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Case No: QB-2021-002959

**IN THE HIGH COURT OF JUSTICE**  
**KING'S BENCH DIVISION**

Royal Courts of Justice  
Strand, London, WC2A 2LL

Date: 13 December 2023

**Before:**

**HIS HONOUR JUDGE SIMON**  
**(Sitting as a Judge of the High Court)**

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**Between:**

**ALEXANDER JOSEPH JOHNSTONE** **Claimant**  
**(Personal Representative of the Estate of**  
**ELAINE JEAN JOHNSTONE, Deceased)**

**-- and --**

**FAWCETT'S GARAGE (NEWBURY) LIMITED** **Defendant**

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**Mr John-Paul Swoboda** (instructed by **Boyes Turner LLP**) for the **Claimant**

**Mr A John Williams** (instructed by **Weightmans LLP**) for the **Defendant**

Hearing dates: 24 to 28 April & 12 June 2023

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**Approved Judgment**

This judgment was handed down remotely on 13 December 2023 by circulation to the parties or their representatives by e-mail and by release to the National Archives.

**HIS HONOUR JUDGE SIMON:**

***Introduction***

1. This claim involves the sad death of Mrs Elaine Johnstone (EJ) from malignant mesothelioma of the pleura (MMP). EJ passed away on 31 August 2019, aged 73, having suffered from the effects of the disease from approximately July 2018. She was formally diagnosed with MMP in November 2018, having been otherwise generally in good health. This judgment opens with this brief chronology of the sudden onset of illness and EJ's succumbing to MMP, because the Court recognises that the course of the disease was shocking and distressing to EJ and her family. Irrespective of the outcome of the claim, her loss remains keenly felt by all those close to her, most particularly her husband, Mr Alexander Johnstone, who is the Claimant (C).
2. C brings this claim on behalf of the estate of EJ pursuant to the provisions of the Law Reform (Miscellaneous Provisions) Act 1934 and on behalf of himself and the dependants of EJ pursuant to the provisions of the Fatal Accidents Act 1976.
3. The Defendant (D) was at the material time and continues to be a vehicle garage in Newbury, Berkshire, although it no longer trades out of the premises at Bartholomew Street in Newbury (the garage), where EJ worked during the period 1982/3 to 1989/90, some seven-and-a-half years. She was employed in the office. C's case is that as a result of her employment with D, EJ was exposed to asbestos such that there was a material increase in risk of her developing mesothelioma. D denies this causation aspect of the claim, which is specific to mesothelioma claims. A picture of the garage when it was operating as such was available at trial within the core bundle.
4. There is a very strong association between exposure to asbestos and mesothelioma, and the greater an individual's cumulative exposure to asbestos, the greater the risk of the condition occurring. "*Cumulative exposure is the function not just of concentration, (but) also the time for which it is experienced.*" (per Dr Moore-Gillon's report). The nature of that association has been a key consideration of the expert evidence in this case. MMP is also a disease with a latency period measured in decades and the precise mechanism by which it is triggered into becoming symptomatic continues to be something of an unknown within medical science. What

is known is that it remains, presently, incurable and its terminal course runs within a relatively short timeframe from first manifestation of symptoms.

### **Law**

5. The inherent uncertainty in asbestos claims has given rise to a special test for causation, enunciated in *Fairchild v Glenhaven Funeral Services Ltd & Ors* [2002] UKHL 22 and in *Sienkiewicz v Greif (UK) Limited* [2011] UKSC 10, which is that C must prove on the balance of probabilities that there was a material increase in risk of EJ contracting asbestos-related disease. There is no disagreement between the parties as to the applicability of this rule. However, Mr Williams was apt to remind the Court on several occasions that the special formulation for causation was the beginning and end of any adaptation of the normal rules of evidence and proof that apply in civil proceedings. The Court has this well in mind.

### ***C's application to adduce late evidence/relief from sanctions***

6. As a preliminary issue at trial, C made an oral application to rely on the evidence of Iain Johnstone, a son of C and EJ, who, it transpired had also worked at D's premises for a period of time. There was no written application for relief from sanctions, although C's solicitors were content to file one if that was determinative. The statement came into existence after a conference held between C, his son and their legal advisers on the Monday before trial, 17 April 2023. D objected to the statement, warning that allowing the evidence to be relied on could give rise to an application for an adjournment.
7. The case was ready for trial at the beginning of the week prior to the discovery of Iain Johnstone's connection with D and the service of his evidence. The bundles – which are many – were all prepared and the experts had not only provided all their evidence in writing but had undertaken the joint experts' procedures that one would expect in a case of this nature.
8. Though I pressed C's counsel for an explanation for the very late service of IJ's evidence, nothing of substance could be advanced. During the course of submissions, it also became clear that C was not seeking to rely on the entirety of IJ's evidence but only those parts that support the already pleaded case. Which sections of his witness

statement came within those parameters and which not was unknown as C had not served an annotated copy to identify them

9. Applying the *Denton* principles: the production of what is said to be direct evidence from an always available witness the week before trial is a serious and significant act of non-compliance; there was, simply put, no explanation at all for the failure to obtain and disclose the statement of IJ within the original timetable set so it became rather difficult to consider and assess why the breach occurred, beyond the bare fact of the evidence coming to light during a conference the week before trial; the failure to have identified those parts of the statement that were sought to be adduced together with the potential for an adjournment if the relief from sanctions were granted, added to an evaluation of the circumstances that militated against granting relief.

### ***Background***

10. Elaine Johnstone was born on 21 July 1946. She married Alexander Johnstone, the Claimant, on 19 March 1966. As set out above, EJ passed away on 31 August 2019, aged 73 years.
11. EJ would have been aged approximately 36 when she began her employment in the accounts department at D's garage and approximately 43 when she left. A picture of the garage shows that it is situated within a terraced-style row of properties. There is an entrance for cars to access the premises, over which there is part of the terraced property. To the left of the entrance is a showroom, behind which is the mechanic's workshop or lube bay, as referred to in the evidence. To the right of the entrance is the building containing the office where EJ worked.
12. It is conceded by D that, for a period of seven-and-a-half years while EJ worked at the garage, unsafe practices were in use in the workshop in that, during servicing of cars, an air-line was used to blow out dust and asbestos fibres from existing brake shoes and clutch drive plates, as well as from processes applied to new ones being fitted. C's case is that the air-line was used at three junctures – when starting a service, when finishing the job and as part of clearing out the lube bay at the end of each day. In addition a grinding machine or manual filing would be used on new brake shoes to get them to the appropriate size.

13. D admits breach by failing to change unsafe working practices in relation to asbestos-containing car components, despite requirements to do so. By the beginning of the 1970s, the industry standards expected for this type of asbestos handling dictated use of a vacuum rather than an air-line. The effect of using an air-line, hand file and grinding machine in the manner described above was to produce clouds of dust containing asbestos fibres.
14. C also relies on D's failure to measure and maintain records of the levels of asbestos at the garage, a failure from which D should not be allowed to profit. Reliance is placed on the case law in respect of adverse inference, particularly *Keefe v Isle of Man Steam Packet Company Ltd* [2010] EWCA Civ 683.
15. The central question in this trial is whether C has established the special rule on causation for cases of MMP, that is whether C has proved on the balance of probabilities that the admitted breach involved exposure to asbestos that created a material increase in the risk of EJ developing the disease.
16. It is unnecessary to describe in any detail the different types of asbestos, because the evidence is that the asbestos fibres with which this claim is concerned are chrysotile (also known as 'white asbestos'), because this is the type that was used in brake and clutch assemblies at the material time. As with other aspects of this case, there is some uncertainty about the extent to which the chrysotile asbestos will have contained traces of tremolite, a more potent form, but this is not a matter that the Court is in a position to resolve to any absolute extent. I merely note it as it was a consideration raised during the trial, but one to which the experts were alive and was accounted for.
17. The metric for asbestos concentration and for cumulative exposure is variously described in the numerous studies referred to in this case. For consistency, I have adopted 'f/ml' for concentration and 'f/ml-y' for exposure. The year element of the metric is in fact 1920 hours, being a working year (eight hour shifts for 48 weeks per year).

### ***Evidence at trial - factual***

18. The factual evidence served by C consisted of witness statements from himself, Mr Raymond Russell (RR), who was employed as a mechanic at the garage at the

relevant time, and Ms Lynne Squibb, from HASAG, a charity supporting those with asbestos-related disease. D served no factual evidence.

