

ANNEX III

Publications and Documents Referred to by the Experts (Section V)

**Dr. Henderson**

Three key references on chrysotile asbestos – published in 1998 and 1999 respectively – are quoted or cited frequently throughout Dr. Henderson's report in abbreviated form:

- EHC 203: Multiple authors, *Environmental Health Criteria 203: Chrysotile Asbestos*

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## **3. Documents referred to in Supplementary Comments (Section V.F)**

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McDonald







*Sullivan 1989, Berry 1994]. This study involved workers exposed up to 50-60 years ago, so controls were poor relative to present day standards.*

*In the USA, another study found no mesothelioma among 1630 deaths in persons manufacturing friction products [McDonald et al 1984].*

### **Exposure Levels**

*The concentrations to which persons in the cohort studied by Berry and Newhouse were exposed were considerably higher than those reported in the Australian friction product plant by Dr. Henderson, even including peaks above the standard.*

### **Control Feasibility**

*The technology and work practices to control exposures during manufacture exist and the*



*The fact that there is no increased risk of lung cancer during manufacture of friction products shows that at exposure levels well above those of brake mechanics, there is no chrysotile related increased risk of lung cancer or mesothelioma.*

### **Exposure Levels**

The requirement and work practices exist and have been shown under field use conditions to reduce workers' exposure during brake repair work to well below 0.01 f/ml. [See NIOSH reports].

*In the 1980s the average concentrations to which brake repair mechanics were reported to be exposed in Finland were less than 0.05 f/ml for automobile brake mechanics and less than 0.1 f/ml for truck and bus brake mechanics. [Kauppinnen & Korhonen]. Similar results were found in Germany where the lifetime exposure of brake mechanics after more than 20 years of full time brake work was less than 14 f/ml-years. These exposures took into account grinding, bevelling, sanding and otherwise modifying the brake linings as well as using compressed air to remove brake wear debris from brake drums.*

*The exposure of workers from work on clutches in the past was even lower than that associated with brakes [Lynch (1968), Kauppinnen & Korhonen (1987), Jacko & Ducharme 1973].*

10. On removal of brake shoes, brake discs and clutches from the vehicles, these will be placed in containers provided by the distributor and returned through the distributor to the manufacturer.

11. As the worn brake shoes are returned to the manufacturer, any re-lining by unauthorised companies/persons is precluded. Any re-lining of brakes will be done as subcontracts by the brake lining manufacturer and with equipment and work practices that are no less stringent than those required of the manufacturer. There will be no brake lining material sold to other "re-lining companies".

12. Disposal of any used brake lining, clutch facing or brake disc pad will be done according to jurisdictional requirements.

### **Environmental Releases and Public Health Risks**

*Data show that during braking or use as a friction product, chrysotile is altered to non-asbestos mineral or amorphous silicates. Thus the bulk of the material to which workers are exposed from used brakes is not asbestos as mentioned by one of the experts. Also, almost all residual fibres are very short [e.g. > 80% of fibres are less than 0.4µm in length].*

*Because of the mineralogical and particle size alterations, the environmental release of chrysotile fibres greater than 5 µm from the use of chrysotile containing friction products is extremely low in the case of brakes and essentially nil in the case of clutches. [Lynch, JR (1968) Brake Lining Decomposition Products. J. Air Pollution Control Assoc. 18: 824-826]. Concentrations of chrysotile fibres measured at street level have also been very low. The data obtained in the United Kingdom under situations of very heavy vehicular traffic indicate that the use of asbestos in brake linings does not measurably contribute to atmospheric asbestos concentrations in the urban environment. Even at two heavily used intersections in the London metropolitan area, concentrations vary from 0.0002 to 0.0004 f/ml. Jaffrey, S (1990) Environmental Asbestos Fibre Release from Brake and Clutch Linings in Vehicular Traffic. Ann. Occup. Hyg. 34:529-534.*

*As there is no indication of an increased risk of lung cancer or mesothelioma in friction product workers or brake mechanics exposed at many orders of magnitude above the general public, the actual risk for the public at their levels of exposure will be epidemiologically undetectable.*



**APPENDIX B**

**EXAMPLE OF THE APPLICATION OF A CONTROLLED USE POLICY  
IN THE ASBESTOS -CEMENT INDUSTRY**

The major portion of current chrysotile cement products is for outdoor applications, such as roofing, exterior wall cladding, rain gutters, pipes, etc. Chrysotile fibres are transported from fibre suppliers to asbestos37.52santtterackpor, rsealpor50 kg52sastic bagserslporand "stres hed-wroored"ibre  
signa.oriesragrefb, tpor pcular(131) 158j 24j 0-12.75 TD -0.0406 3.328.4371 twatstw y wir w"pr  
rom fbtos37.5mixonhaplad iontw (ent pro, wee-curiad asstw STRY) Tj 0 -12.75 TD 32 -358 Tc





### **Comment**

*Proper disposal site management practices have shown that there is no measurable additional burden to the naturally occurring environmental fibre concentrations, as is illustrated in the following example:*

*Marfels et al (1988) Staub Reinhaltung der Luft, 48: 463-464*

*This report is about a survey of air concentrations at disposal sites in Germany, showing the following data:*

- *directly over disposal sites: 0,0005 to 0,003 f/ml*
- *vicinity of disposal sites: 0,0001 to 0,0009 f/ml*

ANNEX V

Comments of the European Communities on the Replies by the Scientific Experts  
to the Questions from the Panel

SUMMARY OF REPLIES BY THE EXPERTS

QUESTION NO.	P. INFANTE	N. H. DE KLERK	D. W. HENDERSON	A. W. MUSK
1(a) Main categories of workers at risk	Principally secondary users (building industry,			

**QUESTION NO.**

**P. INFANTE**

**N. H. DE KLERK**

ANNEX VI**Meeting with Experts – 17 January 2000***Transcript***Chairman**

1. I would like to welcome the four scientific experts and the delegations of Canada and the European Communities. I should like to introduce the Panel members and the Secretariat staff especially for the benefit of anyone who wasn't at previous meetings. My name is Adrian Macey, on my right is Mr. Lindén and his right Mr. William Ehlers. In the Secretariat staff, the Secretary to the Panel is Ms. Mireille Cossy and Assistant Secretary Ms. Doaa Abdel-Motaal. The Legal Officers are Mr. Yves Renouf and Ms. Kerry Allbeury. I would like to remind everybody that we have simultaneous interpretation in French and English. Secondly, the proceedings will be recorded and subsequently transcribed. The verbatim transcript will become an integral part of the final report. I would like now to invite the experts to introduce themselves, going in alphabetical order.

**Dr. de Klerk**

2. My name is Nick de Klerk, I work as an epidemiologist in asbestos-related diseases in Western Australia.

**Dr. Henderson**

3. My name is Douglas Henderson. I am the Professor of Pathology at the Flinders University of South Australia and the Flinders Medical Centre. I have been pursuing an interest in asbestos-related diseases for some 32 years.

**Dr. Infante**

4. Peter Infante. I am an epidemiologist and I am with the United States Occupational Safety and Health Administration.

**Dr. Musk**

5. I am Bill Musk, a clinical professor of medicine and public health of the University of Western Australia.

**Chairman**

6. We have received lists of the two delegations, Canada and the European Communities. Could we ask the delegations' leaders to indicate who is who amongst your delegations? Can I ask firstly Canada to introduce themselves?

**Mr. Hankey (Canada)**

7. Thank you, Chairman. I am Blair Hankey, Associate General Counsel at the Department of Foreign Affairs and International Trade. I have on my right Maître Thomas-Louis Fortin who is Legal Counsel at the Ministry, Eric Wildhaber, who is also Legal Counsel and Sebastien Beaulieu, also Legal Counsel at the Department of Foreign Affairs and International Trade. Also opposite me is André Dulude, who is Director of the Regulation and Technical Barriers Division at the Department,

and Pierre Desmarais from the same Division. Behind me, I have Louis Perron from the Canadian Ministry of Natural Resources, and on his left, Gilles Mahoney, who is Director of the mineral industry for the "Ministère des ressources naturelles" of the Government du Québec. Then, on my left, I have Professor Corbett McDonald, as scientific adviser to our delegation, and Professor Alison McDonald. On my right, I have Dr. Graham Gibbs, who is also an expert, and behind me, Dr. Jacques Dunnigan and Dr. Michel Camus, also experts. I would also like to add that the Professors McDonald are serving as honorary members of the delegation and have declined to accept any compensation from Her Majesty in order that both their independence and the appearance thereof may be guarded.

**Chairman**

8. Can I now ask the representative of the European Communities to briefly introduce their delegation?

**Mr. Christoforou (European Communities )**

9. Thank you, Mr. Chairman. My name is Theofanis Christoforou, and I am a Legal Adviser of the European Commission in Brussels. We have a big delegation, composed partly of Commission officials and French representatives. We have scientific experts and members of the Member states' delegations which are based here in Geneva. As the presence is quite long, I would rather leave it to each member to present himself or herself shortly.

10. Jean-Jacques Boufflet, Legal Adviser of the Delegation in Geneva of the Commission; Hubert van Vliet, member of the Legal Service of the Commission in Brussels; Dr. A. Tossavinen, Scientific Adviser; Marcel Goldberg, Scientific Adviser; Maud Valat-Taddei, responsable de la réglementation concernant l'amiante, Ministry of Employment and Solidarity, France; Sophie Chaillet, Ministry of Health, France; Marie-Christine Poncin, Ministry of Economy, Finance and Industry, France; Pierre Monnier, Legal Adviser, Permanent Delegation of France to the WTO, Geneva; Christian Forwick, Permanent Mission of Germany in Geneva; Mr. H. Rieck, Permanent Mission of Germany in Geneva; Mr. M. Nielsen, Permanent Mission of Denmark in Geneva; Sergio da Gama, Legal Adviser, Portuguese Mission in Geneva; Jacques Bourrinet, Professor à l'Université d'Aix-Marseille; Mrs. A. Bensch, DG Trade, EC Commission, Brussels; Dr. B. Terracini, Professor, Scientific Adviser; Dr. P. Huré, Scientific Expert; Mr. B. Castleman, Scientific Adviser; Mrs. Mchanetzki, Ministry of Economy, Finance and Industry, France.

**Chairman**

11. Thank you very much. I would like to explain how the Panel intends to organize its work for today. I would like to thank the four experts for having agreed to serve as advisers on the Panel and





of my opinions and conclusions. Broadly speaking, I see the issues in a way which is very similar to that of my colleague, Dr. de Klerk. The three key issues as I see them are: firstly, is chrysotile carcinogenic for the lung and for the mesothelium? My answer to this is that the evidence is strongly in favour of the fact that it is, and that it is capable of inducing both lung cancer and mesothelioma at reasonably low levels of exposure; for example, low levels of exposure, such as occurred in the South Carolina asbestos textile workers in the studies carried out by Dr. Dement and his colleagues, led to a greater than two-fold increase in the standardized mortality ratio at quite low levels of exposure for white males, in the order of 2.7 to 6.8 fibre-year. And the additional information submitted in this case concerning the possible significance of amphiboles in the lung tissue of those workers does not, in my opinion, detract from the significance of that observation, and the reasons why are set out in my Supplementary Remarks to the Panel.

16. The second point, which I think is a crucial point, is whether or not the use of chrysotile can be controlled at all points of use. Again, I would be in close agreement with my colleague, Dr. de Klerk, that it cannot. My own series of mesotheliomas, amounting to in excess of 2,000 cases, indicates that by far the greatest number of mesotheliomas that I see occur – not in miners and millers nor in products manufacture – but they occur in those exposed to asbestos at the multiple points of end-use. In the Australian Mesothelioma Register, which represents a systematic compilation of all mesotheliomas found in Australia, there is good evidence that the greatest number of mesotheliomas that we see occurs among carpenters, builders' labourers, plumbers, plasterers, painters and all others involved in building construction in particular. In Australia, this group represents a very large workforce; it is usually employed by small business, or the workers are self-employed. In the past, it has not been possible to extend controlled use of asbestos to this group of workers, and to the best of my knowledge, this situation continues today, although the use of chrysotile in building construction materials in Australia was phased out in 1987 or 1989.

17. The third issue that I believe is of significance here, is whether alternative substitute materials for chrysotile are safer than chrysotile. Again from my survey of the literature, I would be in close agreement with my colleague Dr. de Klerk that the evidence available to me indicates that substitute fibres are – according to national and international health authorities – safer for end-use than the use of chrysotile. And these are, I believe, the three key issues for resolution by this Panel.

