THE LEGISLATIVE COUNCIL SELECT COMMITTEE ON ROAD SAFETY MET AT NSW PARLIAMENT HOUSE, MACQUARIE STREET, SYDNEY, ON MONDAY 2 FEBRUARY 2009.

THE COMMITTEE MET WITH **Mr PAUL FRANCIS HANSEN**.

CHAIR (Mr Wing) - I declare the meeting open. Mr Hansen, we welcome you and thank you very much for coming to talk to us about your company's product. For the purpose of the record please state your official position.

Mr HANSEN - I am the General Manager of LB International. We are the Brifen agents in Australia and have been since 1988.

CHAIR - Please give us an outline of the history of your company's part in developing this product, when it began, the original design, details of any changes that have been made in the current hues.

Mr HANSEN - The Brifen product came out of a think tank in England in 1958, the time the first motorways were being developed in the UK. The use of wire rope was not new, there were untensioned systems in the US in the 1930s and 1940s.

Mr HARRISS - Did you say 'untensioned systems'?

Mr HANSEN - Yes. The difference here was the British scientists wanted to test tensioned systems. That testing was carried out during the 1960s and the first system was installed in Britain in 1972 on the M16 motorway. That was a two-rope system only. In the 1980s, it was decided to reduce the deflection of the fence, that is, increase the performance of the fence. A series of tests was carried out by the British Department of Transport, in total 17 tests. The tests were on full-scale length of 626 metres, as required by the British authorities. They started by trying straight ropes by simply adding two ropes to the system that was working well. What they found early on was that the deflection of the system depended on the length, so they were searching for a method of improving the fence to give a predictable and reproducible performance level without the influence of fence length. They tried weaving ropes and the system that you see in Tasmania, where you have two straight top ropes and two woven bottom ropes, is the product of that test. The effect of that physically is you get a tension point at each post where the rope wraps round the post and you have to break the friction to draw the rope to the site of the accident. As the vehicle impacts the rope stretches. You have a rope that is in a purely elastic state; it is a special rope. The effect of the impact is the rope is drawn towards the impact point when the vehicle deflects. It comes out, the rope being elastic simply returns to its original length.

Ms FORREST - Does the wire itself stretch or is it just the way it is woven that enables it to stretch?

Mr HANSEN - No, the wire itself stretches. If any of you are familiar with stress-strain curves as taught in physics at school, you come into a point where you get a uniform strain with increasing stress and then you reach a yield point. Below the yield point it is

in the elastic range, so you can stretch it and it will come back. Above the yield point you're in the plastic range where you stretch and it will keep stretching and then break. The whole theory is that you keep the load on the wire in the elastic range.

Ms FORREST - Do the posts do that - where it goes through the posts?

Mr HANSEN - No, the effect of weaving in the post is to reduce the flow to the point. You can still keep the impact load in the wire below the yield point. What happens effectively over a length of about 70 posts either side of the point of impact is that at that seventieth post you have no influence from the anchors at all. You can reproduce that impact. A fence length of less than 140 posts will have slightly less deflection, depending on the post spacing, which typically is about 300 metres, so we know that if we build a fence of 500 metres or more we can get a predictable deflection. That is the effect of the weave. Interestingly, the new American standard, MASH08, which took effect on 1 January for the first time has stipulated a test length for an HO's600 feet, which is 182 metres. Brifen argued that 300 metres should be it. Commercial interests in the US wanted less, 182 as a compromise. Typically every other system is either tested only over 60 metres or 100 metres.

CHAIR - So did the one the American authorities want have more favourable implications to the manufacturers?

Mr HANSEN - The manufacturers who only tested over 60 metres or 100 metres will in due course be forced to retest over the minimum length and their deflections will increase. Brifen test over greater lengths so we meet the standard anyway.

Ms FORREST - So what are the limitations of only testing at shorter distances? What effectively could you miss?

Mr HANSEN - If you have straight wires and you test, the load goes to the anchors, so you are stretching the wires only over 60 metres or 100 metres to the anchors. If you go 200 metres you will get a greater deflection or a worse performance.

Ms FORREST - Are you looking for a certain amount of deflection? We have heard in evidence previously - and this could be quite incorrect - that the rope allows a car to go a certain distance into the fence, and it is grabbed by the wires effectively and then sort of tossed back onto the road it came from. Is that an accurate description of how it works? It is more complicated than that, I am sure.

Mr HANSEN - Deflection depends on the impact severity, which is a measure of the energy the vehicle impacts into it. The energy, just briefly, is related to the vehicle mass, vehicle speed and the angle of impact. When the vehicle enters the fence the vehicle crumples or deforms round the rope. It will deflect to a point that the energy of the incoming vehicle is matched by the energy that is built up in the ropes. At that point the ropes will guide the vehicle out. The angle of exit is dependent on several things: the type of road surface, the angle of entry and the vehicle itself. Typically the vehicle will come out - this is driverless, with no control over the wheel - the front wheels will be dragging and turn towards the fence, it will re-enter, hit again and drive off.