19. The evidence from C, which was not the subject of cross-examination, detailed EJ's work record by reference to HMRC records. She had been employed in a number of administrative roles until 1983, with a couple of years working in a retail-sales capacity. In 1983 EJ went to work for D, where she remained until 1990. She was employed in the Accounts department on one side of the garage forecourt. The lubrication bay used by RR was on the other side of the forecourt. EJ worked five days a week from 9am to 5pm. Although C did not think that she went into the workshop area much, "*she had to walk across the forecourt every day, more than once a day and there was a shed where a mechanic worked on the brakes and clutches. The mechanic used to blow out the asbestos dust with a compressed air line and Elaine said he used to blow it all outside into the yard at the end of the day and she would walk through it. The mechanics also went into the office throughout the day with dust on their overalls.*"
20. I note in passing that although C refers to mechanics in the plural, there was no evidence to suggest that asbestos dust was produced by anyone other than RR.
21. C addressed his wife's subsequent employment. C's evidence was that his wife, in both his and her opinion, was only exposed to asbestos while working for D (for reasons that are self-evident, one might caveat this with it being the only known exposure to asbestos). In his evidence, C also described the various places where he lived with his wife over the years as well as his own work history. He was never involved in work that exposed him directly to asbestos, although some army buildings in which he was stationed may have contained undisturbed asbestos.
22. C described the first symptoms of EJ's illness and its progression from October 2018 until her passing in August 2019. It was plainly a distressing and difficult time for all the family.
23. Mr Russell's evidence was accompanied by a Civil Evidence Act notice, because he was not medically fit to attend court due to age and infirmity. He was employed as a mechanic at D's garage between 1960 and 1995, returning part-time post-retirement until about 2005. He undertook car servicing in a dedicated lubrication bay (the lube

bay), opposite the office in which EJ and another lady worked. He estimated that the lube bay door was no more than eight yards from the office. The lube bay's sliding doors were almost always open, save in very cold weather, as RR was using a compressed air-line. RR believed the office door was kept closed, except in hot weather.

24. RR's job was to service and maintain vehicles brought into the workshop. This brought him regularly into contact with asbestos, particularly in the course of replacing brake shoes and clutch drive plates. The brake linings and clutch linings contained asbestos. RR described the process, undertaken by him regularly, of removing brake drums, which would have dust and dirt where the brake linings had deteriorated through wear and tear. The asbestos brake shoes and clutch drive plates would wear out over time creating dust within the brake drum and clutch housing. Whether replacing or renewing brake linings and clutch plates, RR used a compressed air-line to blow dust out of the drum, shoes, brake drum plates and clutch housing. This process released clouds of dust into the lube bay as well as out into the yard, the air-line being used to blow it out there. RR described being covered in asbestos dust, on his hands, face, hair and overalls.
25. In addition to blowing out the brake dust, RR often sanded the asbestos dust from the brake shoes and filed the edges to ensure a smooth connection. This would be done by chamfering, usually by hand with a coarse file, but occasionally with a grinding machine. RR would wear a single pair of overalls for a week at a time, after which they would be laundered. His own clothes beneath would also get contaminated. RR described seeing EJ most days as he would often have to go into the office if he needed something.
26. Understandably, RR could not provide a definitive figure for how often he serviced vehicles over the more than thirty-five years that he worked for D, but it was a regular part of his job. He stated, "*On average, bearing in mind there were some weeks when I would do it more than others, I estimate that one day a week was spent servicing brake shoes and clutch drive plates and using a compressed airline in the manner that I've described to blow out brake drums and clutch plate housing before I started working on them and again once I'd finished the job.*"

27. Ms Lynne Squibb, runs HASAG Asbestos Disease Support Charity. She was contacted by EJ in November 2018 for assistance about claiming benefits. She was the only live factual witness called and she clarified one part of one form filled out in relation to EJ's employment history. Nothing turns on Ms Squibb's evidence in the event.

***Evidence at trial - experts***

28. The Court heard from six expert witnesses over the course of the five days of trial. They were called in pairs, reflecting their respective disciplines (I have not set out the full extent of each expert's qualifications and expertise, but sought to capture the essence of the discipline in respect of which they gave evidence):

(i) Mr Christopher Chambers – occupational health and safety practitioner with specialist expertise in asbestos-related claims

(ii) Mr Martin Stear – chartered occupational hygienist with specialist expertise in asbestos-related claims

(iii) Professor John Norrie – Biostatistician and Epidemiologist

(iv) Professor Stephen Jones – Professor of Environmental and Occupational Toxicology

(v) Dr Charles Twort – consultant chest physician

(vi) Dr John Moore-Gillon – consultant chest physician

29. The trial bundles contained a substantial quantity of research and analysis papers in relation to asbestos use, asbestos exposure, MMP and risks associated both from identified exposure, non-identified exposure and environmental exposure to asbestos. Over the course of the trial a number of the papers emerged as the ones primarily relied on or criticised by each party's experts. For ease the papers will be referred to in the rest of this judgment as follows:

<b><i>Full Title</i></b>	<b><i>Year</i></b>	<b><i>Judgment Reference</i></b>



Hickish D, Knight K. Exposure to asbestos during brake maintenance. Ann Occup Hyg 1970; 13; 17-21	1970	H&K
Rohl et al. Asbestos exposure during brake lining maintenance and repair. Environmental Research 1976; 12; 110-118.	1976	Rohl
Health and Safety Executive. Selected written evidence submitted to the Advisory Committee on asbestos 1976 – 1977. HSMO, 1977 (Ferodo Ltd data)	1977	Ferodo
Timo Kauppinen & Kari Korhonen (1987) Exposure to Asbestos During Brake Maintenance of Automotive Vehicles by Different Methods, American Industrial Hygiene Association Journal, 48:5, 499-504	1987	Kauppinen
Plato N. Tornling G, Hogstedt C, Krantz S. An index of past asbestos exposure as applied to car and bus mechanics. Ann. Occup. Hyg. 1995; 39; 4; 441-454.	1995	Plato
Hillerdal, G. Mesothelioma: cases associated with non-occupational and low dose exposures. Occupational and Environmental Medicine 1999; 56; 505-13	1999	Hillerdal
Bourdès, V., P. Boffetta, et al. (2000). "Environmental exposure to asbestos and risk of pleural mesothelioma: review and meta-analysis." <u>European Journal of Epidemiology</u> <b>16</b> (5): 411-417.	2000	Bourdes
Hodgson, J. T. and A. Darnton (2000). "The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure." Ann Occup Hyg 44(8): 565-601.	2000	H&D
Peto, J., C. Rake, et al. (2009). Occupational, domestic and	2009	P&R

environmental mesothelioma risks in Britain: a case-control study, HSE Research Reports, RR696, Health and Safety Executive, London.		
Rake, C., C. Gilham, et al. (2009). "Occupational, domestic and environmental mesothelioma risks in the British population: a case-control study." Br J Cancer 100(7): 1175-1183.	2009	R&G
WATCH (2011). Asbestos: final position statement, HSE Working Group on Action to Control Chemicals,	2011	WATCH
Gilham, C., C. Rake, et al. (2016). "Pleural mesothelioma and lung cancer risks in relation to occupational history and asbestos lung burden." Occup Environ Med 73(5): 290-299.	2016	G&R 2016
Marsh, G. M., A. S. Riordan, et al. (2017). "Non-occupational exposure to asbestos and risk of pleural mesothelioma: review and meta-analysis." Occupational and Environmental Medicine 74(11): 838.	2017	Marsh
Gilham, C., C. Rake, et al. (2018). "Past and current asbestos exposure and future mesothelioma risks in Britain: The Inhaled Particles Study (TIPS)." International Journal of Epidemiology 47(6): 1745-1756.	2018	G&R 2018

***Expert evidence – occupational hygiene – Mr Chambers***

30. In his written reports, Mr Chambers reviewed and quoted from source material from before through to after the relevant period to provide a detailed context for his opinions and conclusions. He had experience of employment with the Health and Safety Executive, including preparing policy and guidance, as well as undertaking inspections, and thus felt well-placed to make observations about such guidance and consider RR’s description of the tasks he undertook. His estimates of mean asbestos

dust concentrations for core processes described by RR are set out in a table at CB211. His estimates were based on actual sampling data taken during the same work as RR in order to provide the Court with an indication of the likely concentrations of asbestos dust given off during the processes. Mr Chambers advanced the view that activities such as use of a compressed air line, mechanical grinding, hand grinding and hand sanding of brake linings are likely to have resulted in the highest release of asbestos dust from any work with asbestos brake linings.