#### **Chairman**

18. Thank you. Dr. Infante, please.

#### **Dr. Infante**

19. Thank you for asking me to participate. First, I would like to state what it is that I feel that all of us experts agree upon. That is that chrysotile presents a high risk of cancer to society, to exposed individuals. It is unlikely to ever be controlled enough to use safely. Substitutes appear available, and there is no evidence that they are as harmful as chrysotile asbestos. Regarding some particular studies - I did express this in writing, I want to reiterate it - the Dement study which has been reviewed, analysed and critiqued, the study of chrysotile textile workers, shows one of the highest risks of lung cancers ever observed among any asbestos-exposed population on a fibre-per-fibre basis. The increase in the relative risk from this study is 2 to 3 per cent per fibre per c.c. year. There are two additional studies of chrysotile textile workers; the Rochdale chrysotile workers which shows a risk of 0.5 to 1.5 per cent. There is a risk assessment based on a study by McDonald et al. which shows a relative risk of about 1.25 per cent increase per fibre per c.c. year. There has been a lot of discussion about the McDonald study of miners and millers; this study shows a significant excess of lung cancer but the dose response is about 30 times lower than the 2 per cent relative risk from the Dement study and about 16 times lower, if one assumes that the relative risk is 1 per cent per fibre per c.c. year of exposure. I suspect, in this study, that there is a fair amount of misclassification of exposure. Because, when you have misclassification of exposure, you are going to dampen the dose response

and be biased towards a flat dose response curve. For mesothelioma, I think the recent analysis by Landrigan and Nicholson et al., which concludes that chrysotile is only one half to one quarter as potent for causing mesothelioma as crocidolite asbestos, I think that is a reasonable analysis. There may be certainly other reasonable analysis as well. But, even if chrysotile asbestos did not cause mesothelioma, which in my opinion it does, there is still enough risk from lung cancer alone, that there should be intervention to substitute for chrysotile asbestos. There is a recent paper that was sent out after we completed our initial reports from Case and Dufresne. It was stated that I might change my opinion regarding the Dement study after I had reviewed this study, so I want to comment on that. I would add that this is an unpublished study and that the authors are much more restrained in their interpretation of the study than is Canada's submission about this study. The authors state that they can't determine to what degree the findings of fibre content in the lungs examined are representative of the entire cohort; their lung tissue fibre analysis only represents what is retained in the lungs by the time of death and there is a tremendous difference here between the miners and the millers and the textile workers between the time from cessation of exposure to death. Therefore you would expect a lot more chrysotile clearance from the textile workers' lungs. Dr. Henderson has done an analysis based on assuming various half-lives of chrysotile fibres in the lungs which I think is a reasonable analysis, which indicates that there would be much more chrysotile in the lungs of the textile workers. But also on the basis of this new report, or furthermore, if the lung cancer in the Dement cohort study of textile workers was related to amphibole exposure, one would expect more than two mesotheliomas in this cohort. So I think that is striking also. Furthermore, Dr. Dement has done an analysis in response to this paper, which he has provided to me and which I would be happy to share with the Panel. What this study shows is that, regardless of when you analyse your data, - because Green had found that only one of 39 workers hired in the 1940s or later had significant amphiboles in their lungs - these were the chrysotile textile workers - only one of 39 that were hired after 1940 had significant amphiboles in their lungs, Dement did a new analysis where he looked at the entire group of 126 lung cancers in his study and he gets the same dose response whether he looks at total employment or employees who were first employed after 1940, or who were employed before 1940 or 1950. So what it shows is the same dose response accounting for different periods of employment. So I thought that was impressive.

20. Regarding controlled use, it is my opinion that it may be theoretically possible, but is highly unlikely that chrysotile can be controlled in commerce. My point from my written submission was, that while it may be possible, in the United States alone, we have had over 4,000 violations of our asbestos standard in the last three years. In the United States there are monetary penalties that go along with these violations and yet, if we have this large amount of non-compliance in the United States in the presence of monetary penalties, and also in some cases there can be criminal penalties, then what does this bode for other countries that might not have this stringent requirement or penalties. Canada's document was criticising, I believe, that I didn't understand their controlled use programme. It seems to me that from recent articles that I have seen in countries where Canada appears to, or is importing, its chrysotile asbestos, in Morocco, Brazil and India, recent reports just came out indicating that asbestos is not controlled according to its controlled use programme. Therefore, in my opinion, the programme has little credibility to me. My point is that if it can't be handled in the United States, I suspect that it is going to be even more difficult to control its use in other countries. Regarding substitutes, I feel that the substitutes do not present the cancer risk that chrysotile asbestos does. Three have been studied experimentally, two of the substitute fibres have been negative in animal cancer studies; fibreglass has been positive. I did not mention refractory ceramic fibres because the question was not specifically asked about refractory ceramic fibres. Refractory ceramic fibres are carcinogenic in experimental animals. I definitely think that there should be various serious concerns to humans exposed, but these fibres are limited to special high heat applications and I don't believe that these fibres would be substitutes for chrysotile in most current applications of chrysotile asbestos.

21. It was commented in the last submission by Canada that I had a different opinion about the carcinogenicity of fibreglass compared to asbestos than what I had published in 1994. Looking

further at data, I feel that there is not sufficient evidence in humans that fibreglass is carcinogenic, but I think that one should presume that these glass fibres are carcinogenic to humans; that doesn't mean that it is proven, but I think that there is enough evidence that we should be concerned about that. But I don't feel that they are as potent as chrysotile asbestos. As I indicated, I recently spoke with several workers who are employees of the fibreglass manufacturing facility that showed a two-fold risk of lung cancer. Those workers explained to me that there were other known human carcinogens to which they were exposed at that facility which had not been mentioned in the report, namely, they were exposed to asbestos and to crystalline silica, along with several others which I mentioned in my report. Because of that, I feel that one cannot look at that study in terms of the fibreglass/fibre count in relation to the elevated risk of lung cancer, there is confounding from other known carcinogens or highly suspected human carcinogens in that population that are not accounted for.

22. On page 49 of the Canadian response, it states that there are three studies in which cellulose exposures have been investigated but that I did not identify them. Cellulose has not been studied for carcinogenicity in experimental animals. What I had indicated was that there are three industries where there is cellulose exposure, namely the paper industry and this study in this industry does not indicate any elevated risk of lung cancer or mesothelioma. I didn't identify the literature, there is an entire IARC monograph on the paper industry. The same with wood dust. I didn't cite any particular specific studies of workers exposed to wood dust which contains cellulose. IARC has an entire monograph on the furniture manufacturing industry and a more recent monograph on wood dust. There is no indication of any excessive risk of lung cancer or mesothelioma. Cotton dust, I didn't cite any particular study but there is a tremendous literature on workers exposed to cotton dust. The Occupational Safety and Health Administration in the United States issued a new regulation for cotton dust a number of years ago, and cancer was never an issue that was raised as a health concern; it was byssinosis from workers exposed to cotton dust. Regarding the cotton dust exposure and the byssinosis, it was never proved whether it was the cotton fibres *per se* or the contaminants that were related to the byssinosis. In any event there is no indication of lung cancer or mesothelioma from cotton dust exposure. So while I didn't cite those, there is a tremendous literature on those.

23. Finally, I would conclude by saying that, once it is known that these fibres are carcinogenic, one should not need to demonstrate their carcinogenicity in ever sector where blue-collar workers come in contact. Once you have identified the hazard, it is not convincing to say a particular study does not show an excess, it is the exposure that we are concerned about. We already know that exposure to these fibres are dangerous. This is an industrial health problem of abating the hazard, not continuing to identify the hazard in new populations that have not heretofore been studied. There have been epidemiological studies, that is, not of controlled environments like the laboratory setting,

**Dr. Musk**

25. Thank you. I would like to echo my fellow panelists' gratitude for inviting me. My analysis and distillation of evidence from my own work and from the literature is that all forms of asbestos may cause disease. The main diseases being well known are: asbestosis, lung cancer, malignant

**Chairman**

28. Could I come back to that point later, and ask the European Communities whether they would wish to make any introductory comment.

**Mr. Christoforou (European Communities)**

29. Can I join you and my Canadian colleagues in thanking the four experts for indeed the hard

**Chairman**

33. I would just like to make the point that we are not here to put the experts on trial.

**Mr. Hankey (Canada)**

34. The experts are leading evidence which is obviously material to the question put to them. Mr. Infante has just referred to a study by Dr. Dement, which he has used to rebut points that we have made. I think it important that he file that paper here so that we have access to it and that if we see fit, we be given the opportunity to file paper over the coming weeks in response thereto. That would be normal.

**Chairman**

35. I think that it was made clear that we have at our disposal a limited amount of time for this expert phase of the Panel process. That phase essentially concludes at the end of today. I think that rather than delay our proceedings in any further discussion of a procedural nature, it would be very helpful if we could begin straightaway on the questions themselves. So I would invite Canada to begin. What I would suggest is that we can alternate questions between Canada and the EU. Canada, would you present your question on question 1 first, and then we can follow with the EU.

**Mr. Hankey (Canada)**

36. I do just want to signal to you at this time that we agree to proceed with this part of the process as you suggest. But on Thursday I will be raising what we consider to be serious procedural problems with the way the expert consultations have taken place. But let's not bother with that now.

37. This question is directed to all of the experts. A majority of you have identified construction workers as being the population at greatest risk. Who do you include in the definition of construction workers? Do you include, for example, skilled workers such as electricians and plumbers?

**Chairman**

38. The parties are free to ask their questions either to an individual expert or to the experts as a group and in cases such as this one, where questions are being asked to the experts as a group, we will leave it to the experts themselves as to which question they wish to respond. I would just like to give the floor briefly to Mr. Christoforou.

**Mr. Christoforou (European Communities)**

39. I really regret having to intervene, but I would suggest – Canada is free of course to ask and to term the question the way it wishes – but I would make a second plea to avoid words like the "majority" without knowing who of the four scientists had said what. I would request Canada to identify which of the scientists had said what, words like the "majority" or "most of you", it is our suggestion that they should be avoided. We need to know who said what instead of referring to the majority of the scientists. Thank you.

**Chairman**

40. Thank you. Take note of that, please.

**Mr. Hankey (Canada)**

41. Thank you, Mr. Christoforou. I could rephrase the question if it is helpful, either to say "some of you have identified construction workers etc. etc." And those of you who wish to respond may do so. I don't insist, I am not in a position to insist, that anyone responds who doesn't think the question pertinent.

**Chairman**

42. I pass the floor to whoever wants to respond to that question. Mr. Hankey, would you mind repeating the question?

**Mr. Hankey (Canada)**

43. Some of you have identified construction workers as being the population at greatest risk. I suppose I can address the question to those of you who have done so. Perhaps you haven't all done so and perhaps the majority of you haven't done so, and perhaps we don't count so well. Who do you include in the definition of "construction workers"? Do you, for example, include skilled workers, such as electricians and plumbers?

**Dr. de Klerk**

44. Speaking for myself, I was talking about people in the construction industry, so that would include electricians, plumbers, carpenters, ladders, boiler makers, anyone in any form of construction. It's basically the group of workers who form the largest part of people who come down with mesothelioma. And where regulations are going to be hardest to police.

**Chairman**

45. Dr. Henderson was going to make a point.

**Dr. Henderson**

46. My inclusion amongst construction workers would include a large and disparate workforce which includes both skilled and unskilled workers involved largely in building construction and building maintenance and so forth. If one looks at mesothelioma as an index tumour for asbestos exposure and you go to the attachment I gave to my first report of the professions or workers included in the Australian Mesothelioma Register, they do include, going down them alphabetically: people who carry out maintenance on asbestos dwellings, fences, they include builders, brickworkers, builders' labourers, carpenters, joiners, construction workers, civil engineer, demolition worker, electrical engineer, electrical fitter, electrical mechanic, electrician. Going further down the list, labourer, locksmiths, machine fitters, maintenance carpenters, maintenance electricians, maintenance fitters, mechanics (they're not involved in building construction, of course, they are a different group). They do include painters, plasterers, plumbers. Together I think it adds up to a fairly large and disparate workforce which is very poorly regulated in Australia.

**Chairman**

47. Thank you. Any expert wishes to add anything?

**Dr. Infante**

48. I would agree with that. It is both skilled and unskilled in the rubric of construction workers.



**Dr. Musk**

49. That would fit in with my ideas. We might argue whether construction and demolition aren't opposite processes, but there is so much overlap in the sort of tasks that people in the construction industry undertake, that we could probably include demolition with construction.

**Chairman**

50. May I invite any further comments or issues that parties might like to raise in connection with this question? No, in that case can we turn to the European Communities for their first question or comment.