That is typical also in real life where you get multiple re-entries. Indeed, there was an accident in Launceston on the East Tamar probably six months ago where a Commodore station wagon had about six hits at this fence and then -

Mr DEAN - About 100 metres of wire was taken out.

Mr HANSEN - There was probably, from memory, about 30 posts and there were six impacts but it was impacted over 300 metres.

Ms FORREST - If those wire ropes had not been there he or she would have gone across the road and probably at great speed. Was it because of the speed that there were so many hits or because of other things?

Mr HANSEN - I did not get any details on the accident but the chap left the scene of the accident. I had a call from a reporter in Launceston who suggested that intoxication and speed were factors in that.

Mr DEAN - High speed was a factor.

CHAIR - What role do the poles play? We have heard some evidence that they can cause problems and that, at least in some cases, there are now plastic-covered poles available.

Mr HANSEN - The poles support the ropes. The fence is only effective if the ropes are of the correct height. So if you are looking at a maintenance regime, ensuring the ropes are the correct height is the first thing. The second part of the poles' function is to provide a structural and safety aspect to the fence. The bottom post is an S-shaped post.

An S-shape is a particularly efficient post shape; if you are choosing any you would choose an S or signal shape. The theory of post shape is that you provide a strong access normal to the fence direction and a weak access parallel to the fence direction. In doing so you ensure that you get a minimum deflection of the vehicle but once the vehicle is engaged in the fence you have a weak access so the post will fold easily and the vehicle will get out with minimum damage and, hopefully, drive off.

Typically in a Brifen impact the g-force on the body is about 6g. Under the standard, you are allowed 20g. At 20g you will get organs tearing in the body. To answer the second part of your question -

CHAIR - The damage that may be done by the post, causing some to be covered by plastic, as I recall from some evidence that we had. The post cracking and breaking off; has that been part of it?

Mr HANSEN - We use a special low-phosphorus steel. The post will bend first; they never crack.

Ms FORREST - Is the force of a motorcycle enough for the post to bend? What we've heard in evidence has been that motorcyclists have a bit of an issue with the wire rope fencing as a whole. They claim the wire has a cheese-slicer effect. The evidence we have had in relation to that is that it is actually the motorcyclist's head hitting the post that is more an

issue, so obviously a car has much greater barrier and ability to withstand a post, but how does a motorcyclist come off?

Mr HANSEN - I can tell you that I have had one positive call from a cyclist. He impacted a fence outside of Alice Springs in 1997. He was driving on a Ducatti 916, travelling at 140 kph. He impacted at an angle of 40 degrees, which is very steep indeed. It was he who phoned me. He had spent six months recovering, but his words were that he'd dropped the bike, he slid in and took the full impact on his shoulder. He cartwheeled down; his body took out three posts; his bike similarly took out three posts. His words were, 'If it had been a guard rail post I'd be dead because it does not yield'.

Ms FORREST - He must have been wearing leathers.

Mr HANSEN - Yes. He was 48; he was a fully experienced cyclist. Had it been concrete, he'd be dead, and if there had been nothing at all it was a long drop into a dry creek bed. He was phoning to say thank you. That was at 140 kph. There have been four deaths in Tasmania in the last three years and they have all been at tremendously high speeds. The coroner in each case concluded about the fence, whilst it was there, that if they'd struck anything they'd be killed.

At this point in time there isn't any definitive testing at all. We have had, for six years, a product called Moto.Tub, which we have advertised. It is a French bike product to protect guard rail fences and wire fences. From 2000 onwards we have marketed this product.

Ms FORREST - They're the rub bars, are they? Is that what they call them?

Mr HANSEN - No. These were plastic tubes. If you look at the FEMA report of 2000, there's a section on that product. The main drawback with that product was that, whilst it was extremely good for motorcyclists, when a car hit the barrier these tubes went everywhere and the danger of a secondary accident was considerable. It was never put in. There are attenuators on posts, which are being used. We teed up with a company looking at putting attenuators on posts. However, amongst the road authorities, other than Victoria the jury was out as to whether attenuators on posts were good or bad. As far as I am aware, none of the attenuators have been tested with cars because the dynamics of impact change.

Mr HARRISS - Was the tubing in place of the wire or around the wire?

Mr HANSEN - The tubing was in front of the wire.

Ms FORREST - Did you say that there hasn't been a lot of research in relation to motorcyclists' bodies taking out a post without them injuring themselves too much, and their bikes too?

Mr HANSEN - In terms of Brifen, there hasn't. The reason is that there is a problem with a standard to test. Even at present Brifen has a product called Bike Rail, which is waiting for British and European authorities to agree on a standard. We have been talking about testing this product for two years now.