31. He pointed out that he had reported in a significant number of cases involving exposure to asbestos dust arising from work with asbestos linings. Of those cases, a proportion have been cases of secondary exposure, including non-manual worker not directly involved in the maintenance of vehicles. He traced the development of guidance against using compressed air lines (from as early as 1968), with similar advice but now including warnings against the filing and rubbing down of brake pads from 1970 (Asbestosis Research Council). He quoted from the HSE's guidance (1985) which he considered related not only to RR but directly to the position of EJ as well. Mr Chambers also made observations about Mr Stear's reliance on Plato, given the data sets being used (1980s without air lines being used) and on other papers, querying whether there could be direct applicability to RR's work.
32. Overall, Mr Chambers considered Mr Stear to have underestimated RR's own exposure by at least an order of magnitude. When considering the calculation of EJ's exposure, Mr Chambers considered that Mr Stear's reduction was out of step with the published data. For his own calculations Mr Chambers had adopted the "*generally accepted approximation*" of dust concentrations reducing by 90% in a reasonably well-ventilated workplace at a distance of 20-30 feet from source. He then added a further reduction of 50%, drawing on ARC material suggesting this was the diminution applicable to a distance of 10 feet outdoors. His report cautioned that dust does not reduce in a linear and mathematical way.
33. Mr Chambers' calculation for RR's exposure, set out in his report, was (based on Ferodo),  $3.14 \text{ (f/ml)} \times 8 \text{ (hours per week)} \times 48 \text{ (weeks of work per year)} \times 7.5 \text{ (years)} \div 1920 \text{ (hours in a working year)} = 4.71 \text{ f/ml-y}$ . Applying his proposed reduction to reflect the position of EJ, would produce an exposure "*in the order of*"  $0.24 \text{ f/ml-y}$ . His report emphasised the impossibility of providing a reliable estimate and suggested

that his calculation be seen alongside that of Mr Stear in demonstrating the challenges.

34. Mr Chambers also quoted the HSE WATCH Committee's 2011 observations about the H&D paper, which included, "*WATCH considers that all of these uncertainties impose limitations on the reliability of risk estimates produced by the H&D model, particularly when it is extrapolated to exposure situations and populations beyond those covered by observed data. Hence WATCH confirms the statement in its 2008 conclusion that risk estimates derived by extrapolation of the model should not be taken to be reliable absolute risk values*".
35. In his oral evidence, Mr Chambers explained that asbestos was widely used until the very late 1980s and in some circumstances even later in vehicle brake and clutch parts. In his main report, he referred to, among other documents, the HSE guidance of 2010, which referred to asbestos being used in brake linings until November 1999. The activities generally undertaken by car mechanics were known to generate asbestos dust and precautions should have been in place from at least the early 1970s. Mr Chambers referred to the K&H papers concerning exposure levels for car and truck mechanics and the Rohl paper. He described the likely actions involved in servicing drum brakes that would release asbestos fibres, noting that the use of an air-line to blow out dust into the yard, and therefore towards Mrs Johnstone's office, would likely produce a higher concentration but he could not say how much. Drum brakes, with their higher levels of asbestos, were still in widespread use in the 1980s. It was not until 2000 that non-asbestos disc brakes were to be found on both the front and the rear wheels of all levels of quality of cars.
36. Mr Chambers relied significantly on the figures in the Ferodo paper, given that company's leading role in the manufacture of brake linings. He suggested that the sampling in H&K and in Rohl was from very similar activities to those described by RR. He mentioned various activities RR might have done on visits to the office that could have dislodged asbestos fibres from his clothes or hair. In short, his opinion was based on EJ working in a garage where there was poor practice throughout her time there and where asbestos dust would have been present. He accepted the Ferodo figures were not presented as a time-weighted/shift average and that there was also only a generic description of the tasks underlying these figures.

37. Mr Chambers said it was important to look at what RR said he was doing and consider the high levels of dust associated with those activities (his report contained a resume of RR's evidence about the dust-producing activities that he engaged in as a mechanic at D). His calculations were of necessity very broad estimates. Technical Data Note 42 describes a reduction of about 90% for exposure at a distance of 20-30 feet. This is a widely accepted rule of thumb, although Mr Chambers acknowledged that the note was dealing with asbestos spraying, which was notoriously contaminating. The suggested further reduction of 50% was to take account of RR's evidence that although the office door was no more than eight yards from the workshop, the space between was partly open-air.
38. Mr Chambers' calculation also allows for EJ going into the workshop at times (although RR did not mention this in his statement) and the air-line being used to blow dust out of the workshop at the end of the day. If the office door is closed then Mr Chambers said there would need to be a further reduction, but only slightly as the door would have been open at times, for example when it was warm.
39. Asked about the Kauppinen paper, Mr Chambers said he had seen it in this case and that the figures did represent a time-weighted average for more defined tasks. The time-weighted average would represent the peaks and troughs of an average working day. He said it would not be unreasonable to take H&K and factor in some figures for the hand and machine filing. Based on Kauppinen, Mr Chambers agreed that factoring in the hand filing would not increase the H&K figure by much.
40. Mr Chambers did not consider it possible to give a reliable dose estimate, because for mechanics – from which a dose for EJ would have to be calculated – there are just many papers with very different ranges of results based on small subsets. There is greater data for high exposure work rather than the work being undertaken by RR. The blowing out at the end of the day would have been of a composite of brake dust, mud from tyres and other such materials from all processes undertaken on that particular day.

***Expert evidence – occupational hygiene – Mr Stear***

41. Mr Stear's reports explained his reliance on the Plato paper, because it dealt with average exposure over a year, when a mechanic was undertaking brake and clutch

servicing routinely but not constantly. Although a study of Swedish workplaces, involving changes and improvements in working practices, Mr Stear expected that UK garages would be similar. However, it would be a matter for the Court to decide whether such improvement had been made at D by the relevant period.

42. Mr Stear recorded that by the 1980s drum brakes (containing asbestos) had largely given way to disc brakes (by which he meant with lower asbestos dust production, to a point at which non-asbestos alternatives were in use). He worked on the basis that RR would have encountered non-asbestos containing brakes at times and that RR's evidence meant that he was only exposed once a week. Due to the use of an air-line, Mr Stear used 0.1 f/ml as his baseline (opining that it was likely too high), which translated to 0.75 f/ml-y for the material period. The factual setting, as derived from RR's evidence, led Mr Stear to the conclusion that EJ's dose would be "*far lower than this*". In seeking to quantify this, Mr Stear's report referred to "*broad approximation*" and "*notionally assum[ing]*" a hundredth of RR's dose, then EJ's would be 0.0075 f/ml-y. The report repeated that Mr Stear was not making accurate dose estimates as this was not possible. In the joint statement, Mr Stear clarified that for the purposes of his calculations he had assumed that RR worked only on asbestos-containing brakes.
43. Mr Stear did, in his reports, consider H&K and Kauppinen, quoting from the latter study which itself recognised that the higher figures in H&K may be due to different work procedures in the UK during measurements, including use of compressed air not present in Kauppinen's Finland-based study. Drawing more significantly on Plato and H&K, in his written evidence, Mr Stear suggested adopting the former study's 1960s figures to be more representative of the circumstances described by RR, thus 1 f/ml-y. Despite being concerned that even a tenth of this "*seemed too high*", Mr Stear adopted this percentage to reflect distance and some accessing of the lube bay by EJ, describing it as "*a cautious overestimate*". He then calculated a dose for EJ based on five to ten minutes per day of exposure, reaching a figure of 0.001 to 0.002 f/ml-y ( $0.1 \text{ f/ml-y} \times 5/10 \text{ (mins)} \div 480 \text{ (mins)}$ ). In reaching a view about RR's and EJ's dose estimate, Mr Stear noted continuing uncertainty but considered his figures were more likely an overestimate rather than an underestimate.