**Mr. Christoforou (European Communities)**

51. This question is addressed to all the scientists, in particular, to Dr. Infante and Dr. Henderson. In your reply to question 1(e) of the Panel, where you are discussing occasional interventions on asbestos, (for example Dr. Infante states 'mesothelioma has been identified from these exposure situations because it is a marker cancer related to asbestos exposure'). We would appreciate it if you could expand on this, and whether you think there are data from the mesothelioma registers which support this, and what is the part of the population which is at most risk. And therefore the question of public health concern.

**Dr. Henderson**

52. Dealing with this group of workers, and in particular, the occasional workers, I think that it is fair to say that the risk of mesothelioma and of lung cancer will be related to the frequency and to the cumulative exposures that these individuals sustain, because professional workers, for example professional carpenters, will be working most consistently and regularly with asbestos-containing building materials. It is they who will sustain the highest cumulative exposures, and therefore suffer the greatest risk of both mesothelioma and lung cancer. For the occasional worker, the risks will be substantially less because the cumulative exposure will be less. But in my own series of mesotheliomas in Australia, I have a number of cases of individuals who simply dwelt in asbestos cement houses and who carried out maintenance and renovation on the houses. It so happens that most of those individuals would also have sustained exposure to the amphiboles. Given the relative potency differential between the amphiboles and chrysotile, I would expect the risks of the occasional worker with pure chrysotile cement materials to be substantially less than those exposed to mixed asbestos cement materials. However, I would also point out that in Australia there are individuals who style themselves as "home handymen" and they make a career of buying dilapidated houses, often asbestos cement houses, and they live in them for a year while carrying out extensive renovations and maintenance work. They then sell these houses a year later and because they have dwelt in the house for a year, the profit that they make is not subject to taxation. These individuals call themselves "home handymen". The houses they buy are often called "handyman specials", because they require maintenance and renovation. These individuals will move through a succession of houses at yearly intervals. Now, it so happens that if you look at their cumulative exposure, they may approach the types of cumulative exposure one would expect for a professional carpenter. So I would have to say that the risks would be related to the frequency and the duration of the exposure, and its intensity, and therefore to the total cumulative exposure.

**Chairman**

53. Dr. Infante, is there anything that you wish to add?

**Dr. Infante**

54. In these situations there is not good information about exposure but rather as the scenario type of exposures. It's this intermittent exposure that you really don't know how much fibre these  
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**Dr. Henderson**

59. That is a very difficult question to answer. I am afraid I cannot give a precise answer because many of the individuals will have sustained mixed exposures or they have sustained exposures for which we have no precise data as to fibre type. However, if you look amongst the Australian

fairly rare, so it is not very good to do a case-control study. So you end up with the case series. I can see your point, but at the same time, if you have got this number of cases with only this exposure, it has got to carry a fair amount of weight in terms of if you choose to stand next to somebody blowing out dust from their brake drums, if you see what I mean?

**Mr. Hankey (Canada)**

66. You say you attribute a fair bit of weight, to what? What conclusions would you draw from the study?

**Dr. de Klerk**

67. Well there are a lot more brake mechanics getting mesothelioma, I mean the rate in brake mechanics is a lot higher than the rate in other groups of the population. Therefore one would attribute a fair amount of weight to that study.

**Mr. Hankey (Canada)**

68. Are you aware that there have been four case controlled studies of garage mechanics, two in the United States. (McDonald and McDonald, Teta et al.), one in Canada (Teschke) and another in Germany (Woitowitz and Rödelsperger). They have all shown no increased risk of mesothelioma for garage and brake mechanics. Do you accept these data?

**Dr. de Klerk**

69. If those studies are there and that is what they show.

**Mr. Hankey (Canada)**

70. And what would you consider to be the more scientifically rigorous methodology and which would have in a court of law the greatest probative value: the register analysis that has been done by Dr. Henderson or these kinds of case control studies?

**Dr. de Klerk**

71. I think that you would have to look at them on an individual basis. The problem with case control studies is that it is very easy to do a bad case control study, where you have a sort of register in place that is sort of collecting data as fully as it possibly can, one might make the point that the register might be better. At the same time, in the case control study, there is a problem with sample size: I mean to show no increase in risk is not the same as showing that there is no risk. It is just showing that the study doesn't have sufficient power to detect an increase if it is there, and I make that point somewhere else in my document, the standard case control case is bedevilled by small sample size problems. I wouldn't like to generalize too far, there may be heterogeneity in the cases in the study, there may be different work practices in the different countries. It is just that certainly in Australia, there seems to be good evidence that the brake mechanics do have an increased risk of mesothelioma.

**Mr. Hankey (Canada)**

72. I don't think that you got the point of my question. I am not asking you to attack the method by which Dr. Henderson conducted his study, as related to the rigour of the four case control studies on garage mechanics to which I have referred. But rather I am asking you: *grosso modo*, as a form of analysis, as a form of enquiry, which is generally considered to be the more reliable in terms of producing hard results?

**Dr. de Klerk**

73. Well, the case control study.

**Mr. Hankey (Canada)**

74. Yes, all right, good. Now, Dr. Henderson, are you aware that a proportional mortality study of mesotheliomas in England and Wales covering the period 1979-1980 and 1982 to 1990 showed no evidence, and I repeat no evidence, of an increased risk of a mesothelioma in motor vehicles? That is the study by Hodgson et al.

**Dr. Henderson**

75. Yes, I am aware of the studies that have shown negative findings with no detectable increase in risk. I would simply amplify the comments that Dr. de Klerk has already made. (And I don't regard myself as an expert epidemiologist). I would simply say that if you are looking at a small effect in a small population, you may not detect an effect. When you deal with national populations, yes, the quality of the information and the controls may diminish, but you are not looking at the same issue in many respects, and we are not looking here – when we look at the Australian incidence of mesothelioma among automobile mechanics – to provide proof in a court room 7 Tc 0.-12.75 TD -0.1858 p say that c

**Dr. Henderson**

77. Well, you are going into some highly specific details, amongst thousands and thousands of pages of information that I have tried to digest in preparation for this meeting. But yes, I agree with the general conclusions, and the simple fact that I would draw attention to is that with so many studies on asbestos-related diseases, one is dealing with contradictory sets of data. The question arises as to what weightings one places upon one set of data as opposed to another and what significance one gives to a particular set of data when trying to set national occupational health and safety policy.

**[Coffee break]**

**Chairman**

78. ... **[Not recorded]** Dr. Infante said that he wished to intervene on the previous question we were discussing.

**Dr. Infante**

79. My comment relates to which is a better study, a case control study or using the mesothelioma registry in Australia to estimate the risk of mesothelioma. In a case control study you are sampling your controls, hoping that they represent the universe. The extent to which they do or not, you don't know, but you use certain matching criteria and hope that they do. The extent to which they do, may affect your findings. On the other hand, looking at the mesothelioma registry for the entire country of Australia, you don't need to sample the universe, because the denominator is already the universe. So you don't have any sampling error that you have to be concerned about. Then Dr. Henderson estimated then what the incidence of mesothelioma would be in the general population of Australia, based on the cases that were reported to the registry. In my opinion, he overestimated the denominator, by making certain assumptions. But nevertheless, he had quite a high incidence of mesothelioma per million population from his analysis. So, in my opinion, in this particular case, I feel that the registry is a very good source and in fact may be superior to using a case control study where you are trying to estimate what the incidence is and the relative risk compared to the universe which you are presuming from your controls. And also it is like we are talking about asbestos exposure in mesothelioma here, it's not that we are looking for some new disease related to asbestos. It is a disease that has already been indicated as being associated with asbestos. So, I feel that using the registry, where we have the entire data based on the entire country, may in fact be preferable to a case control study where you are trying to sample or estimate what the frequency is and the comparison population.

**Chairman**

80. Thank you. Canada wishes to further comment on this question?

**Mr. Hankey (Canada)**

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without any preconceived idea of an association. Is not that the object of a properly designed case control study? And secondly, is it not true that in a register study, of which I have done many, the issue of asking information about occupations is almost certainly biased by concepts of what you believe or what the people believe to be the truth? Is not in Australia, the biggest producer at one time of crocidolite, liable to get questions which suggest that lots of occupations may be due to mesothelioma? Is not the object of an objective, scientific epidemiological study to remove sources of sampling bias and information bias?

**Dr. Infante**

83. Yes, when you are sampling, you are trying to eliminate the bias in your study design and the extent to which you do that depends on the success of selecting your controls. If you do a study and you are looking at mesothelioma in North America then you are really trying to sample, as you said, the individuals that match closely the cases, and the cases are coming from the entire North America. So in my opinion, you are still trying to estimate the universe in that particular type of a case control study. In terms of bias from a registry source, you can have bias from a case control study, you can have bias from the registry. It depends on how the questions are asked.

**Chairman**

84. Canada?

**Mr. Hankey (Canada)**

85. I have one final point. It is to Dr. Henderson and Dr. Infante and it is simply this. If we have a registry s Tj 84 0 TD -rf shaid,iculas ituct assoctson and Dr.

don't pretend that the statistics are anything more than that, but to me they are an indicator in terms of approaching a problem at a national occupational health and safety level of indicating a possible effect and therefore the need for a cautious and prudent approach.

**Mr. Hankey (Canada)**

87. Sir, it sounds to me like you are saying that your study, the probative value of your study is your intuition as to what the percentage of garage mechanics is in Australia because the kind of calculations you have just suggested do not strike me as the kind of scientific rigour that would be required in order to produce a study which would have probative value in any court of law.

88. But I have another question, Dr. Henderson, well this is for Dr. Henderson, yes, again. Are you aware that in about 1990, Dr. Woitowitz and Dr. 8 8 .



Thank you. Before that, we invite Mr. Christoforou to take the floor who has been seeking to make a comment for some time.

**Mr. Christoforou (European Communities)**

91. Thank you Mr. Chairman. I would like to ask a question on this because I'm afraid that the way we proceed – it is up to you Mr. Chairman - but it will take us quite the entire day probably. We will not finish, and on this point we run the risk of trying to see an individual tree and would lose the entire picture of the entire wood in this case. So I would like to come back to this question with one and then I still have another question to ask, as I pointed out.

**Chairman**

92. I am sorry I didn't quite understand what precisely you wanted to come back on.

**Mr. Christoforou (European Communities)**

93. I want to ask a subquestion on this point and then ask the other question I have. I announced two questions on this first point.

**Chairman**

94. OK. I did invite Mr. Hankey to make a final comment on this particular set of issues. Please go ahead.

**Mr. Hankey (Canada)**

95. My question is: taking account of the definition of construction workers, of those categories of workers that you each identified as construction workers in response to my first question, over a one-year period, is a construction worker at greater risk from exposure to low-density asbestos products in place, or from exposure to products at issue in this case, that is, high-density chrysotile-cement or friction products? That question is to each of the experts, thank you.

**Chairman**

96. Would you mind repeating the question, I think the experts are not clear exactly what the question was?

**Mr. Hankey (Canada)**

97. Of course, Sir. I said that, taking into account the definitions you gave earlier, or rather the list of workers, the universe of workers, that you consider to fall under the general rubric "construction workers", over a one-year period, is a construction worker at greater risk from exposure to low-density in place asbestos products or from exposure to the products at issue in this case, that is to say high-density chrysotile-cement or friction products?

**Dr. Henderson**

98. The question is a little bit like asking how long is a piece of string. It depends on so many different variables that the answer will vary according to those variables. It depends on what the

higher risk for both mesothelioma and lung cancer. When one is dealing with a high-density product such as asbestos-cement, it is very difficult to make direct comparisons. But if you look at individuals cutting asbestos-cement building products with a power saw for example, that can generate very high airborne fibre concentrations and again the effect in terms of mesothelioma and lung cancer induction will depend on the levels, the frequency and duration of the exposures and therefore the total cumulative dose. But even if one takes into account the fact that, or one concludes that, the worker dealing consistently with friable insulation materials is at greater risk, the point that I would make is

**Dr. Henderson**

101. Well, I would be in broad agreement. I think the argument would be made that most of the mesotheliomas – and some would argue that the lung cancers that we see – are not so much due to the chrysotile, but due to co-existent amphiboles in place and encountered by building construction workers. Certainly most of the mesotheliomas, but not all, that I see occur among workers who have had a history of mixed exposure to asbestos cement building products that contained chrysotile and varying amounts of amosite and crocidolite, or both at different times. However, as I have indicated, I have seen mesotheliomas among brake mechanics who only had exposure to chrysotile. So I think that this becomes an argument, as to whether one says that the chrysotile has no effect whatsoever – and that all the effects we are seeing are due to the amphibole content – or that one is looking at a mixed response to amphiboles plus the biological effects of chrysotile. I suppose that one of the concerns I have about the continued use of chrysotile, particularly in situations where it cannot be controlled, is that many of the workers who will be handling that type of material may have a pre-existent amphibole and chrysotile content in their lung tissue and we have few, if any data, on the additive or multiplicative superimpositional effect of extra chrysotile exposure on top of a pre-existing amphibole burden. Although I can't quantify the effect, one suspects that it would not be a negative effect and that it would contribute both to mesothelioma and lung cancer incidence. But perhaps the others might prefer to elaborate upon that.

