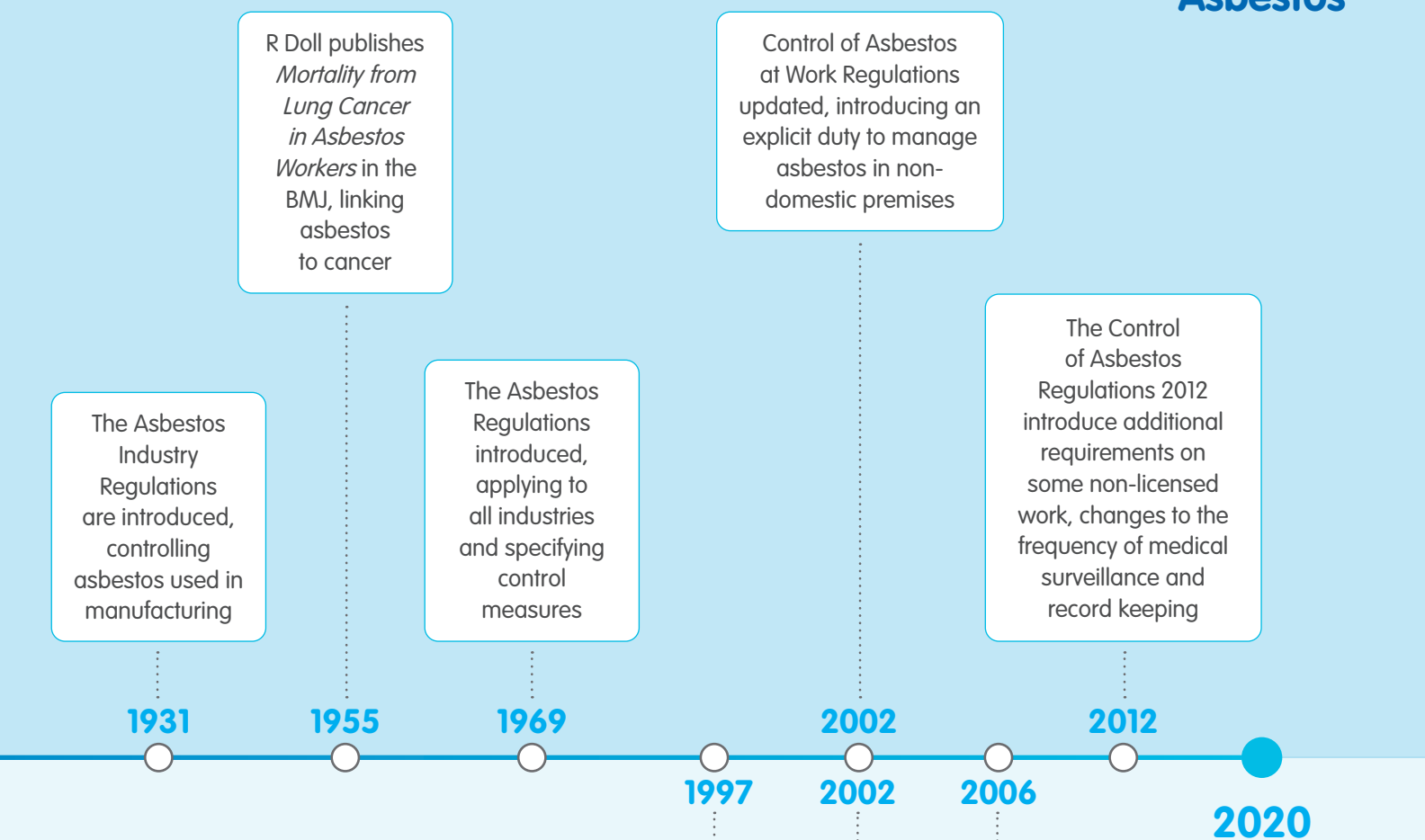
13. Asbestos v Silica: a timeline

Asbestos



Silica

Asbestos



Silica

14. Glossary

- CCG – Clinical Commissioning Groups. These have a responsibility to decide what services a specific geographic area will provide. All GP surgeries belong to a CCG. NHS England retains some decisions around primary care services (GPs and dental services) and some specialist hospitalised services
- COPD – Chronic Obstructive Pulmonary Disease. A group of lung diseases including emphysema and chronic bronchitis, most commonly caused by smoking
- COSHH – Control of Substances Hazardous to Health Regulations 2002
- CT – computerised tomography scan. This uses X-rays and a computer to build a detailed picture of the inside of the body
- CXR – chest X-ray
- GPs – general practitioners
- HSE – Health & Safety Executive
- IIDB – Industrial Injuries Disablement Benefit
- OH – occupational health
- PPE – personal protective equipment
- RIDDOR – Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013
- RPE – respiratory protective equipment
- RCS – respirable crystalline silica
- SLE – systemic lupus erythematosus
- SWORD – Surveillance of Work-Related Diseases
- TB – tuberculosis
- THOR – The Health and Occupation Research network
- WELs – workplace exposure limits

15. List of contributors

We received 26 written submissions from the following individuals and organisations:

- Arco
- Dr Steven Boorman CBE – Chair, Council for Work and Health, Chair Faculty of Occupational Medicine Ethics Committee
- Robert Bradford – Senior Health & Safety Advisor, BAM Nuttall Ltd and Chair, Civil Engineers Contractors Association (CECA) National Health & Safety Forum
- British Occupational Hygiene Society (BOHS)
- British Tunnelling Society
- Paul Bussey – Architect and RIBA lead on CDM issues
- Civil Engineers Contractors Association (CECA)
- Drilling and Sawing Association
- Health in Construction Leadership Group
- Health and Safety Executive
- Dr Gareth Walters, Dr Alastair Robertson, Dr Vicky Moore and Professor Sherwood Burge – University Hospitals Birmingham NHS Foundation Trust
- Institution of Occupational Safety and Health (IOSH)
- iOH (formerly Association of Occupational Health Nurse Practitioners)
- Loughborough Construction OSH Research Group
- Tricia O'Neill – UK Head of Occupational Health, Wellbeing and H&S Education and Competence, Skanska
- Professor Mike Morgan – Respiratory National Clinical Director, NHS Commissioning Board; Consultant Respiratory Physician, University Hospitals of Leicester NHS Trust; Honorary Professor, University of Leicester
- Dr Peter Reid – Respiratory Consultant, Western General Hospital
- Alison Rodgers – Principal Lecturer in Health and Safety Training at the National Construction College / CITB
- Nigel Roper – Group Health and Safety Advisor, Concrete Repairs Ltd
- Professor Paul Cullinan, Dr Joanna Szram and Dr Jo Feary – Royal Brompton and Harefield NHS Foundation Trust
- Alicia Parfitt, Julian Hayward and Tim Dupont – RVT Group
- Carol Sanders – Health Scientist, PhD Student (University of Birmingham), Senior Occupational Health Practitioner
- Society of Occupational Medicine (SOM)
- Gordon Sommerville
- Stone Federation Great Britain
- Unite the Union

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for Respiratory Health**