44. In his oral evidence, Mr Stear recognised that there are studies dealing with exposure of mechanics that might provide an estimate for exposure for a task or potentially for a shift. The value of the Plato paper, in his view, is that it looks at cumulative exposure over time – not just a shift but over a year – giving an impression of what a typical dose would be. The figure from Plato would be 0.1 f/ml-y, based on what RR describes of his work, which was more reflective of the 1960s than the 1980s. Whether RR was doing all of his asbestos-related work on one day per week or for parts of a number of days per week did not make a particular difference in terms of the order of magnitude.
45. Mr Stear took issue with Mr Chambers' calculation of a 90% reduction, because the resulting 10% figure would be appropriate for someone not doing the work but in some proximate position close by. Proximate exposure is dependent on the specific scenario and EJ was not proximate because she was not in the workshop itself. Mr Stear's 1% had been a broad approximation to indicate the magnitude involved, based on his experience. He considered that the upper storey over the driveway into the premises would have had some impact, for example on stopping the rain getting to some part of the ground on rainy days, but not in terms of magnitude, but rather as an additional consideration. His assumed level of magnitude remained 0.001-0.002 f/ml-y for EJ.
46. Mr Stear explained that the Ferodo study was not without some value, but it involved only very short-term monitoring, representing a very small part of a shift. EJ's exposure profile over the 7.5 years would have been quite complex, involving periods of nil, low and higher exposure. It is not possible to calculate a realistic average daily exposure. There is insufficient information in the Ferodo study to allow extrapolation over a shift. The exact amount of asbestos that was in new brake and clutch linings is unknown and this is one of the uncertain variables. However, although there is a level of uncertainty it is possible to make a reasoned judgment about the exposure for a mechanic. This provides a magnitude of exposure, and one would not expect the true value to be ten times higher or lower, for example. That magnitude of exposure could be calculated with reasonable confidence for different activities. This was the case for a mechanic, but EJ's exposure raised greater uncertainty because of the additional variables in play. Mr Stear rejected the suggestion that he had only brought into his

calculation uncertainties that would reduce dose, not increase it. He emphasised that the dose estimate assumes only asbestos-containing drum linings and no improvements being introduced (although these were common by the 1980s).

47. Mr Stear explained that if EJ walked past the lube bay while the air-line was being used to blow out, there would be brief, high exposure but to a tiny dose. He referred to the way in which Plato had developed a model based on a number of studies and how this, and H&K had been used within his calculations. He had relied on his professional experience to reach his opinion on EJ's exposure relative to that of RR. He had assumed, for his calculation, EJ would be outside in the yard for 5-10 minutes per day, but had not gone into such detail as allowing for the opening of the office door or RR coming into the office in his contaminated overalls. His approach was not to try to model for the opening of the door, nor specifically when dust was blown out, that is, not to deal with that level of detail, but to take account of everything described and give a representative guide of the type of magnitude for RR's dose. For EJ's dose he was not seeking to provide the most accurate level but rather in terms or orders of magnitude, and not an exact figure. He had not excluded any factors from his calculation. He placed reliance on the Plato paper because it provides an approach to understanding exposure, both that of a mechanic and that of a bystander.

***Expert evidence – Epidemiological – Professor Norrie***

48. In his report, Professor Norrie identified the two main challenges requiring epidemiological insight and comment as EJ's cumulative exposure to asbestos and linking this to lifetime risk of mortality. This would allow for expert opinion on the risk of EJ contracting MMP if she had only had environmental exposure and not occupational exposure as well as to what extent that risk was elevated by the occupational exposure. Professor Norrie set out, with some detail, the significant and multidimensional uncertainties inherent in the case. He considered the calculations of the occupational health experts, given their origins in various studies. He made a number of observations about the Plato model, explaining why he considered estimated exposures drawn from it as less reliable than might otherwise be assumed. As to H&D, he too made reference to the WATCH Committee's cautioning about the use of that meta-analysis, with a detailed critique setting out the reliability difficulties



of using the paper in the way suggested in this case, ie extrapolating down to low exposure scenarios.

49. Professor Norrie addressed the conclusions of studies that had included actual low dose participants, such as P&R and also G&R (2018) as well as Hillerdal . He then provided an analysis of 'idiopathic' as the term is used in the literature to refer to MMP.
50. In his oral evidence, Professor Norrie explained that he had not previously been involved in asbestos-related litigation and perceived his task as reviewing the relevant literature to try to work out what EJ's cumulative exposure might have been and then link that to an estimate of the risk of an unfortunate outcome. It is a very difficult task epidemiologically; the event being distant from the exposure creates very significant challenge to calculating this. Professor Norrie tried to rehearse certainties and then proceeded to consider other 'moving parts' to come to an understanding. The certainties are that EJ died of MMP and her only occupational exposure was seven-and-a-half years of work at D. The uncertainties are "*legion*" with some of the major ones being that her exposure was not at the frontline and was due to the acts of others, principally RR, and how to relate her exposure to an estimated chance of a negative outcome. This latter uncertainty was probably the largest.
51. Professor Norrie addressed the difficulties in the published papers of high dosage exposure when trying to extrapolate down to low dose. H&D's primary purpose was not to deal with low doses, but was a meta-analysis which then sought to plot exposure to risk. Professor Norrie described it as a "*good paper*" that came up with "*a reasonably straightforward mathematical model for that level of exposure*". The problem comes when trying to apply it to exposures anything between 100 and 1000 times smaller than the data on which the model is built, although he accepted that the authors were conscious that the paper might be used for this and had adopted a non-linear model. The problem is "*untestable assumptions with no data about applicability of those mathematical calculations when moving well outside the areas from which they were derived*". Extrapolation done naively can lead to very bad models, resulting in either underestimate or overestimate. Professor Norrie had never seen extrapolations down 100 or 1000 times from reliable data and cautioned against accepting the view of others that H&D is 'the best we have got' so that it is safe to

use. He said this is “*a very difficult area*” and a useless model is “*as good as tossing a coin*”. It was extremely difficult to respond to the suggestion that it represented the best guide available.

52. The Marsh paper was a more ‘production-line’ meta-analysis, summarising the available data in a classic way, without seeking to create a model. Studies brought from different regions, timeframes and which use different quantifications for outcomes also pose problems, however. Professor Norrie compared this to Peto, which was a bespoke case-control study taken from just UK data. He said it was an important paper in the literature, which underlined a lot of the uncertainties which he had been describing. However, he went on to say that he found the paper’s reference to genuinely spontaneous non-attributable mesothelioma very difficult. He did not understand where the quantification of a third had come from as it did not logically flow from the sentences that preceded its introduction in the study narrative.
53. Professor Norrie said he thought Mr Stear’s approach was reasonably thorough with reasonable assumptions about the context and they had both come to roughly the same answer.
54. He opined that as EJ did die of mesothelioma and appeared to have been exposed to asbestos, the statistical balance of probabilities would not put her in the idiopathic group, but that was illustrative not definitive. Environmental exposure is not well quantified in the literature and is very variable depending on region/country and time. On the topic of risk being elevated by occupational exposure, Professor Norrie said that as a statistician this was the area about which he was most reluctant to express an opinion. He considered H&D not fit for purpose for extrapolating down. One could use Marsh or a different approach entirely. He noted that the terminology is not consistent in different studies. In relation to H&D’s 500:100:1 ratio, for different forms of asbestos, that is for occupational exposure. The corresponding ratio for environmental exposure is much more uncertain.

***Expert evidence – Environmental and Occupational Toxicology – Professor Jones***

55. In his report, Professor Jones had concentrated first on the H&D model (or formula) in order to create illustrative graphs of the extrapolation down to low exposures. He noted, “*There are considerable uncertainties in the risks estimated for low exposures*

*by this model, due in part to the extrapolation from occupational exposure levels and in part to the difficulties of interpreting historic measurements of occupational exposure levels. However in my view the authors have made reasonable scientific judgments in their interpretation and consequently the model does provide a reasonable picture of the range of risks that might be attributed to low levels of exposure to asbestos*". He then considered other studies, including P&R referring to the concept of idiopathic cases.