**Dr. Infante**

102. Yes, I think if I understood your question, how I interpreted your question was, that if you have an individual who is diagnosed with mesothelioma and they have been exposed to amphibole and chrysotile, can you dismiss the component of the chrysotile exposure as contributing to that mesothelioma? My answer to that question is no. We know that chrysotile is capable of inducing mesothelioma, so just because individuals have mixed exposure to amphiboles and to chrysotile, you can't exclude that individual's chrysotile exposure as contributing to the development of mesothelioma.

**Chairman**

103. Would either Dr. de Klerk or Dr. Musk like to add anything to what has just been said? Canada, please.

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**Mr. Hankey (Canada)**

106. Could I ask Professor McDonald to comment on that please?

**Dr. C. McDonald (Canada)**

107. Dr. Infante, I haven't got the paper of Hughes in front of me, but I am very familiar with it, and

**Mr. Hankey (Canada)**

114. I meant to say lung cancer.

**Dr. Infante**

115. I can't recall the particulars of that study right now, but I do recall table 10, like I said, which showed a similar dose response. If your question to me is that, well, if they then removed the short-term workers, were the results different? I don't recall the data that well to answer that question at the moment. But the authors in the study pointed out that the dose response was similar for the two groups as I had mentioned earlier. And besides if there is some difference because of short-term

**Dr. Musk**

120. I'm afraid I'd need those studies in front of me to address that. I'm not familiar enough with them, although I have read them.

**Dr. de Klerk**

121. I think, because we are looking at asbestos-cement and, therefore, because Canada is saying that most of the products that they want to export to the European Union, presumably are used in asbestos cement, that therefore one should ignore all the other evidence about chrysotile apart from that from asbestos-cement workers, I think that it is a bit of a ..., I can't think of the word, but anyway I think you know what I mean.

**Mr. Hankey (Canada)**

122. I don't know what you mean. I would be grateful if you would elaborate on that.

**Dr. de Klerk**

123. Well it's a ..., I can't think of the word, I will explain what I mean. It's, you are sort of ignoring a lot of the fact that chrysotile will be completely different in its actions and effects; because it's in a cement product, ignores the facts about the fibre clouds produced by asbestos-cement products and the evidence from other forms of use of chrysotile. You know, even when you add these four

the Ohlson study is not as high as three-fold for lung cancer. So I think that you have to look at not only the SMRs, but the confidence intervals around these studies.

**Chairman**

128. Professor Henderson, would you like to add anything on this point?

**Dr. Henderson**

129. I couldn't add anything unless I have the particular reference in front of me. It is part of a large volume of material and I can't remember the precise details. In general, though, I would point out that certainly in the manufacture of high-density chrysotile products, at least in Australia, where it is almost a totally closed operation and the airborne fibre concentrations are extremely low with a predictably low risk for that particular cohort. My major concerns about the use of these products is in the end-users who manipulate, saw, drill, rasp, grind or otherwise handle these materials and that one knows that some of the fibres released from these operations will produce elevated airborne concentrations of fibres which are in the dimension range known to be associated with carcinogenicity, even though in some circumstances it might be a relatively small proportion of the total fibres released.

**Chairman**

130. Thank you. Canada, please.

**Mr. Hankey (Canada)**

131. I think we have really gotten to the heart of the matter, because it is incontestable that in these four studies - which are the only cohort studies of persons working with chrysotile cement, the only control studies - they all show together, collectively, that there are fewer deaths from lung cancer than expected in the general population. I don't think those data, Sir, can be swept under the carpet. Dr. de Klerk, I think really does identify what is the issue here. He says that we should look at data for other industries and apply it to the cement industry or the friction industry, because asbestos is a known carcinogen. So it seems to me that Dr. de Klerk proposes that we compare apples with oranges. Now, in my business, Sir, as a lawyer, when we deal with evidence it is always a requirement that we compare like to like. There are many, many rules of jurisprudence that require that. So I would like to ask, now, this question generally because it is on the very same point to each of the experts who wish to take it up: given that each chrysotile industry sector has its own particularities, that is to say, wet or dry processes, open door and closed processes, different fibre lengths and the possibility for oil treatments, doesn't it make sense to base risk assessments as much as possible in one given sector on the particular experiences of the workers in that sector and not in workers in a completely different sector?

**Dr. de Klerk**

132.

**Chairman**

133. Does any other expert wish to comment?

**Dr. Henderson**

134. Really I can't elaborate beyond what my colleague, Dr. de Klerk, has said. One of the problems we are dealing with trying to assess the risks to different groups is that we're faced sometimes with conflicting or contradictory data for areas for which we have no direct observational data. Therefore we need to proceed in an area where there is some uncertainty as to the exact risks for a particular population. This is one of the reasons why one tends to use extrapolation models as Dr. de Klerk has said, and also use other investigations. For example, the South Carolina chrysotile-textile workers [are used] almost as a worst-case scenario in order to formulate prudent approaches to population safety.

**Mr. Hankey (Canada)**

135. I'm still following up on this question. This question I could direct to both Dr. Henderson and Dr. Infante because Dr. Infante is obviously very keen on Charleston, as am I, it is a wonderful city. My question is, if indeed there are no applicable studies to the use of asbestos cement in construction, then evidently we have to find a surrogate study, something that is closest to it and it seems to us, and that is why we put the question, that the other sector where asbestos cement is being handled and being used, that is to say in its manufacture, that that would constitute the best surrogate. The results of those studies incontestably demonstrate that there is no increased risk of mesothelioma or lung cancer, there is no dispute about that. So instead, the surrogate that Dr. Infante takes us to, and I gather Dr. Henderson, is the textile industry in Charleston. Now, I mb980.18 wter(gao25 Tf -0.42s2nh Tf 0 5 Tw



production only and lung cancer. In fact the potency estimate is 0.7 per cent which is just a little bit less than the 1 per cent estimate per fibre per c. c. year which has been identified in two other studies of workers exposed to chrysotile textiles and a little bit lower than the estimate from the Dement study. But there is really not a great deal of difference in my opinion, between 0.7, 1 or 2 per cent. So in fact you do have dose response and when you demonstrate dose response in an epidemiological study, that is a very powerful tool. So there is evidence, even though some of the other studies don't show an excess of risk, they didn't find it for whatever reason, but I would submit that the Hughes study does demonstrate an excess and does demonstrate dose response. In terms of the abuse of the Dement study to estimate risk, it's the study that has been the most thoroughly evaluated, the exposure

burden analysis was carried out. But there is another factor which needs to be taken in to account, is that it was argued that the Charleston workers had [commercial amphiboles, crocidolite and amosite, in their lung tissues, but if one looks at the total amphibole content]... **[END OF TAPE]** ... that is

figures which are radically at odds with all the other studies and I am still ... knowing what I do know about the conditions in that plant which are well documented. By the way, it is not factually correct to say that it is not known whether oil was used; oil was used and that is recorded in the studies and used frequently and used consistently, so we know that oil was used and we know that oil is a carcinogenic product. It seems to me that one cannot at all exclude that as a valid hypothesis for the difference. Even apart from the oil, how and why would you justify using that textile mill, where conditions were so different to those in the chrysotile-cement industry, a plant that was clearly negligently controlled by the South Carolina authorities, why would you use such a surrogate for the

have cases of some of the studies that have been cited. They are usually there in the material somewhere, but perhaps sometimes a page reference would be helpful to enable the experts to respond more quickly. We will reconvene at 3 p.m. Thank you very much.

**[Lunch break]**

**17 January 2000, p.m.**

**Chairman**

148. We were part way through the discussion of one question. I just checked with Mr. Hankey as to how far through the list of those questions relating to the first four questions submitted by the Panel Canada was and I understand that they've made very good progress through them. So that being the case, I think we will continue on with this current question where there may be one or two comments still to be heard, then proceed on through the remaining one or two questions concerning the first broad heading of chrysotile asbestos itself. That would then give us adequate time to work through controlled use and the question of substitute fibres. I would really express the hope that by 3.30 we should be beginning our discussion of controlled use. If that is acceptable, we now open the floor. We were in the midst of a discussion, there was a point that had been made by Mr. Christoforou which had not yet been responded to. I think Canada also had one or two additional elements that they wanted to mention. So unless the experts feel that they need to add any points to the responses they have given so far, I could pass the floor back to Canada if you were following up on the question currently under discussion. Then we can ask the experts to respond to Mr. Christoforou's point.

**Mr. Hankey (Canada)**

149. Thank you Chairman. Our follow-up just has to do with this issue that in the absence of much direct data on the use of chrysotile-cement products in the construction industry, what would constitute a good paradigm or surrogate among the various studies that do exist. We know that there are close to sixty studies about the use of chrysotile asbestos and we have had a lot of reference to the Charleston study: Charleston is wonderful for the jazz festival but I am not so sure it is very relevant for the issue before the tribunal. So Dr. McDonald would address the issue of what he thinks might be a more appropriate paradigm or surrogate to examine the issue of risk exposures in the use of chrysotile-cement. Thank you, Dr. McDonald.

**Dr. McDonald (Canada)**

of chrysotile exposure. Now the issue of exposure levels has been questioned, if you like, by Dr. Infante who said that the methods used in the Quebec cohort were different from those in Charleston. I would like to point out that it is not so. We also estimated exposures individually in relation to fibre conversion and in fact published a detailed report in 1980, showing that the risk estimate based on individual estimations by fibre gave us exactly the same estimate risk as using the average. I can give the reference for that: it was published in an international meeting in Lyon by the IARC and I am sure Dr. Infante is familiar with it. I hope that that would reassure him that there is no reason to think that the exposure estimates in Quebec were any better or any worse, shall I say, than in Charleston. In fact, they were based on a very much larger amount of data, a very much larger, with parallel counts by fibre and dust, as in Charleston. There was no difference. So we are left with the fact that Charleston is an anomaly. Now I don't want to go into the Quebec result in detail but we

**Chairman**

154. Thank you. Perhaps we should now pass to the question or element of question which Mr. Christoforou asked us shortly before we concluded. I think it might be helpful if we asked Mr. Christoforou to repeat the question so that the experts can respond. Thank you.

**Mr. Christoforou (European Communities)**

155. Thank you, Mr. Chairman. What I said was, following up on what Canada was saying about high density chrysotile-containing cement products and I was confining the argument about the manufacture of such products - and the argument was whether there was any evidence that these may have effect and what was the level, whether there were any worries about the level of exposure and the consequent asbestos-related diseases. I said we want to somehow reposition this argument and request Dr. Infante from his experience and also Professor Henderson: given the fact that even Canada does not dispute that all forms of chrysotile have been classified by international agencies, like the International Agency for Research on Cancer. There is a proven human carcinogen - I don't think anyone in this room would dispute it. And given the fact that the four scientists have defined very broadly the population most at risk to include both skilled and non-skilled workers, not only those dealing in the manufacture of cement, high-density cement and products containing asbestos. The question was then addressed to the experts was from the regulatory point of view, and Dr. Infante has such experience, is it really reasonable to believe that a country like France, which has been importing for the last fifty years, more than 95 per cent of chrysotile asbestos, and we see so many cases of asbestos-related diseases, is it really reasonable to attribute these cases to chrysotile, is it reasonable to confine the argument to cement products, which anyhow Canada does not export - Canada exports asbestos as a product.

**Chairman**

156. Thank you. I pass the floor to the experts. Anyone who may wish to respond?

**Mr. Christoforou (European Communities)**

157. Mr. Chairman, if you wish, because there is an element of controlled use here which can  
Canada exports not to IARC Agency because the chrysotile is not a carcinogen. I have been told that many

**Dr. Infante**

159. Let me see if I understand the question. Is the question: is it possible to control exposure to chrysotile in the construction sector of industry, outside of, talking about manufacturing? Is that essentially the question?

**Mr. Christoforou (European Communities)**

160. Yes, yes. I can give you an exact reference. It is on page 19 of your replies<sup>2</sup> where you talk about pre-sized ... and the need to modify these products and whether it is realistic to argue, as Canada does, that these high-density cement products will never be changed so that the risk will be, as Canada argues, in this type of situation very low levels of exposure.