Ms FORREST - How does that differ from what we now use?

Mr HANSEN - I have not been privy to any data on Bike Rail at all. I know it exists; I know that it has been tested on a small car. They are not taking it any further until there is a European or American agreement. At the moment there is a Spanish and a French standard.

Ms FORREST - In relation to that particular product?

Mr HANSEN - In relation to motorcycle impacts. The standard is coming, but they are still talking.

Mr DEAN - I have recently visited Singapore where they have almost half a metre of cement at the bottom and then they have the Brifen, or whatever it is, on top of that. The posts are an oval shape with the wire stretching between, as with your product. I don't know whether it is Brifen or not, but the posts are the things that really interested me. I was questioning the people there and they were saying that tests had been done with the shape of the posts to show that it was a safer product that the squarer-type posts. They did not have the sharp angles and edges and it was a better product. Are you aware of that?

Mr HANSEN - I'm not aware. The post shape is critical. When you go into a square or a circular shape - the oval is a variant of the circle - you tend to equal your *x* and *y* axial strengths, which means as the car is exiting from the impact it reaches a point where the car strikes a post and starts to rotate out of the accident zone and finishes up facing oncoming traffic, which is a hazard that you want to avoid. If you look at Swedish tests on circular posts, that is the mode.

Typically, when you put those ropes up high you have the lower part of the fence, be it concrete or guard rail, to contain the small vehicles. Singapore has a predominantly low speed, very small vehicle fleet, apart from the limos that go around.

Mr DEAN - I didn't think it was a small fleet; I couldn't even cross the damn roads!

Ms FORREST - Small cars, not small numbers.

Mr HANSEN - Yes.

Mr DEAN - They have a lot of buses and trucks.

Mr HANSEN - The top part is to catch to higher centre of gravity vehicles, stopping them from rolling over.

Ms FORREST - Are you suggesting that would not be as effective a measure where you have bigger vehicles generally which travel at high speeds?

Mr HANSEN - Probably it could be, yes.

Ms FORREST - Could the model in Singapore effectively be applied in Australia?

Mr HANSEN - I am not aware of that model. You would have to look at the crash data and see. Our English company that owns the Brifen patent has a product, which is a similar composite where you have a steel beam section and a wire rope part on the top. We have not introduced it here. I think cost-wise it would not be a goer but if there is any interest we can get data on it.

CHAIR - We have heard anecdotal evidence that some countries using these wire rope railings are doing away with the idea. Are you able to give us any detail of that?

Mr HANSEN - There are three I know of. In 1995, Denmark decided to pull out their rope barriers and they had a fairly extensive network of them. I went to Copenhagen and spoke to the main roads authorities. They said it was a purely political thing. I have to say that the Danish fence that was used at that time was unlike any other wire system in use in that the anchor ropes were firmly cemented into the ground. There had been two high-speed, alcohol-related impacts right at the anchor points and because the ropes did not release these vehicles were caught. The g-forces that developed were particularly high and the drivers died. Both accidents coincided with the time of an election and became an election issue, hence the change there.

I am told that the recent decision in Holland not to install ropes is a political move to gain votes, and I believe a similar thing happened in Norway. That is the full extent of my knowledge of countries not putting them in.

Ms FORREST - In Denmark - and you might not be able to answer this - in your view, if they had addressed the anchorage of those wire ropes so that they did give - you can imagine the g-force that would build up in a crash where there is no give at all -

Mr HANSEN - Yes, a dead stop.

Ms FORREST - A bank has some give in it but this is concrete. Did they actually look at that or was the political will to get rid of them and make them look good that way?

Mr HANSEN - It was a political directive to the main roads directorate.

Ms FORREST - Did they not look at further research?

Mr HANSEN - Nothing technical, no. I was in his office. These rope systems had been in for 20 years and in his views had saved many lives. They were the first of the anchor deaths and he had two occurrences in a short period of time; it was a timing issue.

CHAIR - Are there any other countries where the poles are cemented into the ground? I have a feeling in Singapore.

Mr HANSEN - As far as the Brifen system goes, worldwide we operate under a strict licence as it is a patented system. You have no options but to supply and install as per these standards. I can only speak for Brifen fences.

Mr DEAN - They are fastened at the end here into a big block of concrete which is level with the ground, aren't they?

Mr HANSEN - The ropes have a threaded fitting on the end with two nuts and they slip in to an anchor plate so when a vehicle impacts the ropes slip out and you have a catch rope to stop them from flying everywhere. I should say that as far as Tasmania goes they have the British and the American anchor systems. If I could just briefly return to the how the system evolved: after the mid-1980s it was installed in many countries, it wasn't installed in the US. They had several issues: in the US predominately the cost of insurance was prohibitive for the market size that they saw, but by the end of the 1990s they perceived they would be ready to try the tension system.