56. Professor Jones' report made reference to two meta-analyses, Bourdes and Marsh. He recognised that both were based largely on populations with unusually high levels of asbestos exposure, but observed that neither study identified a statistically significant elevation of MMP risk in populations exposed only or principally to chrysotile asbestos. He alighted on an extract from Marsh to the effect that the risk of developing MMP "*was directly related to asbestos fibre types, with chrysotile fibres not showing statistically elevated risk of [MMP]*". He recognised the problems in applying meta-analysis to diverse studies not carried out to the same protocols and having a diversity of outcome measures. However, Professor Jones then considered G&R (2016 & 2018), the latter suggesting that the average lifetime mesothelioma risk from environmental exposure among people born since 1965 would be 1 in 10,000, tenfold less than for older people.
57. His report then reviewed the methodologies used and estimates given by Messrs Chambers and Stear. In doing so, Professor Jones stated that he had considerable experience of assessing occupational and environmental exposures from measured data. The instant case involved making judgments about how published data in different work settings might best be applied to EJ's experience. He then addressed the question of environmental exposure, providing an illustrative assessment of it for EJ from age 0 to 50, for the reasons explained in the report. This resulted in a figure of 0.046 f/ml-y as set out in the table below:

Period	Setting	Years	f/ml	hr/yr	Factor to 1920	f/ml y
Age 0 to 4	Outdoor	4	0.0001	870	0.45	0.0002
	Residential	4	0.0002	7890	4.11	0.0033
Age 5 to 16	Outdoor	12	0.0001	870	0.45	0.0005
	School	12	0.0005	1200	0.63	0.0038
	Residential	12	0.0002	6690	3.48	0.0084
Age 17 to 50	Outdoor	34	0.0001	870	0.45	0.0015
	Residential and commercial	34	0.0002	7890	4.11	0.0279
Total						0.046

58. Professor Jones opined that EJ’s exposure to asbestos fibres from sources other than D would have been substantially greater than the occupational exposure estimated by Mr Stear but well below that assessed by Mr Chambers.
59. Thereafter Professor Jones addressed the lifetime MMP risk, which he represented in the following table:

Expert	Exposure f y ml <sup>-1</sup>	Lifetime mortality risk per 100,000		
		Best estimate	‘Lowest arguable’	‘Highest arguable’
Chambers	0.24	0.81	0.077	3.8
Stear	0.002	0.022	0.0006	0.22

60. His report set out his methodology in detail and pointed out that on the ‘best estimate’ Mr Stear’s estimate of exposure represents an addition of less than 0.1% to lifetime risk whereas Mr Chambers’ estimate adds about 2%. Even at the ‘highest arguable’ projection Mr Chambers estimate adds only about 8% to lifetime risk.
61. In his oral evidence, Professor Jones said he had considered the same papers as Professor Norrie. He explained from P&R the calculations for idiopathic/spontaneous cases. The metric of 1 f/ml-y is well understood in occupational hygiene and is the sole metric. There is no alternative for considering ambient, as opposed to occupational, exposure. Bearing in mind all of the uncertainties in H&D it is necessary to look at other papers to try to put all comparisons before the court, to assist with how one might treat very large uncertainties. Professor Jones was reassured from H&D that his “*sketchy attempt*” at model validation was supported. In

his report, he was not purporting to provide an accurate figure, because he did not have all of the information needed for that to happen, but he considered it a credible picture of what the figure could be.

62. Professor Jones was taken through various aspects of the papers dealing with environmental exposure (including home, school and so on). Although commercial chrysotile generally contains tremolite, Professor Jones understood this to be less potent in relation to mesothelioma when compared with asbestos-related lung cancer. There is a mixture of fibres in the environment and the proportion cannot be determined, because if one bases it on lung retention, chrysotile fibres are cleared rapidly and therefore not detectable, whereas amphibole fibres will be detected. The UK studies differ from the US studies because of the presence of higher levels of amosite.
63. Professor Jones addressed the P&R paper, commenting on the three groups described but emphasising that there are no hard dividing lines for potential sources of exposure. He explained how he reached a figure of 0.5 in 1000 (being 30%, i.e. a third, but of 62% making 0.5). A qualified guess at apportionment would be that it has to be less than 1 in 1000, because there has to be some contribution from unrecognised occupational exposure. Having thought that 0.5 was a little too high, and taking account of spontaneous cases, the figure would be somewhere in the region of 0.1 – 0.5, depending on the magnitude of the environmental risk.
64. As to the issues raised in respect of H&D, Professor Jones understood the nervousness, but by using the model from which Table 11 in the paper is derived, which is non-linear, one gets more resolution and information than the table alone provides and particularly at low exposures. It has to be borne in mind that this was not incidental, but in the minds of the authors. When presenting risks, Professor Jones calculated them as a wide range because that is what the model produces and needs to be accounted for when making use of the numbers. Analysing many of the other papers reveals expected variability due to the addition, for example, of younger age groups who would have worked at a time when asbestos was supposed no longer to have been used.

65. Professor Jones opined that for those born in the 1940s, taking account not just of H&D but all available papers, he would still consider a risk of 1 in 1000 for categories with no identified exposure. In terms of different fibre types, H&D was dealing with chrysotile together with any associated tremolite. When considering RR's dose it is important to calculate an average exposure that takes account of peaks and troughs. It is an issue of fact for the court whether that exposure was eight hours over the course of a week or on one specific day.

*Expert evidence – Medical*

66. Dr Twort had completed three reports and a joint statement with Dr Moore-Gillon. Dr Twort had taken the view, from the evidence given at trial, that within the unattributed category in P&R there were people in occupational settings with low asbestos exposures, thus reducing the incidence of those who had purely background exposure. He had been concerned about expressing an opinion on medical risk, because the values in the other experts' reports were so disparate. He was now content to give an opinion, calculated alternatively on the Chambers and the Stear occupational exposure figures. The process was to take the occupational exposure, feed it into the H&D model, making an adjustment for EJ's age when first exposed. For the Chambers' figure, one comes out with a figure of 1 in 100,000. The Stear calculation would obviously be very much less. Dr Twort noted the observations about the reliability of H&D, in that it should be treated as a broad view of magnitude rather than a reliable estimate of absolute risk.
67. Dr Moore-Gillon provided additional information in respect of his professional involvement in research relating to mesothelioma. He did not disagree with Professor Norrie about the limited available data for relevance of gender, so the figures could be an underestimate or an overestimate; it is a further unknown in this case. Genetics could also be relevant for some who develop mesothelioma, but for statistical reasons he explained this need not be overly concerning. Dr Moore-Gillon referred to the origins of the f/ml-y metric and why it is based on 1920 hours and not a calendar year. There is no separate definition of year in the metric when discussing environmental, as opposed to occupational, exposure. From a medical perspective, although the headline potency ratio is 500:100:1 for the three main forms of asbestos, the ratio to apply at lower doses would be less steep. In assessing the medical risk in this case,

Dr Moore-Gillon considered the various papers, such as Bourdes, Marsh and P&R, but none of these provide figures for absolute risk, only relative risk.

68. When considering increased risk, Dr Moore-Gillon had looked beyond H&D but not found anything that helped him in his assessment. In using H&D he acknowledged the limitations and therefore took a best estimate, then looked at the figures in H&D, which considered each fibre-type separately and did not just apply the ratio above. He was also familiar enough, he said, with Peto to apply the methodology. His interpretation of Peto was that there were three broad groups of women with mesothelioma. The first group had clear occupational exposure or lived with someone directly exposed to asbestos. That left 62% not in that group. This percentage would be split roughly in half to represent first cases due to ambient exposure or unsuspected occupational exposure and second true idiopathic unrelated to asbestos exposure. According to P&R, those second two groups are represented by 1 in 1000. Exactly where the line is drawn between these two groups is uncertain but there is a substantial group who develop mesothelioma due to ambient exposure, which would be represented at 0.5 in 1000. Although Professor Jones had thought 0.5 was a bit too high, Dr Moore-Gillon wondered if he had fully understood the calculation in the way that he had presented it. Dr Moore-Gillon insisted that he had not “plugged-in” the information to the model uncritically.

### *Submissions*

69. Mr Williams for D emphasised that the special rule in mesothelioma cases reflects the inherent evidential difficulty in finding the source that initiated the disease process, the so-called ‘rock of uncertainty’, representing limits on scientific knowledge. However, that could not translate into a test of material increase in exposure to asbestos as opposed to the established test of material increase in risk of contracting the disease. There were strong indicators in *Fairchild* and *Sienkiewicz* that the broadened test for causation marked the end point of travel so far as setting the balance of justice and fairness. There was nothing in the case of *McGhee v National Coal Board* [1973] 1 WLR 1 to support the proposition that D bears the burden of any difficulty in proving a material increase in risk, nor in relation to any and every matter in respect of which scientific proof is not established. If C encounters difficulty in the relaxed burden of proof, there is nothing in the case law to support a further relaxation

of the standard to enable proof of material increase. There has to be a test to apply by which a material increase can be assessed, otherwise one is left to gauge by instinct alone. The need for a material increase means that any exposure will not automatically qualify.