**Dr. Infante**

161. It's my opinion, that I stated here, that I don't think you can have chrysotile asbestos cement products in commerce without presenting risks to individuals who may need to manipulate those products. Even if they are pre-sized, they periodically have to be cut, those that are in place sometimes have to be cut into to get into the contents inside pipes that are carrying whatever they happen to be carrying. For example, I know, in the United States, if you take chrysotile-cement to a dump, you are charged by the dump for the volume that you take to that dump site. So, for example, if you were to take a large chrysotile pipe to the dump site, you are charged for the entire volume. So it's beneficial to the construction worker to chop the cement up into pieces which then adds to the fibre exposure because, one, it's easier to remove it in pieces and two, it's cheaper when you deliver it to the dump site. I don't know what policies are in other countries or how they do business but that's how it is in the United States and that creates exposure. I feel that, and I think I've said, if you cannot control exposure in the occupational setting, in the United States particularly where even in manufacturing you can't control it, how are you going to control it in the construction sector? There are just too many variables that you can't control. People don't get educated well enough, people don't wear the appropriate respirators, there just are not programmes that can extend that far in my opinion to protect those workers. Even in the manufacturing sector, just this past October, we fined an asbestos brake manufacturer \$125,000 for being over the permissible exposure limit, for not providing respirators, for doing dry sweeping. That's in the United States where we've had an asbestos standard in place for a number of years. So, my point is that it may be theoretically possible but it's not practical to think that you can control exposure to asbestos even in the example I gave in manufacturing and it's certainly less practical to begin to control it in construction.

**Chairman**

162. Thank you. We appear to have made a seamless transition to controlled use at the moment. I invite new responses by Canada on that.

**Mr. Hankey (Canada)**

163. Before you get too excited about controlled use, I'd like to bring us back to the question ... There was a premise in Dr. Henderson's answer which I think needs to be examined. He said "even if we can't control exposure to asbestos in the manufacturing industry ... ". But Sir, the only evidence you've cited or any of the experts here or the European Communities have cited that indicates maybe we can't control it in the manufacturing sector, if I'm not mistaken, relates to textiles. As we have demonstrated, or at least argued I think quite coherently, this is an entirely different sector and one in which asbestos is not used and has not been used for many years in the European Union, certainly not in France. We have data relating to some fifty studies of the use of asbestos in the manufacturing of

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<sup>2</sup>See Part V.C.2 of this report, answer to Question 5(c).

cement and friction products. We know of no instance that indicates that, in these current manufacturing facilities, there are levels of exposure, cumulative levels of exposure, to asbestos that cause danger to human health. If you or your colleagues or the European Union can put evidence on the table that indicates otherwise, I'd be happy to see it but it seems to me that the premise you base



exposure. Well, I don't think anyone can answer the question to that. Canada is arguing controlled use and my point is that that's something to aim for, but because you aim for, or have a policy, doesn't mean that it gets implemented. I'm giving that as one example.

**Chairman**

171. I'll just interrupt you for a moment. As we're taking an *ad verbatim* transcript here, it's probably better if we go through the Chair so that I can then announce clearly who is speaking each time. So I give the floor to Mr. Hankey.

**Mr. Hankey (Canada)**

172. Thank you Sir. Insofar as the risks of exposures in the friction products industry, I cited you considerable data earlier which you did not contest. These data indicate no excess risk of lung cancer or mesothelioma to workers in the friction manufacture industry as compared to the general population. Speaking of, for example, Berry and Newhouse, McDonald, Teta, Teschke, ....

**Dr. Infante**

173. Can I respond? I thought that our discussion earlier had to do with asbestos-cement production, not friction products.

**Mr. Hankey (Canada)**

174. Am I mistaken? Did you not raise the issue of exposure levels in a facility that was manufacturing friction products. Am I mistaken?

**Dr. Infante**

175. Just now I did, yes. But earlier you said I didn't challenge something you had on friction products and my point is I was responding earlier to your comments on asbestos-cement production and that's why I cited the Hughes study. That's a study in asbestos-cement production. I wasn't

~~Mr. Hankey (Canada)~~ products earlier. I just now gave that as an example where an inspection was products on asbe

**Dr. Infante**

178. If I look at the document 203, on page 109 and table 23, they list several studies on friction materials production. The study overall by Newhouse and Sullivan does not show any excess like the SMR is 93, the study by McDonald et al. 94, (we're talking lung cancer now), shows a statistically significant excess. Then there are mixed products in friction materials, several of those, in fact all of them, show a significant excess of lung cancer. Granted that these are mixed products, but nevertheless they show an excess and you can't totally discount, in my opinion, the chrysotile contribution. The study by McDonald et al. in 1984 shows a significant excess in lung cancer and the majority of that excess, not all, was in short-term workers. That's noteworthy in that study. So you say, well what does that relate to? I think you have to know something about the short-term workers

**Dr. Henderson**

182. In relation to my colleague, Dr. de Klerk's, observations, I would have to agree with him. I was struck in Professor McDonald's comments that he pointed to the consistency of the high lung cancer risk among textile cohorts. He also indicated that the explanation for this difference between the textile workers and other groups of workers still awaits elucidation. We have no clear explanation for this difference. In the absence of something which we cannot explain and therefore take measures to control, prudence should lead us to take the position of maximal caution because we don't know that the extremely low risk of lung cancer found in the Quebec chrysotile miners and millers will be translated across other cohorts. In this respect, it's what I said in one of my earlier reports that when in doubt, or there are uncertainties or lack of observational data in comparison with cohorts, one adopts a principle of "first do no harm" or when in doubt play it safe for the setting of national occupational health policy. I was also heartened to hear Professor McDonald basically say that there is a modest risk of lung cancer at low levels, that he did endorse the linear relationship model and he did state that the explanation for these differences is not clearly known. Because of these uncertainties concerning risk, I would adopt the same policy as Dr. de Klerk and argue that one takes a conservative scenario in order to avoid a risk of harm – here we're talking about cancers with close to a 100 per cent mortality rate – for the benefits of the average population.

**Chairman**

183. Thank you. Dr. Infante wanted to come back on a point.

**Dr. Infante**

184. I wanted to comment on what Dr. McDonald had said earlier. I think his point was that why would one rely on DementpsRint wa4n9dyere are



**Dr. de Klerk**

193. I thought that in that paper the levels went up to as high as a 100 and 120, as I recall, and not 10. The averages are based on specific jobs and if you are getting levels of a 120 next to somebody cutting an asbestos sheet, it depends on the structure of your job how much you would get over a week and over a year, it just happened that the average was over that particular job. There would be other jobs where you would be doing that all day long, I would have thought.

**Chairman**

194. Canada please, Mr. Hankey.

**Mr. Hankey (Canada)**

195. Perhaps I'm in error but I have the impression that, generally speaking, in the construction industry exposures would tend to be intermittent and therefore it was the accumulative factor of peak exposures which was the relevant measure of what would constitute risk. Perhaps I'm not right about that.

**Dr. de Klerk**

196. If you're putting up asbestos-cement fences, you would be exposed to that kind of level all the time.

**Mr. Hankey (Canada)**

197. If you're putting up asbestos-cement fences as a sort of a full-time occupation, wouldn't that be a little like working in a nuclear field? If indeed you understand it to be a highly dangerous job, wouldn't it be the sort of job in which presumably controlled-use should, ought to be, I would hope, is enforced and properly administered.

**Dr. de Klerk**

198. Yes, you would hope so in theory, but it's the kind of thing that doesn't happen in practice and that's I think one of the crucial issues: there's been asbestos regulations in place for over a hundred years and there is ample evidence that in very few places have those regulations ever been adhered to by the people using it.

**Chairman**

199. Any additional comments from the experts? Professor Henderson.

**Dr. Henderson**

200. Again I noticed the estimate of the peak airborne fibre concentration cited from the Rödelsperger paper and again my recollection was that the peak concentrations were up to 100 fibres per millilitre of air, so it was a stated underestimate. Yes, one would hope that the use of these products in the building construction industry, in particular [could be "controlled" by best work practices or, alternatively, the use of chrysotile restricted to a few special applications, analogous to nuclear fuels, but even in this latter situation] ... [END OF TAPE] ... a recent episode in Tokaimura, If you're .8727 TwT\* -0.1468nd again m -0r777 wyea undiy, t0.5 0.bledwe148ngs doesn't ication589by best02-12.75 .

high and the risks of mesotheliomas were high, was a relatively small workforce - the greatest number of mesotheliomas that I see comes from carpenters who give a history that day in and day out they cut asbestos-cement building products with handsaws, power saws, they used power sanders, they used angle grinders, electric drills and the like. We know that all of those operations can produce substantial elevations of the airborne fibre concentrations. If we are going to use mesothelioma as an index of exposure, the fact that we have such a large number of mesotheliomas among carpenters and building construction workers indicates that exposure did occur. Now, certainly many of those workers, perhaps the majority of them, also sustained exposure to the amphiboles. But here I'm using mesothelioma simply as an index to a marker for the fact that significant exposure did occur. The simple fact is that, among the many, many cases of mesothelioma that I see, a consistent theme amongst the workers is that they were not told by the employers that the materials they were dealing with were dangerous, there were never any airborne fibre concentrations measured in their working environment, only late in history were they provided with face masks, usually in the form of a surgical paper mask or a plastic mask, and we know that even more substantial respiratory protections are sometimes ineffective. So that, from my perspective in Australia, historically, we have never seen controlled use of asbestos and the very fact that no measurements or estimates of the risk were carried out indicates that controlled use has not been in place historically in Australia and so far as I am aware, it still isn't. In fact, it was dealt with by phasing out chrysotile from asbestos-cement building products in 1987 or 1989 so that they are no longer used in this particular application. In this respect I'd have to harp back to the WHO document Environmental Health Criteria 203, which indicated that construction workers pose particular concerns because of the large and diverse nature of the workforce so that it is very difficult to disseminate information to all the individuals concerned in these types of operation. That document indicated that chrysotile use in that situation is not recommended.

**Chairman**

201. Thank you. Dr. Musk wanted to comment.

**Dr. Musk**

202. I'd just like to reinforce that. We've been arguing about which is the best sort of model of exposure in industry where it has been measured what the exposures are. But in the construction industry it hasn't been measured and can't be measured regularly, so it isn't really controllable.

**Chairman**

203. Thank you. I give the floor now to the European Communities.

**Mr. Christoforou (European Communities)**

204. Thank you Mr. Chairman. I would request the four experts, if they can take a minute, to have a look at page 28 and page 29 of Canada's comments of 13 December. Page 28 please.<sup>3</sup> This is a document dated December 13<sup>th</sup> called "Canada's Comments on the Experts' Responses to the Questions from the Panel".

**Mr. Christoforou (European Communities)**

205. Page 28, and especially paragraph 6, where there are four bullet points which go over to page 29, where Canada describes what is in its view the so-called controlled use. Canada, I would like to remind you in case you have not read all the documentation, has been changing position constantly since we started this dispute about what is controlled use and progressively moves and tries

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<sup>3</sup> See Section V. D. 1, Canada's comments to Question 5 (a).

to restrict more and more what in its view is controlled use it has in mind. Now, I would like to request you to read these four bullet points and would appreciate if you could tell me if this type of situation described here, that is: to distribute products only to companies licensed to purchase these products; those companies must have workers trained and licensed to install products and must be in compliance with regulations; approved users shall not resell to third parties and any unused material must be returned to the manufacturer; to provide a list of users of products to the responsible government agency; to provide products cut to specification at established centres equipped to cut the products to size and where persons cutting the products are trained and are licensed to work with asbestos; and, fourth point, to police the downstream users in cooperation with the government; the product manufacturer visits, monitors and reports on the performance of the downstream users at regular intervals. There are penalties for failing to provide this product stewardship. The question is, from your own experience in dealing with these questions in your profession, do you think this is a feasible and realistic scenario taking into account the type of population exposed as you have defined it previously? Thank you.

### **Chairman**

206. Thank you. Let's give the experts a moment to decide who might want to respond first on that point or whether you want to take up aspects of it, as it's quite a broad issue, individually. Dr. Infante.

