Grant has been involved with civil and contracting engineering for over 27 years. He has worked in the technical support and laboratory testing side of the industry. His current role is as Bituminous Products Manager with Fulton Hogan. Grant is a member of CETANS, the Association of Asphalt Paving Technologists, the New Zealand Institute of Chemistry, and represents Fulton Hogan on Roading New Zealand’s Asphalt Committee. He also represents the New Zealand industry on an Austroads Research Management Committee. Grant is an experienced technical expert for IANZ and sits on IANZ’s Physical Sciences Professional Advisory Committee.

It’s a wonder I get any work done sitting on these committees and going to meetings – but I manage to fit it in, in my spare time!

I’ve come to talk to you about Roading New Zealand’s Asphalt Plant Accreditation Scheme. The bulk of this presentation will be to give you a bit of information on where it came from, and that probably will leave you understanding why we’ve done it and what the benefits will be.

I’m a Fulton Hogan employee as you’re probably aware, but today I’m representing Roading New Zealand – Alan Stevens of Roading New Zealand would have liked to have been here, but his schedule is probably worse than mine, so he apologises for his absence, but sends his regards and greetings. I’ve been deputised to stand in his stead. For those of you who know Alan, I’ve got shorter hair than he has – in fact much less.

Asphalt Plant Accreditation Scheme – Where it Came From

Some years ago a local authority in that small island off the north coast of the South Island – namely Auckland City Council – got a bit bitter and twisted over the perceived poor performance of asphalt pavements that they were laying, and commissioned Opus to have a bit of a look at why asphalts allegedly weren’t performing for them. As it turned out, Opus did a whole lot of work and discovered that in fact it wasn’t the asphalts that necessarily weren’t performing, but there are all sorts of contributing issues like pavement design, treatment selection, etc., etc.

Be that as it may, there was a bit of a cloud cast over the quality of asphalts that were being produced in Auckland, and that attracted Roading New Zealand attention. The Roading New Zealand Council thought it might be a good idea to put in place a scheme something like the certified concrete scheme where an independent assessment of asphalt quality could be implemented so that clients could have some confidence about what they were receiving and laying.

The Executive Council appointed a working group that got together and started work on dreaming up some sort of scheme that would show our clients in an independent transparent way that the asphalts we were making and providing were both specification compliant and fit for purpose. So this group got together and I got involved in it.

It seemed like quite an easy assignment when we started out, but in fact when we looked into it, it got more and more complicated and more and more difficult to put something together because I guess unlike concrete, there isn’t a single test for asphalt that quantifies its performance or relates to its performance. I guess with concrete we’ve got compressive strength, which is a performance-related criterion, so we can test our concrete and classify it as quality on that basis, but asphalt, there isn’t a single test that applies to it. So we ended up having quite a lot of debate about how we put together a scheme that would fairly quantify the quality of asphalt we were making. We looked at various models (not the models one finds in illustrated magazines). There was a UK model we looked at that rated plants as good, bad, or indifferent, and was incredibly complicated. The only people that would have made money was the laboratories, which I thought was a fine idea – but nobody else agreed. In the end we managed to dream up a scheme which I’m going to explain to you, which we called Asphalt Plant Accreditation Scheme (or APAS).
The basis for this was to help us, as asphalt producers, to show our clients that what we were giving them was fit for purpose. And the whole philosophy is to dream up something that is in fact not a burden on the industry but is a tool to make life easier.

What is APAS?

It is an industry initiative. It is part of the industry's self-governance philosophy that, certainly Roading New Zealand is quite enthusiastic about. It is independent of contractual arrangements and clients, it's something we do ourselves. We don't see it as forming a part of contracts - at least not at this point. Maybe in the future asphalt users will require suppliers to be APAS accredited. I can't speak for them as to whether that will occur, and I have mixed feelings about it - maybe that will come to pass.

APAS is based on process control. This is testing over a range of samples and looking at trends and graphs. I really like graphs - I'm a technician from way back. APAS provides a standardised method of analysing series of test results. We take a whole lot of test results, put them into the APAS machine, crank the handle, and out comes a quality number or compliance score. The criteria we are looking for at this point are the bitumen content of the asphalt, because bitumen content is a performance-related criterion, and the grading of the asphalt. The APAS system takes out 30 consecutive test results. We really wanted to get away from the situation where we make some asphalt, we send it out on the job, we do a test, we give the test report to the consultant or client, if the test result passes he's happy and it goes in the file, if the test result fails we've got to mill it all up and start again.

APAS is based on looking at a set of test results. So we look at test results in context. Maybe we have 30 tests results and all of them are perfect, we've got one out, we can tolerate that, or maybe we've got a whole lot of "outlies" and we can see something has gone wrong, and that's when we mill the road up. It's based on process control - looking at test results in context.

The system requires asphalt producers to look at the test results for the largest volume product they produce. We were exceedingly cunning when we dreamed up the scheme, because rather than inventing something that was completely novel, we based the acceptance criteria on NZTA's M/10 specification for asphalt. We thought this was really cunning because NZTA could hardly not accept APAS because it was modelled on what they've required since at least 1975. The novel thing about APAS is we take our test results, we take NZTA's M/10 criterion and we dream up a compliance score. We put all the numbers for the 30 test results in a spreadsheet, the spreadsheet goes away into a corner and does some sums, and out comes a compliance score.