70. In *Sienkiewicz* the outcome was determined by evidence at trial as to what the occupational exposure was and what increase it gave rise to over and above background exposure. There was no argument about relative risk from fibre types. Caution is to be exercised when considering other cases where the expert evidence available may have been very different from the instant case. In relation to C's positing two methods for calculation in his submissions, Method 1 is based on risk proportionate to dose, whereas risk is not only a function of dose/exposure. Chrysotile is the least potent fibre-type. There is an incidence of MMP from background exposure. Method 1 invites the court to ignore risk factors other than exposure. It is wrong to consider Method 1 as a status quo, given the relative number of judgments following *Sienkiewicz*. Lord Philips did not mandate the use of any particular method and there is no rule of law in favour of Method 1. It may be easier and more convenient but should not be treated as dispositive of this case. In this case there is epidemiological evidence and it is important to consider the purposes for which it is deployed when assessing the question of weight.
71. Mr Williams submitted that Professor Norrie had given evidence in a way that was not foreshadowed in either his report or in the joint statement, whereas Professor Jones had taken a more balanced and reasonable approach, showing a complete grasp of the concepts and interpretation of epidemiological studies, based on long experience of them in occupational settings. By contrast, Professor Norrie had none. He had also taken an unrealistic standpoint when an error of calculation (outdoor versus indoor living) had been put to him. Professor Jones' approach to methodology and the use of H&D should be preferred.
72. On P&R, neither medical expert considers it medically plausible that there is no instance of idiopathic mesothelioma; it is only the proportion that is up for debate. Dr Moore-Gillon's evidence had been coherent in explaining the calculations. Where a range of values is known, it is appropriate to adopt an average.



73. As to any benevolent findings in line with *Keefe*, Mr Williams submitted that C's position was that the court should accept the totality of Mr Chambers' dose estimates. However, whether to draw an inference, and if so what inference, must be considered in light of the court's findings as to the reliability of Mr Chambers' calculations (both as to his interpretation of RR's evidence and as to his reliance on the Ferodo paper). There was fundamentally no evidence as to how the keeping of medical records, even if the duty was triggered, would have assisted the court. Any breach of monitoring would also only likely have captured the last twelve months of EJ's employment with D. It was submitted that Mr Stear had not deliberately downplayed exposure. The thrust of the exposure was the blowing out activity at the end of a day, therefore 5-10 mins was a reasonable estimate. He had also allowed for occasional visits by EJ to the lube bay. The Rohl study was not relevant as it could not be argued that there was an elevated level in the office at all times; the factual scenarios in that study were very different.
74. Mr Swoboda for C addressed what he described as Method 1 and Method 2, arguing that Method 1, a calculation for exposure that would itself indicate the increased risk in EJ's case, was the "status quo", the correct approach to calculations and was therefore dispositive of the claim. The court should only make findings on other issues, if that would provide cogency to the judgment. Within his written submissions Mr Swoboda provided a table based on Method 1, adopting the standard assumption of risk proportionate to dose. This method he argued was a scientifically reasonable compromise. There being no way to determine the level of idiopathic risk, one cannot take it into account. He emphasised that the words of Lord Philips represent the most authoritative statement as to what amounts to 'material' when assessing this as a descriptor. There is no basis for a distinction based on fibre type.
75. Mr Swoboda argued that it was impossible to calculate a precise level of dose, but rather one simply ends up with a range. He suggested that the facts of *Sienkiewicz* were to a large degree analogous with the instant case and that Method 1 had been adopted, as it had been throughout the case law. To depart from this model would require a good reason. Method 1 was endorsed by Professor Norrie and is consistent with scientific literature. Professor Jones (who acknowledged his lack of epidemiological or medical statistical experience) did not argue against it, but merely

presented different options. Dr Moore-Gillon is not qualified to opine on the statistical validity of any method, but rather is qualified in applying the conclusions. Indeed, the only expert with relevant qualifications was Professor Norrie and the court should accept his opinion as to the statistical validity of H&D and whether it is fit for the purpose for which it was deployed by D. As for P&R, there is no clear way of dividing the 1 in 1000 (for those born in 1940s) into three in a reliable way; if one cannot assess whether the idiopathic group is 0% or 30% then it is impossible to take into account without guessing. Evidence of “*fair assumptions*” was not helpful to the court.

76. There was also difficulty in accounting for fibre length and width, whether in the occupational exposure or, indeed, in the environmental exposure. It is “*an impossible exercise*” to take into account fibre type, on the evidence before the court and on the basis of the present scientific understanding. The radically different approach to mesothelioma claims was emphasised with the caveat that medical opinion can indicate whether EJ suffered from the disease, but the risk and increase in risk of contracting it is a statistical or epidemiological question. Materiality is a matter for the court and requires a comparative exercise [per Lord Philips].
77. Mr Swoboda invited the court to draw the inference in *Keefe* for D’s failure to undertake air monitoring. Such monitoring would have provided useful evidence of the levels of exposure for RR, among other things. In accordance with *Mackenzie v Alcoa Manufacturing (GB) Ltd* [2019] EWCA Civ 2110, ignoring the absence of potentially useful evidence would be tantamount to allowing D to benefit from their breach of duty. The court should draw a *Keefe*-type inference in respect of RR’s dose and that of EJ.
78. As to findings of fact, Mr Swoboda relied on the higher level of exposure at the end of each day, but reminded the court that there would have been some exposure even when EJ was in her office. He criticised that part of D’s submissions that sought to rely on environmental exposure by nothing more than being present in a building with asbestos, but seeking to downplay the level of elevated exposure when close to an industrial-type process. This was not a sensible argument. The court should not seek to reach a single figure for exposure but rather accept that only a range is possible. The benefit of using the Ferodo paper is that it takes into account the entirety of the

mechanic's work. H&K only relates to blowing out, albeit a time-weighted average. Mr Swoboda argued that it was better to use the short duration measure relating to the activity the court was concerned with, rather than an eight-hour time-weighted average. The epidemiological evidence on its own would be insufficient to prove an issue; something more would be required to tie the evidence to a finding. For example, assertions about EJ's likely exposure in school, at home or in other work environments had no basis in evidence and C could have been challenged about his evidence on these points, but he was not.

### *Analysis and discussion*

79. I begin with three important contextual observations. The first is about the factual evidence, referring back to the early paragraphs of this judgment. There was evidence from C about EJ's time when employed by D and there was the evidence from RR, the latter subject to a Civil Evidence Act hearsay notice. D proffered no factual evidence, nor was C's evidence challenged by way of cross-examination. D sought in submissions to undermine the reliability of C's evidence on the grounds that it was not corroborated by other evidence and D could not be expected to provide evidence about events so long ago.
80. I acknowledge the difficulties in D's providing detailed factual evidence for the relevant period, but I am not persuaded simply to dismiss C's primary evidence. It is also fair to observe that D is not being required to provide evidence of a single or short-term event many years ago.
81. I have considered the evidence about EJ's time in D's employment carefully and have reached necessary findings of fact (as set out below). The factual evidence is relatively limited in scope and there was a helpful photograph in the bundle, which assisted in understanding some of the general layout.
82. The following matters pertaining to the relevant period did not appear to be in dispute and/or were matters about which there was no evidence to the contrary:
  - (i) The physical location of the lube bay and the office in which EJ worked, relative one to the other;

- (ii) The lube bay doors would usually be open, unless the weather was particularly cold;
  - (iii) The office door would usually be closed, unless the weather was particularly warm;
  - (iv) Dust containing asbestos would be generated within the lube bay during the various tasks described by RR due his use of a compressed air line;
  - (v) Use of the air line during tasks created dust both within the lube bay and, when the lube bay doors were open, out into the yard;
  - (vi) The air-line was also used at the end of a working day to clean out the lube bay by blowing dust and detritus into the communal yard that separated the lube bay and office;
  - (vii) The asbestos used in drum brake and clutch linings was chrysotile (albeit commercial chrysotile generally contained tremolite, an amphibole form of asbestos);
  - (viii) Chrysotile asbestos is recognised to be of substantially lower potency in inducing MMP when compared with amosite or crocidolite);
  - (ix) The asbestos component of the dust produced from used brakes and clutches that were being replaced would have been approximately 1 – 2 % thereof, as a result of chemical changes caused during use;
  - (x) The communal yard was partially covered in at the front by the entrance/exit to the garage.
83. I have introduced the above paragraph with the wording set out because I am alive to the position taken on C's behalf, for example, that the exact asbestos composition in the brake and clutch linings is unknown. However, the expert evidence was clear that it was chrysotile which was used in such car parts. There is no evidence in this case upon which one could properly reach any other conclusion.
84. D's concession as to breach also provides a degree of corroboration for aspects of the evidence of C and RR, the evidence of each being in some respects consistent with

and supportive of the other.