### **Dr. Infante**

207. I feel that this stewardship programme, when I read this, I feel that it's not a reality; it's a possibility but it's unlikely and definitely not likely to occur in construction. With regard to point 6 about controlled use,<sup>4</sup> that "this permit will be withdrawn if the company does not meet the following commitments", what went through my mind when I read that was: withdrawn by whom? Who enforces this? The first bullet point about "those companies must have workers trained and licensed to install the product", well who oversees that training? It's not clear to me who would do that in countries that would be working with the asbestos? And bullet point 3: "to provide products cut to specification". I think that's good to do that but then there are always adjustments that have to be made, so even though products may be cut to specification, there are places where you have to trim or the pipe or something is too long and you have to make some adjustments, and the concern is when those adjustments are made, that proper precautions aren't taken. Then, in the last bullet there are penalties for failing to provide this product's stewardship. As I read this, I wondered what are these penalties and how many have been issued to date. This, to me, seems good in theory but it doesn't seem real to me. Then when I just recently read an article about asbestos, chrysotile-asbestos exposure in Morocco which imports Canadian chrysotile and I see these photographs in this article just published this year – I have a copy of the article – and it shows that asbestos is just all over the place. So I'm wondering if the Canadian Government, if it has this partnership for a sustainable development, why are there countries like Morocco, Brazil and India that seem not to be following what's required by this stewardship and the controlled use?

### **Chairman**

208. Thank you. I think perhaps any further comments from the experts before we get into discussion on this item. Dr. Musk, please.

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<sup>4</sup>See Section V.D.1 of this Report, Canada's comments to Question 5(a).

**Dr. Musk**

209. This sort of regulation would require a new system for enforcement which hasn't previously existed anywhere that I know of. Secondly, it doesn't take into account people working with products that are already installed, modifying and installing pipes, electricians, plumbers and the like. So it certainly wouldn't cover all the opportunities for exposure.

**Chairman**

210. Professor Henderson, please.

**Dr. Henderson**

211. I'd have to agree with my two Panel colleagues that, as I've indicated, so far as I'm aware, controlled use for the stewardship-type of arrangement has never been used in Australia in relation to asbestos products of any type. As I've also indicated we don't really have detailed dust measurements in almost all workplaces including asbestos manufacture; or where they have been done, their count seems to be artificially low in comparison to the fibre count seen in the lung tissue of the workers. So





part of the asbestos regulations, certainly in force in Australia, at say, for example, the Wittenoom mine and mill and they weren't really of any help at all in preventing disease occurring from there. There was risk assessment in the sense that people knew that heavy exposures caused asbestosis but those levels weren't kept. There was information provided on the notice board that the mine was a registered mine, there were attempts made to reduce the dust but they didn't reduce it, they just spread it around; people were encouraged to use face masks but in the heat they couldn't wear them; the mine had a license which the government was supposed to supervise and it didn't. When they broke the rules it didn't remove the license. So it 's an example of where, although you've got something in theory that should work, in practice it won't.

### **Chairman**

223. Do other experts want to add to that response? Dr. Infante, please.

### **Dr. Infante**

224. I would agree that they would all be helpful, assuming that the hazards/risk assessments have already been done or we wouldn't be here today. As far as information, education and training, yes, that's important; registration of tradesmen, that's important; hazard control, of course these are all important; personal protective equipment is important. They are all important but some of the problems are, you have personal protective equipment, what does that mean? Let's take respirators, for example, when do you wear a respirator? Our standard requires a competent person who has to know about where asbestos may be, whether or not the product may contain asbestos. It's not simply having a respirator available, but do you have a respirator fit-testing programme to assure that the worker who wears a respirator is getting the protection they should have; do you have a programme that cleans the respirator? Do you have different types of respirators that are available depending on what the exposures might be? So a respirator programme requires a fair amount of training in itself and knowledge on the part of a competent person. Then, one of the problems is that in the United States there is a tendency not to train short-term workers in the construction sector because it costs to train workers and you know they're only going to be there short-term and they're going to be moving on to another job where there isn't asbestos exposure. Since they're going to be gone shortly there's a tendency to try to save money and not to train workers that would be there for a short period of time. So, all of these are good: the problem is implementing such a programme in reality, I think is difficult.

### **Dr. Henderson**

225. Again, I would reinforce the comments from my two colleagues. In Australia, the use of respirators in the building construction or any other industry poses particular problems, despite penalties, in the form of fines, and even three breaches of the regulations and the worker is dismissed. The simple fact is that compliance is poor because in a hot, dry environment, where temperatures regularly go over 30°C and sometimes above 40°C, the thermal consequences of wearing a respirator are c704

very small businesses which do not themselves have a background and depth to provide training in the correct application of safe work practices. So, we're dealing basically with a very large, diverse, often



**Dr. Musk**

240. I was saying, I don't think any of the measures addresses the handling of asbestos that's already in place to the extent that, if the measures were put into place, there would still be asbestos going into construction. That asbestos would then be there for plumbers, electricians and anyone else coming along later. It doesn't address their exposure.

**Mr. Hankey (Canada)**

241. What, Sir, would you propose to do about asbestos already in place?

**Dr. Musk**

242. I think, as a general principle, one needs to minimize the exposure to it and work practices are important in that area. Once it's there, as far as I'm concerned, it ought to stay there until there's a good reason to remove it. And then when one does remove it, it should be removed with due care.

**Mr. Hankey**

243. If I understand you correctly, you would say that asbestos which is already in place should be left there and that due care should be taken with its use. By due care, could controlled use be another way of expressing the same idea or not?

**Dr. Musk**

244. The notion of controlled use I interpret from these measures relates to providing new asbestos products for the construction industry, not to protecting workers against asbestos that is already in place.

**Mr. Hankey (Canada)**

245. What measures would you propose? What kind of due care measures, perhaps you wouldn't call them controlled use, I don't know what appellation you would give them, but what kind of measures would you propose to deal with asbestos already in place? Because Sir, I don't know what the situation is in Australia, but I do assure you that in France, which is the country that's at issue here, there are vast amounts of asbestos in place, including very great amounts of low-density asbestos, much of it of mixed fibre, although we have some dispute with the European Union as to how much of it is mixed fibre, certainly a substantial amount of it is. It's incontestable, as a matter of social history, that the very issues that gave rise to the ban that's currently in place, which is the very subject of this dispute, is in-place asbestos, old uses, high density, low density asbestos in places like Jussieu and there are vast amounts of in place in France, so the issue of how to deal with that in-place asbestos strikes me as extremely relevant. So I would like to know, Sir, you seem to think that these measures that I have proposed or put out for comment are not applicable to in-place ... and you also propose that it should be not removed. Now I think everyone would know that it's a real and present danger, these old uses of asbestos, vast amounts of which still exist in France, how would you propose to deal with it if you were a policy maker?

**Dr. Musk**

246. I'm not a policy maker and this isn't my area of expertise, but I would say that when the time comes that it's required to be removed in buildings where it's past its use-by date, or the insulation is deteriorating or the asbestos-cement products are cracked and broken, the roofs and there's a lot of asbestos-cement roofs, where I come from, have deteriorated to the extent they're not doing their job, then the people permitted to remove them need to be policed to use methods for removal that will not

expose the worker. There are in Australia licensed asbestos removers and they are required to have air-supply respirators and they do the major jobs for removing asbestos from buildings. But the most exposed people are the small businesses or the handyman who does it himself and nobody gets to know that it's happened till it's passed. So it's relatively unregulated.

**Chairman**

247. Thank you. That's a last point before we break for coffee.

**Mr. Hankey (Canada)**

248. I am very glad to hear that in Australia you are able to exercise control, it seems, when necessary to remove this stuff. I'm really, though, very interested in what goes on when the stuff is there because it may not be removed, I don't know, for twenty, thirty or forty years, you haven't given me any indication but you say you're not involved in the business of policy-making, but fortunately we have at least a couple of people on the Panel of experts who are ... Mr. Henderson, for example, in his paper, in his summary of conclusions, prescribes indeed the remedy which this Panel should provide in this case, so he is clearly in the business of making policy, or at least he has a very great interest in it. And I wonder, Sir, what remedy you might propose, relative to the vast amounts of asbestos, including very much low density products of asbestos in place in France, much of it containing mixed fibres. What would you do about it, Sir?

**Chairman**

249. I'll give Professor Henderson the opportunity to respond to this point, and then we will have a coffee break of 15 minutes. Professor Henderson.

**Dr. Henderson**

250. The question is based on a false premise. I'm not involved in setting public policy on this issue: this is done by others, and particularly, the National Occupational Health and Safety Commission. My comments on the disposal of existing asbestos products in place are similar to those of Dr. Musk. I think that some of the procedures that you've outlined should be implemented, as a matter of common sense, to try and minimize exposures to existing products. As Dr. Musk says, there are licensed asbestos removal organizations in Australia, which are meant to carry out these operations under controlled conditions and at minimal risk to the asbestos-removal workers and to the general public. However, just in the last six months, I've come across two mesotheliomas that have been a direct consequence of asbestos-removal programmes because it appears that those procedures were not followed. One of them was a fireman who was regularly called to buildings which had been incinerated by fire and where fire alarms were set off by high airborne dust fibre concentration as a result of asbestos-removal programmes. This fireman visited these buildings at least once a month to check them through and was, we believe, exposed to elevated airborne fibre concentrations. Another one concerned a university lecturer who for a period of weeks had to walk to and fro through a building where an asbestos-removal programme was being carried out. Although the removalist was supposed to encapsulate the material and seal it in polythene bags, it appears that they left it lying on the ground in an unprotected state and this person, the lecturer, walked past this asbestos material quite regularly over a period of some weeks. So, I agree that best work practices should be aimed at, in order to try and minimize exposures, but my concern is one of caution and prudence, to realize that not everybody is going to implement these procedures at maximal efficiency all the time and that exposures will occur. I'd agree with Dr. Musk that probably the best thing to do with existing asbestos in place is to encapsulate it until such time as the building is demolished or unless it can be shown that elevated airborne fibre concentrations exist in the building, and again I've got other mesotheliomas which have occurred simply from individuals who worked in department stores where there is friable asbestos insulation with elevated airborne fibre concentrations. So, I think you need to

balance the risks of removal against the risks of the asbestos continuing in place until the time of demolition. But implementation of best work practices should minimize exposures but ultimately exposures will be best minimized when there is no new introduction of asbestos materials into the workplace where they can remain for 20, 30 or 40 years and be subject to periodic and sometimes regular maintenance and renovations.

**Chairman**

258. Dr. Infante, please.

**Dr. Infante**

259. The point of my written comments was that, I don't think controlled use is likely to occur in the occupational setting and so that in the non-occupational circumstances, it would be even much more difficult, because there is no..., you don't really have the potential here for training that you do with the occupational setting, or even the construction sector, where training quite often doesn't take place nor any of the other programmes related to controlled use and exposure to asbestos. If you are asking, well, in non-occupational circumstances, could fibres exposure exceed 0.1 fibre per ml, it depends on what the individual would be doing. I would say, yes, that's possible to occur. For example, I know that with using a Transite, which is an asbestos-cement product, when individuals tear this off a wall, it usually breaks apart, because it's either nailed or screwed on, and it's much faster to just simply pull it off the wall and quite often, it will pull the nails out with it. So, it is a lot faster to remove it that way. But quite often, as is usually the case, it breaks into pieces and when that occurs, you can generate fibre levels above 0.1. That's one example. It just depends on what's being done in a non-occupational circumstance and what product is being manipulated.

**Chairman**

260. If there is no further comment on that point, I'll pass the floor to Mr. Hankey.

**Mr. Hankey (Canada)**

261. My question is in relation to the products that we are discussing, in particular those used in construction, that is to say chrysotile-cement products, do you consider the greatest risk to be at the point of installation, or maintenance – that is to say interventions after it's put in, by electricians, carpenters, plumbers and so on and so forth – or its demolition and removal? Where, at which point would you consider the risk to be greatest? And I wonder if each of you could answer that question. Thank you.

**Chairman**

262. Dr. de Klerk first.

**Dr. de Klerk**

263. It depends on the exposure, really. I know we said it before but it's obviously where the greatest amount of dust is generated, it's going to be the process that gives the greatest risk in terms of existing measurements made around operations that are available – obviously demolition and removal have the highest exposure levels. But in some ways the people in demolition and removal may experience less exposure because there is more of a likelihood that precautions will be taken. ...  
[END OF TAPE]



**Dr. Infante**

264. I don't think that, as a general statement, you can say that one has a greater risk than the other. I think they all carry, you know, a great risk depending on how the installation, or the maintenance or the demolition is carried out. That is what relates to the fibre exposure.

**Dr. Henderson**

265. Again I'd agree with the comments from my two colleagues. I see cases of mesothelioma related to all of these types of activity using mesothelioma as an index-marker of exposure. Again, it's my belief that the risks will be dependent on the frequency of the operation, the types of operation carried out, the airborne fibre concentrations generated and the duration or the type of work. I see mesotheliomas resulting from all of these activities, for example, among carpenters, and for example the handyman who regularly carries out maintenance and renovations on houses, where he might use a power saw to cut a new doorway through an asbestos-cement clad wall, will generate fibre concentrations equivalent to the carpenter carrying out this type of work day after day. It's just the frequency with which he does this type of operation, may be less. The same can also apply to demolition, particularly of small dwellings, if precautions are not carried out during building demolition and disposal of the asbestos-cement product. So I'd have to say that I couldn't give a figure for the risks to each of these groups because they would vary according to the variables I've already mentioned, but I do see cases of mesothelioma resulting from all of these types of activity.