They had to make some changes for the United States because they have a completely different vehicle mass, with a lot of huge trucks. Part of the American system also is that you test the body of the fence between the points of need. You test the length of need and you also have to test the anchors, which in England you didn't have to do. In time that filtered into Tasmania, so in Tasmania now you have the American-tested anchors, which have been proven to release and work, and you have the British anchors which, as far as I am aware, there has never been any issue with. So you have both systems.

CHAIR - What percentage of these barriers that are in place in the world would you estimate your company have provided? Do you have any idea?

Mr HANSEN - It would be in excess of 50 per cent worldwide.

CHAIR - And that's in the case of what - about four or five suppliers?

Mr HANSEN - Worldwide?

CHAIR - Yes.

Mr HANSEN - There are probably no more than six suppliers.

CHAIR - You mentioned Denmark taking out this particular type of road barrier. Are there any other countries that have taken them out?

Mr HANSEN - As far as I am aware, no.

CHAIR - Just Denmark.

Mr HANSEN - Yes.

Mr HARRISS - Paul, what process is used post-crash to determine whether ropes need to be replaced, or are they replaced after every crash? Or is there an assessment made as to whether they were still in the elastic stage or past the stage?

Mr HANSEN - The ropes are rarely replaced. On Brifen fences there have been two impacts in 17 years where there have been ropes replaced in Australia. On perhaps three or four other accidents, there have been sections of posts that have ropes replaced. You only replace the rope if it's actually been damaged. If there's been enough force to break a wire, you cut out a section and replace that section only.

The two impacts that I speak of were on the Hume Highway, and they were just big impacts. One was a 28 tonne intercity freighter which took about 400 metres and the other one was a 41-tonne Carlton Brewery truck that took out about 600 metres.

Ms FORREST - Did it stop the vehicle?

Mr HANSEN - It stopped the vehicle in both cases.

Ms FORREST - Do the ropes need to be re-tensioned every time there has been an impact, or only sometimes?

Mr HANSEN - No, the ropes are in an elastic state. We recommend that every five years you check the tension in the ropes.

Ms FORREST - How is that done? In a maintenance schedule what is needed to check the tension?

Mr HANSEN - It is a simple gauge. DIER in Tasmania owns one, or maybe two.

Ms FORREST - How long would it take to do, say, a 300-kilometre highway where there are significant sections of it with the wire rope barrier up?

Mr HANSEN - That is a big question. I can tell you that when we do 20-odd kilometres on the M5 motorway it probably takes about four nights. That is checking and re-tensioning it if need be.

Mr DEAN - Paul, has the Motorcycle Riders Association of Tasmania had discussions with you in relation to the Brifen wire?

Mr HANSEN - I was at the big meeting in 1997 out at the Police Academy. We addressed that meeting. I think, from memory, there were about six motorcycle groups out there. We are in regular contact with some cycle groups and have a lot of contact with cyclists who express opinions. The meeting itself in Hobart just boiled down to where the fences were being built rather than the product, and often that is the greater issue. It is the proximity of the barrier to the riding lane.

Mr DEAN - I think the Motorcycle Riders Association is saying that they support it but they have some concerns about where the wire is on sharp corners and in areas where motorcycle accidents are probably more likely to occur, that they should be given greater protection in those circumstances. I was wondering whether that has been raised with you and whether or not you agree with that position.

Mr HANSEN - The statistics show that the bends pose the greatest issue on a bike. As far as wire goes, wire is not normally built on bends less than a 200-metre radius. I do not know that there is a major issue. There is a psychological issue. In 17 years there has never been any cyclist killed or injured, to my knowledge, riding at a normal speed. Having said that, we have agreements on two products that have been developed. Probably in about 18 months to develop and are within about 18 months to two years of being finalised and which will be suitable for rope on curves. There are basically two

issues in developing these products: they have to be tested with cars, particularly small cars; and they have to be tested to a bike standard that everybody agrees on.

Ms FORREST - Are you still waiting on that standard?

Mr HANSEN - Yes. There is an awareness of motorcyclists' need from the manufacturer's point of view. There is a concern that the cost of development is chancy in that the purchasing is probably going to be based on an emotional need rather than a logical need. We are currently doing work with a Spanish product, BASYC, which fits onto the guard rail. It is a fabric. You normally find guard rail on your tight bends. It is a product which could well be used now it has been tested using Spanish tests for cyclists. It has been tested with small cars. Australian road authorities have asked for UV stability for ageing and we are doing all those tests. We could finish up with an extremely good product. It certainly appears it is but whether there will be anybody buying it is another issue.

Ms FORREST - It could be cost prohibitive?

Mr HANSEN - No, I think it will be pretty reasonable if it goes through in its present form.

CHAIR - Thank you very much indeed for your evidence.

THE DISCUSSION CONCLUDED.