85. It is correct that RR's evidence comes with the distinct disadvantage of being unable to hear from him directly and interrogatories went unanswered, although I am equally conscious of the medical evidence about RR's state of health. Nevertheless, I have had to reach such factual conclusions as I can in the absence of any evidence from D that might have assisted in interpreting RR's evidence. The factual findings overall are then the foundation for assessing and overlaying the expert evidence.
86. The second contextual point is to address C's primary submission, the application of Method 1, which amounts at its essence to calculating EJ's likely exposure, equating exposure broadly with risk and, unless it is de minimis, finding the claim proved. This is an ambitious submission for two reasons. First, there is no actual authority for the proposition that this is the only acceptable way in which to determine an asbestos-related claim. Many such claims, reported or not, may well have been determined on this basis as that is the only available evidence, but that is distinct from creating a binding rule. Secondly, expert evidence is only permitted in proceedings with permission. Such permission was granted for the experts in this case at interlocutory hearings. If it were truly the case that the evidence of some experts in this case would always be otiose, it is difficult to understand why permission to rely on it would have been granted.
87. In this trial, the Court has had the benefit of hearing oral evidence from each of the experts and counsel have had the opportunity to cross-examine them and to make submissions as to how I should treat their evidence. The test for causation remains the same as in other asbestos-related claims, but the breadth of available and relevant evidence that must be considered in assessing whether the test is made out may well be considerably wider than in other comparable cases.
88. The third contextual observation is that generalised evidence about exposure to clouds of asbestos dust, poor working practices over an extended period and the contracting of a disease associated with asbestos might lead an uninformed observer to wonder what the issues in the case could possibly be. However, as the comprehensive expert evidence in this case illustrates, a proper analysis of the finer detail reveals a far more nuanced picture than any superficial snapshot.

89. To adopt Professor Norrie's terminology, "the uncertainties in this case are legion" for various reasons. In a non-exhaustive list, some are inherent uncertainties in relation to mesothelioma, its genesis and its incidence in the population; some relate to asbestos, particularly ambient levels in the UK as well as actual levels at D during the relevant time given the absence of any onsite monitoring; yet others relate to the accurate correlation between RR's exposure and that for EJ. It is in those circumstances unrealistic to expect the Court to reach any supportable conclusions that involve absolute figures for exposure or indeed any of the other relevant variables engaged by this claim. The best the Court can do is to reach a best approximation for such variables, based on reasoned conclusions and applying the balance of probabilities.
90. It is uncontroversial that there is neither published study nor reliable data set that directly addresses EJ's situation during her employment at D's. The published studies and meta-analyses broadly relate to those working directly with asbestos-containing products, with a small amount of published research on those in proximity to such workers, albeit usually within the same physical environment. Even then, calculating RR's likely exposure has necessarily engaged the experts, but especially Messrs Chambers and Stear, in considerable speculation both in advance of and during the trial, as the factual parameters of RR's exposure were treated (albeit understandably) as being open to different interpretations.
91. The evidence of RR is a key element in comprehending the particular practices at D's that pertain to working with asbestos-containing car parts. Any attempt to calculate a dose exposure (whether a settled figure or a range) for EJ must necessarily derive from the best available calculation for RR himself. Before addressing interpretations of RR's evidence, I am driven to point out the obvious limitations of it. In doing so, there is no explicit or implicit criticism of RR, who I have no doubt was doing his best to recollect events some decades ago.
92. Having been employed full-time from 1960 to 1995 and then part-time for a further ten years, RR does not make any reference to changes in working practices or the introduction of disc brakes and pads, let alone asbestos-free alternatives at any stage of his employment. While it is possible that he was seeking to describe the situation at the time of EJ's employment, and he appears to have clear recall of EJ and her

colleague in the office, he does not say this explicitly. Furthermore, he appears understandably to have had no independent recollection of when EJ started work, but he also gives no indication of how long they worked together at the garage. As a result of the lack of responses to interrogatories and of the general wording of RR's evidence, it has been necessary for the Court to interpret it as best it can in order to assess its impact on the expert evidence.

93. RR's evidence that he was engaged in working on asbestos-containing brakes and clutches on average one day per week is in my judgment more likely to refer to exactly that, one day per week of dust-generating activity related to asbestos. RR specifically allows for "*some weeks*" when he would do more than others and so it seems one should treat the calculation as based on one day per week with some allowance for weeks when more than that period of time would be devoted to such activities.
94. I reach this conclusion simply because without further elaboration or reference to shifts, numbers of hours or the like, that is the plain meaning of RR's evidence. In addition, my finding is consistent with his evidence about his being covered in asbestos dust, particularly the details about only weekly changes or laundering of overalls. Although this finding may have little impact on the calculation of exposure for RR, it does have a potential bearing on the calculation of EJ's relative exposure.
95. A second element of the time dimension is whether the asbestos-related activity, averaging a day per week, represents time spent only on such activities or the overall time within which, for a percentage thereof, such activities were engaged in. This will provide further clarification of which of Messrs Chambers' or Stear's principles of calculation should be adopted as the baseline for approaching RR's exposure. I remind myself that neither expert considered it possible to arrive at a definitive figure for this; both emphasised that they were only providing an illustrative order of magnitude.
96. The difference between the estimate adopted by Mr Chambers (4.71 f/ml-y) for RR's cumulative exposure and that for Mr Stear (1.0 f/ml-y) is, what became characterised at trial as 'peaks and troughs'. Mr Chambers' calculation treats RR's one day a week as wholly 'peak' exposure, applying the short-term (eight-minute) testing outcomes in

Ferodo; Mr Stear's calculation relies on a time-weighted average, reflecting peaks and troughs of exposure. This explains his lower figure. In reaching this figure, I remind myself that Mr Stear relied on the Plato figure of "annual mean exposure" for the 1960s, rather than for the 1980s as he sought to do his best to reflect RR's evidence, at least insofar as it suggested no appreciable change in working practices over the period of his employment. Had he adopted the base figure for the 1980s in Plato, the outcome would have been only about a fifth of what it was. Mr Stear did also consider the position based on the 0.68 f/ml figure from H&K, reaching the same overall conclusion.

97. Though Mr Chambers' approach is understandable, based on one interpretation of RR's evidence, and draws on a published study, in my judgment it is not reflective of the factual scenario as I find it to be. To find the opposite, and thus support for the basis upon which Mr Chambers was working, is not possible without explicit reference in the evidence. RR does describe in some detail the particular activities that generated dust. However, the more natural reading of his evidence leads me to find that his quantification of average time spent does not already exclude all associated, non-dust producing activities.
98. This conclusion means that Mr Stear's calculations are likely to be considerably closer to the actual figure. Although he pointed out that his working figure for RR was likely to be an overestimate, given the introduction of disc brakes and pads during the relevant period, for the purposes of the proceedings he worked on the basis that RR only encountered drum brakes and shoes. I am not in a position to make a positive finding either way, but have adopted the same approach. On this basis, RR's cumulative exposure across the relevant period was, on the balance of probabilities, of the order of 1 f/ml-y or less.
99. I interpolate here that it is quite possible that RR used the air-line to clean out the lube bay or in respect of other non-asbestos related work as a mechanic on many more days than on those when he was actually exposed to newly-generated asbestos dust. By extension, there is no reason why EJ would be expected to distinguish between contaminated and non-contaminated dust. My finding about contaminated dust is not inconsistent with C's unchallenged evidence reporting that which EJ told him on this point.