**Chairman**

266. Thank you. Dr. Musk, would you wish to add anything to those three comments?

**Dr. Musk**

267. I'd agree with the three previous speakers. I'd suggest that people involved with maintenance, being the least regulated group, and least easily regulated group may be at greater risk but like Dr. Henderson I see cases of mesothelioma from people involved in all those activities.

**Chairman**

268. Thank you. Mr. Hankey.

**Mr. Hankey (Canada)**

269. Thank you. If I could just try to make a synopsis of what I just heard. I think each of you said essentially, although Dr. Henderson's answer was I think more complex than the others, but certainly each of you said really it all depends on what precautions are taken. Dr. de Klerk said precisely that, and as did Dr. Infante, Dr. Henderson did say that but along with a number of other things, and finally, Dr. Musk said exactly that and added to that he thought that perhaps maintenance was perhaps the biggest problem because it was the most unregulated. So, if I understand you correctly, then the issue at each point, that is to say installation, maintenance - and by maintenance I mean interventions once it is already there by tradesmen such as plumbers, carpenters and electricians and so on and so forth. And then the removal -you consider you can't distinguish between these risks, you say it all depends on what precautions are taken at each point. That's what each of you said. Now, I'm wondering still if we could come back to this problem about the asbestos in place because we all recognize - and I don't think there is any issue about this - that the asbestos in place, if you like, fibre for fibre and man for man in terms of the exposure to it represents still the greatest risk. I concede that we don't know what the risk will be perhaps 100 years or 200 years from now, that's another question. But currently, I recall, Dr. Henderson said early this morning that, when I asked which he thought was the greatest risk, he indicated, if I understand correctly, that, yes indeed, the

greatest risk from an exposure at a given level, or for the same amount of exposure time, I think was really the point, but you can correct me if I've got it wrong, to low-density products which may contain mixed fibres. You thought that would be greater - sort of intervention for intervention - than interventions in these high-density chrysotile-only products. You said you had difficulty calculating the overall risk because indeed, you felt there were more interventions; more people were perhaps coming into contact with chrysotile-cement products than with these old kinds of products. Is that a correct statement, Sir, of what you have said this morning? I haven't finished my question, but I'm basing it partly on what you've already said. I want to make sure that I've got that right.

**Dr. Henderson**

270. Well that is not quite correct. What I was trying to say this morning is that the risks of lung cancer and mesothelioma will be dependent on the type of operation carried out, and therefore the airborne fibre concentration, the frequencies with which those operations are carried out, and their durations – that you are looking at a risk related to cumulative exposure levels; and the point that I was trying to make this morning was that, if you take a cohort, for example, the Wittenoom cohort in Western Australia, those individuals have a very high risk of mesothelioma and yet, the cohort, which numbered about 7000 individuals, was relatively small. Although, if you are looking then at a lower risk in a larger group of workers, for example, carpenters, because there are many, many more carpenters in Australian society than Wittenoom workers, then the total number of mesotheliomas you will see in this larger group at lower risk will be equivalent to those you see from the

**Chairman**

272. I'll give the experts the opportunity to respond on this point and then I think we need to move on to substitute fibres and then immediately after one or other of the experts has responded on this current question, I'll give the floor to the European Communities. Or did you want to make a point, Mr. Christoforou?

**Mr. Christoforou (European Communities)**

273. I would like to hear the follow-up question after I hear the replies of the experts on this point, Mr. Chairman, please.

**Chairman**

274. OK. Fair enough. You may do so. Professor Henderson first, please.

**Dr. Henderson**

275. Well, in reply to my comment about the workers at risk, I can only reiterate my comment, it is not so much on the controls in place, although hopefully by disseminating information one can try and implement best work practices to minimize exposures to those products that remain in place. When you disputed the estimates I gave for a lower risk among carpenters in comparison to the Wittenoom cohort producing a larger aggregate number of mesotheliomas, your doubts are not supported by the figures from the 1999 Report for the Australian Mesothelioma Register, which records, among carpenters and joiners, 187 mesotheliomas due to single exposures only, 33 additional mesotheliomas from workers with multiple exposures, making a total of 220 cases. Whereas the Wittenoom cohort accounted for 189 mesotheliomas (single exposure) and an additional 25 (multiple exposures), making 214 cases. So, although the risk of mesothelioma is high in the Wittenoom cohort and among non-smoking survivors, mesothelioma is now the most common cause of death, the numbers in aggregate are slightly less than the number of mesotheliomas in absolute numbers we see among carpenters, simply because – although the carpenters are at lower risk – there are many many more carpenters in Australian society than there were Wittenoom workers. So, that low risk needs to be multiplied against a larger population. That is the point that I was making.

276. As for the problem of asbestos in place, I agree entirely that this is a major problem. What do we do about the asbestos which is in place, and how do we minimize exposures? Some of the strategies that you've indicated, in terms of informing people, trying to implement these best work practices, will hopefully minimize the exposures but so far as I am concerned this is an ongoing problem for which we have no easy solution, taking into account that many of the people who carry out interventions on those products, by way of building maintenance and renovation, are almost completely unregulated. Although it is very regrettable, despite our best efforts, I believe that we are going to continue to see mesotheliomas from that type of exposure. But having pointed out the difficulties of minimizing exposure to asbestos in place, that does not by itself, from my perspective, represent a justification for the introduction of more asbestos into the environment whereby the total quantity will become greater and the scope for people to be exposed, even at lower levels, will be translated into an ongoing population over time.

**Chairman**

277. Thank you, Professor Henderson. I will give the floor briefly to Mr. Christoforou for the follow-up question he wanted to ask. Could I ask that you do make it brief and hopefully the reply could be brief so that we don't lose any more time before getting on to the substitute fibre questions. Thank you.

**Mr. Christoforou (European Communities)**

278. Mr. Chairman, I renounce to ask the question because the reply of Dr. Henderson covered my point. Thank you

**Chairman**

279. Well, in that case, I would give the floor to the European Communities, if they wish to ask a question concerning substitute fibres.

**Mr. Christoforou (European Communities)**

280. Yes, Mr. Chairman, thank you. We would like to request all experts to elaborate on your replies concerning alternative products which are non-fibrous and whether, in their knowledge and experience, such non-fibrous alternative products have been classified as proven human carcinogens, as is the case with chrysotile asbestos. I highlight the word non-fibrous alternative products.

**Chairman**

281. Yes. Dr. de Klerk.

**Dr. de Klerk**

282. I'd just like to answer fairly briefly. The question, as it was asked before, was really asking about alternative fibres but when you look at non-fibrous products, as far as I am aware, anyway, it is the fibre quality of asbestos that makes it dangerous and if you've got a product that isn't fibrous then it doesn't have those qualities and therefore is unlikely to be risky in that same kind of way.

**Chairman**

283. Thank you. Question six did concern substitute fibres. It was not specifically asked about non-fibrous substitutes. If there are no further comments on that point, could I now pass the floor to Canada on the fibrous substitutes issue.

**Mr. Hankey (Canada)**

284. You may indeed. I mean, I do have a comment about that question but perhaps if you rule the question at the border, perhaps I need not comment.

**Chairman**

285. Well I think, as I see it, the issue that was concerning the Panel was the question of fibrous substitutes particularly.

**Mr. Hankey (Canada)**

286. My question is to any of the experts who really cares to answer, but I'd perhaps suggest that I would like Dr. Infante, among others, to answer because I believe he has considerable expertise in this

**Chairman**

287. Dr. Infante.

**Dr. Infante**

288. I think that compared to what we know about chrysotile asbestos, the data on most toxic substances is meagre in comparison.

**Mr. Hankey (Canada)**

289. I just wonder then if Dr. Henderson and Dr. de Klerk and Dr. Musk would agree with that statement.

**Chairman**

290. Dr. Henderson please.

**Chairman**

296. Could I just perhaps reiterate that we did not specifically ask the experts to address the questions of non-fibrous substitutes. The interest of the Panel in the scientific aspects of this were especially concerning the qualities, properties of fibrous substitutes. I could perhaps invite the parties and the experts to concentrate as far as possible on the specific issues that were asked under Question 6, which is really concerning the fibrous substitutes.

**Mr. Christoforou (European Communities)**

297. Mr. Chairman, with due respect, we don't think this is the situation. Question 6 refers to both fibrous and non-fibrous and we would suggest that it is even more relevant, because, as we suggest here and as we have been making in our submissions, there are numerous non-fibrous products which can substitute asbestos for nearly all of its uses. So the question is very relevant to see the magnitude of the problem, of whether there is a problem posed by fibres, which will come later on.

**Chairman**

298. Having re-read the question very carefully, I can say there were one or two references to non-fibrous substitutes. I would invite the experts to respond on that point.

**Dr. de Klerk**

299. I'll just chip in a couple of points. In terms of, in Australia anyway, I mean I haven't really looked into this because I sort of assumed it was fibrous but, for asbestos-cement the main manufacturer uses cellulose instead of asbestos. I think in brakes it's para-amid fibres, so that in fact, as a general rule, most of the substitutes are fibrous, well certainly in Australia. I would also like to add that most of the comments that I made in terms of this, because it is probably outside my area of expertise in a way, were based on a good review by Harrison et al., which I think everyone has probably read. I think that sort of summarizes the extent of knowledge at this time. I haven't found anyone who disagreed with that at all.

**Chairman**

300. Thank you. Any amplification or further comment? Professor Henderson?

**Dr. Henderson**

301. Well again, like Dr. de Klerk, I focused on fibrous substitutes because so far as we know the agents implicated in the causation of mesothelioma are almost always fibrous materials namely,

**Mr. Hankey (Canada)**

303. Yes. My next question is: do you believe that fibres used as substitutes for chrysotile in cement and friction products, for example, glass fibres, cellulose fibres, para-aramid fibres, PVA and RCFs, such as potassium octotinate should be used without controls? Perhaps Dr. Infante, you could start, and I would like the others to answer as well.

**Dr. Infante**

304. If you could perhaps refine your question. What do you mean if they can be used without controls. What do you mean by that?

**Mr. Hankey (Canada)**

305. Well, for example, would you suggest that workers who are installing them or removing materials made with, that contain these substances, any of them, should work without masks, for example, that they should saw it with high-speed saws. That would be two questions. I would have to really, I'm afraid, ask my experts to propose other answers, or help me formulate other questions. I suppose – I may be wrong – that for each of these they present somewhat different risks, and that therefore the measures you would impose would perhaps be different for each of them. Another thing might be exposure limits for example, would you say there would be a need for exposure limits for any of the materials I've indicated, and if so, which ones?

**Chairman**

306. Dr. Infante, are you able to answer on the basis of that?

**Dr. Infante**

307. I think, as a matter of industrial hygiene you should reduce exposures to the extent that you can in the occupational setting. Now by saying that that, doesn't mean that these fibres carry the same risk as chrysotile. I don't think that any of them do, but as a matter of proper industrial hygiene, we should try to reduce exposure levels or use good work practices. You can get some of these things perhaps in your eyes, from sawing them, so perhaps you would want to wear goggles, for example. I always think you should handle substances in the workplace appropriately. Should you be concerned about the same risk of exposure to these substitute fibres, as you should be concerned about asbestos fibres? I guess what I would say is that I don't see the evidence that these fibres are as harmful; but yes, you should try to control them to the extent that you can.

308. You have to look at what some of the information is here. If you look at refractory ceramic fibres, for example, I think that they are hazardous, and that, if you are working with these fibres, yes, you should take precautions with them and you should wear appropriate protective equipment if you are exposed to these. But it is my understanding that the refractory ceramic fibres would not be a substitute for chrysotile on any large basis. That does not mean that they are not toxic. Is there evidence that they are carcinogenic in humans? – No. But there is evidence in experimental animals, and on the basis of that I would take all of the precautions that I could. With the polyvinyl alcohol fibres, there have been some implantation studies that have been conducted on experimental animals and IARC concluded that there is insufficient evidence of carcinogenicity for those fibres. It is my understanding that their size is such that with a large diameter, it is unlikely that they would be respirable. So I think that it is good that that's the case. So I don't think there would be much biopersistence then if they are not able to get into the lungs. With the para-aramid fibres there has been, I believe, inhalation study and intra-peritoneal injection studies that IARC reviewed and they concluded that there was no evidence of carcinogenicity for the para-aramid fibrils. In terms of biopersistence, I think that I cited the study by Searl that indicated that these fibres greater than five





the substitute fibres are safer in general, with the exceptions already indicated by Dr. Infante. Importantly that they are less biopersistent in lung tissue, so that presumably their capacity for carcinogenesis is proportionately less than chrysotile.

