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a place of mind
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December 30, 2011

Jonathan Ruckdeschel
The Ruckdeschel Law Firm, LLC
5126 Dorsey Hall Drive
Suite 201
Ellicott City, MD 21042

Dear Mr. Ruckdeschel:

I am Professor in the School of Population and Public Health at the University of British Columbia. My areas of expertise and training are occupational hygiene and environmental health. I have academic training in the field from the British Columbia Institute of Technology (DiplT, 1979), the University of California at Berkeley (MPH, 1982) and the University of Washington (PhD, 1994). I have professional certification from the Canadian Registration Board of Occupational Hygienists: ROH No. 296. My area of research interest is exposure assessment, with a particular emphasis on improving exposure-response estimation in epidemiology and empirical modeling of factors that influence exposures.

At your request, I have reviewed the information about Mr. Harry Chichester. You provided me with Mr. Chichester's Supplemental Answer to Interrogatory No. 19, Exhibit 3 from Mr. Chichester's deposition, and a transcript of Mr. Chichester's deposition.

You asked me to answer the following questions based upon my expertise and training. In answering these questions, you requested that I assume that Mr. Chichester's diagnosis of mesothelioma is accurate. In considering these questions, I have reviewed, among other things, the scientific articles discussed in my answers and the articles provided by you.

I have listed your questions below (in italics), then my answers to them.

1. *Was Mr. Chichester exposed to respirable asbestos from the work he and his co-workers performed as describes in his deposition?*

   By virtue of the tasks he performed, including brake inspection, repair and replacement, Mr. Chichester was exposed to airborne and respirable dust from brake linings, which were designed during the time of his employment to contain asbestos.

2. *Were such exposures significant?*

   Yes, he performed this work repeatedly on a daily basis, 6 days per week, over a period of 40 years. Each time he replaced brakes, Mr. Chichester used compressed air to clean dust and debris from the brake drum area. Sometimes, he didn't need to replace the brake linings, and instead repaired them via sanding.

a. *Were they within the range of exposures known to be capable of causing or contributing to the development of mesothelioma?*

Brake lining replacement and repair work, as performed by Mr. Chichester and his colleagues, includes numerous activities that produce high levels of airborne asbestos dust, including using compressed air for cleaning the brake area, sanding brake lining surfaces, and filing edges of brake linings. The current OSHA Permissible Exposure Limit (PEL) is 0.1 fiber per cubic centimeter of air (f/cc) as an eight-hour time-weighted average. Levels that have been reported in the literature (listed in the footnote below[1]) for these activities regularly exceeded the current OSHA PEL, often by 2- to 10-fold and sometimes by as much as 100-fold. Cleaning with compressed air and sanding and grinding friction products have been shown to create hazardous levels of airborne asbestos dust, and because of this, these specific operations have become subject to regulatory restrictions.

Some jurisdictions have lower exposure limits for asbestos than the USA. As an example, the current standard in the Netherlands is 0.01 f/cc[2] and the Health Council of the Netherlands has recently proposed even lower standards of 0.002 f/cc for chrysotile asbestos and 0.00042 f/cc for amphibole asbestos[2] because epidemiological evidence based on the highest quality exposure information has shown that the exposure-response relationship is steeper than predicted when poor quality studies are included in the analysis.

3. *Was there sufficient latency between Mr. Chichester's exposures to friction products and the diagnosis of his disease?*

Mr. Chichester's work as a mechanic, including daily brake repair, took place over a more than 40-year period starting in 1950 when he was about 23 years of age. Estimates of the minimum times since first asbestos exposure to mesothelioma diagnosis vary, though they usually range from 15 to 20 years. One study that examined the elevations in risk of mesothelioma with respect to timing and duration of exposure[3], found about a trebling of risk with 38 to 48 years since first exposure, a five-fold increase in risk with more than 20 years of exposure duration, and more than doubling of risk with an age of first exposure of 23 or more. Mr. Chichester's exposures met all these criteria.

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[1] Kakooei H, Hormozy M, Marioryad H. Evaluation of asbestos exposure during brake repair and replacement. *Ind Health.* 2011;49(3):374-80. Epub 2011 Mar 1.

Richter RO, Finley BL, Paustenbach DJ, Williams PR, Sheehan PJ. An evaluation of short-term exposures of brake mechanics to asbestos during automotive and truck brake cleaning and machining activities. *J Expo Sci Environ Epidemiol.* 2009 Jul;19(5):458-74. Epub 2008 Jul 30.

Weir FW, Tolar G, Meraz LB. Characterization of vehicular brake service personnel exposure to airborne asbestos and particulate. *Appl Occup Environ Hyg.* 2001 Dec;16(12):1139-46.

Rodelsperger K, Jahn H, Brückel B, Manke J, Paur R, Woitowitz HJ. Asbestos dust exposure during brake repair. *Am J Ind Med.* 1986;10(1):63-72.

[2] Burdorf A, Heederik D. Applying quality criteria to exposure in asbestos epidemiology increases the estimated risk. *Ann Occup Hyg.* 2011;55:565–568

[3] Iwatsubo Y, Pairon JC, Boutin C, Ménard O, Massin N, Caillaud D, Orlowski E, Galateau-Salle F, Bignon J, Brochard P. Pleural mesothelioma: dose-response relation at low levels of asbestos exposure in a French population-based case-control study *Am J Epidemiol* 1998;148:133-42.