100. I have also considered carefully the adverse inference point made by C, but I do not find it helpful in this case. The difference between the calculations of the occupational hygienists rested in large measure on their very different interpretation of RR's evidence, which required judicial determination. Any measuring of levels could only have assisted in relation to RR's exposure, but would then have been the subject of judicial determination as to what such figures represented. Any measurement would not have assisted in relation to identifying the reduction factors to be applied to EJ's exposure, which also required judicial determination. It does not seem to me be a sustainable argument that the lack of monitoring should lead the Court to adopt uncritically Mr Chambers' calculations in circumstances where I have concluded that they do not reflect the factual matrix I have found to exist at the relevant time.
101. The next element in the time dimension is to identify the exposure of EJ relative to that of RR. Both Messrs Chambers and Stear began their calculations by applying the 90% reduction for distance from source based on Technical Data Note 42. Thereafter they diverged on the next step.
102. At paragraph 83 above, I have made some findings that are relevant to assessing EJ's exposure, insofar as the physical setup of the garage was concerned. It is important to identify the circumstances in which she would likely have come into contact with asbestos-containing dust. The evidence from C and RR identifies the following points, with my additional observations added in brackets:
- (i) EJ's leaving work at the end of the day when it coincided with RR cleaning out the workshop with the air-line (potentially one day per week with some weeks involving more than one day);
  - (ii) During visits by RR to EJ's office (one or more visits on one day or occasionally more per week with asbestos-containing dust from that day's work on overalls and on his person, as well as on other days when wearing overalls with previously contaminated dust on them);

- (iii) When the office and lube bay doors were simultaneously open (which seems to have been only occasionally);
  - (iv) On occasions when EJ was walking across the forecourt (referred to as more than once a day by C); and
  - (v) On (rare) occasions when EJ may have gone into the lube bay on a day when asbestos-containing dust was being generated.
103. RR's evidence is that the office door was eight yards away (about 25 feet) from the lube bay and this was the focus of Messrs Chambers' and Stear's consideration of percentage estimates. Mr Chambers assumed a 90% reduction for 20-30 feet distance indoors and a further 50% reduction for short distance outdoors, reaching an exposure percentage of 5% relative to RR's. Mr Stear considered likely time spent by EJ walking across the courtyard as a proportion of a day, applying it to a figure for 20-30 feet distance from source. This results in a range of 0.001 to 0.002 f/ml-y for an estimated time period of five to ten minutes.
104. In considering the two approaches adopted by the occupational hygiene experts to calculating EJ's dose relative to that of RR, I have considered not only their oral evidence but naturally the content of their reports. I quite understand why Mr Chambers' second-stage calculation of a further 50% reduction for EJ's being in the office is suggested as a way to reflect the factual matrix, but in my judgment it significantly overestimates the level of EJ's exposure. The 90% reduction itself is an overestimate because it relates to those at 20-30 feet within the same premises and then in relation to notoriously contaminating asbestos spraying. To then apply a 50% reduction ostensibly to represent a small further distance and/or the fact that the distance is outside and not inside, does not account for the limited occasions on which any dust escaping from the lube bay might enter the office, given that the evidence is of the door being predominantly closed.
105. Having made a finding of one day per week exposure for RR, with occasional additional days, not losing sight of the residual dust on RR's overalls and the like, one time-related approach is to seek to quantify EJ's exposure to asbestos-containing dust

as a proportion of a working year. This would permit the Court to make some additional allowance for weeks when RR did more than one day's worth of brake/clutch servicing. The most 'concentrated', though very short-lived, point of EJ's exposure is likely to have been her walking through the dust cloud at the end of a working day. Thereafter, some additional allowance needs to be made for the other types of exposure, albeit these will be of a much lower order, even though their duration may be longer.

106. However, this more granular approach does require a degree of guesswork about the number of times that RR may have visited the office on a day, whether with recently acquired or asbestos-containing dust or residual dust from earlier exposure. In the circumstances, I am satisfied that the better course is to adopt Mr Stear's average time for exposure of five to ten minutes per day. Having said that, in light of my findings in relation to RR's exposure, the lower average exposure (five minutes) is more likely to be accurate simply because up to four days per week will be exposure only to any residual dust rather than freshly generated dust.
107. By applying Mr Stear's calculations, the figure for EJ's exposure then becomes something in the region of 0.001 to 0.002 f/ml-y.
108. The next question to be addressed is how this figure is assessed in terms of the test of material increase in risk. Whatever may have been the approach in any other mesothelioma case, this Court has to address the evidence that was presented to it and consider the correct approach to the task at hand. Dr Twort seems to have been the first to suggest epidemiological expert evidence as a matter for consideration. Permission was sought and granted for such expert evidence and Professor Norrie, an expert within that discipline, provided a report and oral evidence. D instructed Professor Jones who, though he plainly comes with excellent credentials within his field, is not an epidemiologist and said so. He is however well-versed in the practical application of many of the crucial studies relied on in this case.
109. Leaving to one side their stated opinions about H&D, I consider the evidence of Professors Norrie and Jones to be, in many ways, complementary. Professor Norrie provides the epidemiologist's overview from an entirely 'clinical' or academic assessment, whilst Professor Jones provides practical application, borne of many

years' experience. Professor Norrie's evidence that the exposure metric of f/m-y could have one meaning when applied to occupational exposure and another when describing ambient exposure was surprising given his apparent familiarity with the studies referred to in his report. This was though his first foray into the world of asbestos-related disease and that misunderstanding alone does not automatically undermine the value of the remainder of his evidence. Professor Jones, on the other hand, was able to draw on extensive, relevant experience, applied to the factual matrix in this case and producing worked models in tables to illustrate his opinion.

110. I accept the thrust of Professor Norrie's evidence which I interpret to be the exercise of significant caution when seeking to extrapolate down to low doses from H&D's model equation. His generalised reference to any useless model being as good as '*tossing a coin*' seemed to me to be an attempt to put into layman's terms the potential outcome if that significant caution were not exercised. In any event, Professor Jones did indeed, in my judgment, pay proper heed to the need for caution in addressing H&D. In his report and in his oral evidence he gave persuasive evidence about the formulations within his report and the range of calculations. As already indicated, there is an inadequacy of evidence to reach absolute figures in this case and the Court is dealing with likely ranges and orders of magnitude.
111. Where I do part company with Professor Norrie is the suggestion in his report, when considering P&R, that as EJ contracted MMP and she had had occupational exposure at D that she would be more likely to be in that one third of the cohort of cases in women (recognised occupational exposure). That was a rather simplistic approach, borne I expect of unfamiliarity with this area of industrial disease, bar the role he undertook in this case. On the other hand, Professor Jones in his evidence demonstrated fairly compellingly why the level of EJ's exposure was such that she would more likely be within one or other of the remaining groups (either ambient/unrecognised occupational exposure or idiopathic). His observations must now be seen in the context of my findings that Mr Stear's calculations are to be preferred. This leads to 0.1% or less increase in risk of developing mesothelioma.
112. I found Professor Jones' insightful observations and opinions on the issues of lifetime risk, his worked models and his conclusions highly persuasive. Added to this was the evidence of Dr Moore-Gillon. The Court does not reach conclusions in any case

purely on the grounds of an expert's qualifications and/or experience, but Dr Moore-Gillon's extensive, recent involvement in mesothelioma research is a matter of which the Court can properly take note in assessing the medical opinion that he expressed. Moreover, having concluded that reliance should be placed on Mr Stear's estimates, there was no material divergence of opinion between the two medical experts.

113. Having considered carefully all of the expert evidence, I return to the observation I made much earlier that the fact that a person suffers some level of asbestos exposure and subsequently develops MMP does not without careful analysis of the individual circumstances establish a material increase in risk. I have reached the overall conclusion that any increase in risk in relation to EJ is in the order of 0.1% or less and that such a small increase does not satisfy the test of materiality.

*Conclusion*

114. It is an entirely understandable human reaction to the adversity of illness and accelerated death that EJ's family should wish to establish responsibility for any contribution to their wife/mother's suffering. Their grief will have been exacerbated by the sudden onset of the disease and the distressing symptoms that EJ suffered. For the reasons given above, however, I must dismiss the claim. Issues of quantum therefore do not arise.