**Chairman**

313. Mr. Christoforou, please.

**Mr. Christoforou (European Communities)**

314. Will you allow me a follow-up question on this point?

**Chairman**

315. Yes. Go ahead.

**Mr. Christoforou (European Communities)**

316. The follow-up is what Dr. Henderson said, with a few exceptions mentioned by his colleague, and I think he referred to the statement by Dr. Infante. Dr. Infante has identified ceramic fibres and glass fibres as possible, probably, dangerous substitutes. The question I would like to ask is the following: I don't know if you know of any country which has banned asbestos from use – all uses of asbestos – and it has substituted by glass fibres entirely all previous uses in which asbestos was used and employed. In other words, I wish Dr. Infante to expand on what he said on a large basis. Is it really true that these suspected - these two possibly suspected products – the glass fibres and the ceramic fibres, are a realistic substitute for all uses made of asbestos previously? Is there any country who has? Is there any knowledge about this? Can we really argue, as Canada is implying, that these are possibly dangerous and so because they are too dangerous, we should not ban asbestos? Thank you.

**Chairman**

317. Thank you. Dr. Infante.

**Dr. Infante**

318.

**Mr. Hankey (Canada)**

320. I have a follow-up question.

**Chairman**

321. Certainly, please.

**Mr. Hankey (Canada)**

322. Dr. Henderson, when you said it all depends on the characteristics of a fibre – and I think you



**Mr. Hankey (Canada)**

334. I was just wondering, and if I could paraphrase your answer, it seems to be that you are not aware of any controls that are in place to ensure that substitute fibres are not carcinogenic, or

address one or two procedural questions, including the question raised by Canada earlier this morning about the two pages of comments submitted by Dr. Infante. So I think there would be time for perhaps one further point or question from either of the parties. Or maybe one quick one from each of the parties if you have a burning need to ask one or two more questions. Mr. Christoforou.

**Mr. Christoforou (European Communities)**

341. Mr. Chairman, I would like, as a last point on the issue of substitutes ... I am sure the scientists know that for example the Environmental Health Criteria 203 has recommended the substitution of products of asbestos, all types of asbestos, by other products because they are safer. On the basis of the existing knowledge of which you are aware, with the possible exception of tile fibres and glass fibres, do you think the substitutes which are used are safer than asbestos-containing products?

**Chairman**

342. I think Dr. Infante will respond.

**Dr. Infante**

343. There is no evidence that they are harmful. We are talking about the polyvinyl alcohol, para-aramid fibres and fibrils, and cellulose fibres. There is no evidence that any of those potential substitutes are carcinogenic – there is no information at all on that. As scientists and as people involved in public health, we do exercise caution in using these fibrous materials. That is different than saying that they have met the same standard of toxicity as asbestos fibres because they haven't. We just exercise caution. But I would, you know, recommend that, as the document says, chrysotile fibres certainly be substituted for.

**Chairman**

344. Thank you. It's a good place to give the opportunity to Canada for a last comment or question.

**Mr. Hankey (Canada)**

345. I just have one short comment and then a question, and my comment is simply ..., and it really relates to the debate I was having with Dr. Henderson. You kept referring to the "substitutes" for chrysotile as if those substitutes were a fixed universe. Now it is my impression, I may be wrong, but they are not in fact a fixed universe, that, given the fact that chrysotile has been banned rather recently in many jurisdictions, new products indeed, new substitutes are invented and come on to the market from time to time, and what I was really asking you was whether you were aware of any controls in place to assess and ensure the safety of these new products, before they were put on the market. I understood your answer to be "no". Now, I'd like now to move on to my last question and it is simply this: a November 1999 report of an independent committee organized by INSERMINSER5 0i1 T-0.2658

**Chairman**

346.

**Chairman**

356. Well, I am happy for the gentleman to do that provided he too can be brief.

**Mr. Christoforou (European Communities)**

357. Yes, he will be very brief.

**Chairman**

358. Then we will ask a brief response from the experts.

**Dr. Goldberg (European Communities)**

359. Merci Monsieur le Président. Je suis Marcel Goldberg et je suis effectivement un des auteurs de ce rapport, et notamment, je suis le responsable de cette partie. Nous avons effectivement écrit la phrase qui a été citée, mais une fois de plus, je crois que la citation est extraite de son contexte. Il est vrai que nous avons écrit cela, mais c'est une discussion dans la partie qui traite uniquement des données épidémiologiques, et il faut rappeler que le rapport complet fait quelque chose comme 450 pages, et que nous avons pris en compte l'ensemble de toutes les données disponibles, y compris les données expérimentales, et que la conclusion de l'ensemble de tout nous a permis de conclure que, très vraisemblablement, le risque de cancer attaché à ce type de fibre était largement inférieur à celui du chrysotile. Merci.<sup>8</sup>

**Chairman**

360. Thank you. I take it the translation has finished coming through. We will now ask the experts, do they wish to make any comment. Dr. de Klerk.

**Dr. de Klerk**

361. Does that mean, therefore, that the substitutes are at least as safe as chrysotile? Is that what you mean, is that why you asked the question? That therefore means that all the substitutes are at least as safe as chrysotile, is that what you are saying?

**Mr. Hankey (Canada)**

362. Yes, I think that could be a fair conclusion – yes. To the same level of exposure.

**Chairman**

363. Well I think that Professor Henderson wants to make a comment. I was about to conclude that the response from the experts had already been made, but please.

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<sup>8</sup> [Thank you, Mr. Chairman. My name is Marcel Goldberg and I am one of the authors of this report and I am in charge of this part of the report indeed. We have drafted this sentence that has been quoted, but, once again, this quotation is out of context. It is true that we said that, but of course this is one sentence in the part dealing with epidemiological data and the whole report has more or less 450 pages, and we took into account all the data available, including experimental data, and the conclusion of this whole work has enabled us to conclude that, in all probability, the risk of cancer linked to this kind of fibre was largely under that of chrysotile. Thank you.]

**Dr. Henderson**

364. I was a little bit surprised by the question as put because it didn't distinguish between mesothelioma or lung cancer and amphibole versus chrysotile asbestos. But now that the translation has been given, clearly it refers to epidemiological investigations and I must admit I was a little bit surprised because animal experimental studies usually involve exposure to fibres of quite high levels - this is simply because the lifespan of an experimental animal is sufficiently short in comparison to the humans that you need to expose these animals to very high fibre concentrations or through a peculiar route whereby dust deposition in lung and translocation does not occur. That is you'd use either an implantation or a high-dose inhalation model. Again I'd would draw the same conclusion as Dr. de Klerk that the experimental investigations indicate that, if anything, the substitute fibres are likely to be safer than chrysotile and that even if one takes that question at face value, it indicates that none of them is more hazardous than chrysotile.

**Chairman**

365. Thank you. I think I would just ask the other experts if they want to indicate a view that differs in any way or adds in any way to the comment Professor Henderson has just made. Yes, Dr. Musk.

**Dr. Musk**

366. In practice then, and I don't know the answer to this, but one of the issues might be how easy it is to control exposure in the asbestos industry versus the substitute fibre industry.

**Chairman**

367. Thank you. Well it seems we have exhausted the comments. I would like to thank everybody very much for their participation in this meeting. I did say that I would offer the floor to the experts to give them the opportunity, if not the obligation, to make any concluding comments. We have about five minutes left so, and I would like a couple of minutes myself to deal with the issues that are raised



**Mr. Hankey (Canada)**

369. Excuse me, I would like to raise a point of order, Sir. I want to know, Sir, am I to have an opportunity to respond to the experts' closing statements?

**Chairman**

370. These are closing statements and we cannot offer the opportunity to respond in this ...

**Mr. Hankey (Canada)**

371. In that case, Chairman, will you please request that the experts not raise new issues in their closing statements. Dr. Henderson has just said that he is raising an issue which has not been discussed today. I think it is not really due process, if I might say so Sir, that the experts raise at the end of the day issues not discussed today to which I shall not have an opportunity to respond. So let's either give the parties a fair opportunity to respond or else let's keep the summaries to issues that have already been covered today.

**Chairman**

372. As I say, there is no room for any further debate on these issues today, but we are also under extreme time pressure which eliminates the possibility for raising any new issues. Can I just invite Professor Henderson to wrap up his remarks briefly?

**Dr. Henderson**

373. Well, this is not a new issue, it was covered in my Endnote to my original report and it was covered in the supplementary remarks I made. What I questioned is ...

**Mr. Hankey (Canada)**

374. Point of order, Mr. Chairman. Shall I have an opportunity to respond to Professor Henderson's Endnote?

**Chairman**

375. I think that ... Excuse me. We can't get into discussion at this point on whether something was or wasn't a new issue and as the clock is also ticking, I think we noted the point that was made. I think I would like to ask Professor Henderson not to keep addressing this issue but to wrap up his conclusion in the next thirty seconds if he can.

**Dr. Henderson**

376. OK. I shan't pursue this issue.

**Mr. Christoforou (European Communities)**

377. Sorry. I really object to this. The experts are free to express their views on what they have written in their reports. I don't understand the objection of my colleague. There is no rule which allows the experts to express their views on what they have written in their report. If Canada didn't feel necessary to raise this issue with [ ... ] because the thing was clear.



parties were given clear deadlines to submit material, comments on the experts' reports. The experts themselves kept to their deadline for the submission of their own reports. We did not place any restriction on what the experts might do between all those submissions of reports and comments and what happened at this meeting. We certainly viewed the paper put together by Dr. Henderson, I think, it was dated 10 January, as he explained as a contribution to this meeting. I think the Panel would view Dr. Infante's note in a similar light, as a contribution to this meeting, to the content of the discussion at this meeting. So it is not our intention to allow any further submission of evidence in relation to the papers submitted by, or the comments submitted by Dr. Infante, and we would note that Dr. Infante does not really depart at all or vary from the opinion that he expressed in his initial written reply. However, I would remind the parties that the purpose of having the gap of two days between this meeting concerning the scientific issues and the next formal meeting (the second formal meeting of the parties) was precisely so that the parties had time to comment, if you like, in the course of the second formal meeting on some of the discussion of the scientific issues that had taken place here. So, in the Panel's view there was adequate opportunity for the parties to incorporate any comment that they wish in the course of the second formal meeting later this week.

387. Just also to set this proceeding a little bit in the broader context, I could just explain what will happen in the coming weeks. It is probably very familiar to the parties. As I said, following today's meeting and the second substantive meeting which will take place on Thursday and Friday, the Panel will proceed to prepare its report. The first part of the report will be a summary of the facts of the case and the arguments of the parties, and will be provided in draft form to the parties for their comments. The responses of the experts to the Panel's questions will also be included in the report. The experts will all receive a draft of the relevant section and will be given the opportunity to make any necessary corrections. Subsequently we need to provide a first and interim Panel report to the parties, including findings and conclusions. Then the parties have an opportunity to comment on that and we then submit a final report. As stated at the beginning of the meeting, there will be a verbatim transcript of today's meeting which will be included as an annex to the final report, and both the parties and the experts will receive a draft of the transcript of today's proceedings for information and corrections as necessary, because the draft is taken straight off the tape. So we would ask – this one final task – we would ask of our experts, will be to check through the record of their remarks. So that, I hope, is a clear explanation of how we intend to proceed. Mr. Hankey please.

**Mr. Hankey (Canada)**

388. Thank you Sir. I just wondered, Sir, if we might expect any further contributions from the experts as part of their contributions to the meeting today or whether their contribution is now definitively closed, apart from the checking of the record that you had referred to.

**Chairman**

389. Thank you. Yes, as I said before the meeting started. We basically have a finite resource, a finite time and it was as set out in our programme and schedule, that this is the final point of the expert process with the exception of the checking of the record of the transcript. So as of now the Panel's expert consultation has been concluded. Yes, Mr. Hankey.

**Mr. Hankey (Canada)**

390. When, Sir, might the transcript be available to the parties?

**Chairman**

391. I'll ask the Secretariat to check that. It will be judged on how long it is going to be.

**Secretariat**

392. Yes it's technically rather long. I don't expect the transcript to be ready before mid-February, before the descriptive part is provided, if not slightly after. Not this week anyway.

**Chairman**

393. Can I thank all the delegates, the parties and the experts, my own colleagues on the Panel and the Secretariat staff very much once again for your cooperation and enabling us to get through our work in the very short time. And I should also like to express a special thank you to the interpreters who went on a little bit beyond the call of duty. Thank you very much.

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