We've said in the scheme that accreditation is awarded to producers who achieve a compliance score of 85% or better. Roading New Zealand had a bit of a roadshow a couple of years ago, and we went round and said we've invented the scheme and it's all jolly good, and the pass mark was 85%, and there was some consternation from our clients and engineers in the audit who thought we were saying we were expecting them to accept 15% non-compliant products. Now while that might be quite nice for us as producers, that's not the intention at all. As I said, the scheme's independent contractual arrangements and the 85% is just the pass mark for achieving accreditation. We explained to our clients that they still had every right, and should, expect 100% compliance for materials that you're being supplied on site. The APAS scheme is just a mechanism to allow producers to manage and improve their quality such that 100% compliance happens. They went away happy after that - which is good.

There are some tools that Roading New Zealand has provided to asphalt producers to allow them to manage their quality. There's a bit of a spreadsheet, and I've just thrown you a graph out of it here. This is the 1.18 mm sieve for a particular product - in fact these are real numbers actually. Here we see the blue lines on the graph are the compliance limits, and I think we've got 100 test results in that one. The red line is the result for that sieve, and you can see it's ticking along quite happily. At the end of the day, if this is our test results for our material, would anybody really be worried if we had one test result here that's popped a leg out of bed, when pretty much everything else around it is very compliant. In fact, that's probably a sampling or a testing error, or something bizarre. Again, this is the thrust of APAS - trying to get clients and trying to get the industry to look at
test results en mass and actually manage our quality and not react retrospectively to one test result and condemn what could probably be perfectly compliant reasonable materials on one result.

There’s a process control spreadsheet that has graphs like that in it. There’s also a spreadsheet that allows calculation of APAS scores which we supply to asphalt producers so people can poke their test data in it for all their mixers and see how the compliance is ticking along. The great thing about a compliance score is you can measure process improvement. At the beginning of the year if one’s compliance score is 86% and you think I want to improve it, and we tighten up on our plant calibrations or aggregate quality or whatever and get to 90% then we have a tangible measure of improvement in our quality – a very powerful tool. As I said, an acceptance envelope is constructed by applying NZTA’s M/10 criterion to our asphalt. I’ll explain a bit more about that in a moment.

We did this APAS roadshow a couple of years ago, and I was one of the presenters. It was a remarkably thing. We had people in the industry come along (asphalt producers) and they all sat in a room and I can think of at least two people I know there were more, and they sat down the back, and I could see written on their faces was “Oh, my goodness. What’s all this? It’s going to be more testing and cost. It’s going to make my life harder. How am I going to cope?”, and we went through it in some detail, and the scales dropped from their eyes when they saw how simple it was and how it wasn’t based on any more testing – it was all in the way we looked at the data and analysed it. When they saw how it gave them power to manage their quality, people were bouncing off the walls. There was a guy who sat down the back, slumped in his chair. He was just watching, as I and some of my colleagues were presenting. At the end of it he was bouncing off the walls, he came up and told us what a wonderful thing it was. Because he didn’t have to do anything. All we were giving him were tools to manage his quality. As a consequence, APAS has been taken up by just about all the asphalt producers in New Zealand, because it’s easy.

A little bit about asphalt mix design (I could talk about this all day too) – a fascinating subject. It’s a blend of aggregate components. It’s a lab activity, so the lab will go off to the nearest quarry, get a whole lot of materials (might be crush dust, chips, etc), put them through the sieves, grade them, and work out the blend to give them both compliance and optimised properties. For the output of the mix design of the lab as a design grading and a design binding content. That recipe, with all the components, is given to the asphalt plant so the asphalt plant can combine the raw materials exactly as per the lab mix design. Which is all very straightforward really. The thing is though, most (I think all) asphalt plants in New Zealand now are just blending plants, so we’ve got a whole lot of bins at the plant, all the aggregate components get tipped in at one end, and the plant just proportions them together. If you think about it, we’ve gone over to the lab, we’ve graded the components, we’ve put them together, we’ve worked out what our blend grading is, we’re utterly dependent at the asphalt plant on aggregate raw material quality for that to be reproduced at the plant. And I guess this is the message I’m communicating to you guys, we’ve put APAS into place, it’s using M/10 criterion which has been around since at least 1975 (so there’s nothing new about it), but to achieve it we’re utterly dependent on raw material quality and accuracy of blending.

So the acceptance envelope, which I’ve talked about, comes out of NZTA M/10. We take our mix design grading at the lab, we put the M/10 criterion around it, and then construct a production envelope. The subsequent test results of asphalt of the plant have to meet that envelope. APAS calculates a compliance score based on the grading and bitumen content results. So aggregate consistency, consistency with the basis on which we did our mix result design, is absolutely paramount for compliance with APAS – or compliance with M/10 for that matter. As I said, there’s nothing new about this.

Here’s M/10 specification. It says that basically we do our mix design in the lab. We construct a target grading. We have to achieve it for each of these sieves plus/minus 8%, and there’s also a “rolling average” of three test results which have tighter criterion.

So just to illustrate it, we’ve gone to the lab, there’s our grading, and we construct that production envelope around the grading curve, and all the asphalt test results from the plant have to fall inside this grading envelope. APAS says that once we have one sieve outside the envelope, then that test result is considered a “fail” and falls in the 15% or hopefully not more of results that are allowed to be outside the specification.
I've talked about the process control graphs. This is a snapshot out of the process control spreadsheet. I've got all the sieves here – the blue lines are the specification, the red lines are the grading test results for a particular product. This is real data – this actually out of the Nelson Asphalt Plant, with 100 test results in it dating back I think over three or four years. And obviously the quarry is supplying aggregates of tremendous quality because just about all of them comply.

So it’s an industry self-governance scheme that we've based on the M/10 criterion using the same testing frequency as M/10 says. All we're doing is that we've built some tools to analyse the test results and put a compliance score on. Obviously there needs to be some checks and balances. The rules are that APAS participants have to be AS/NZS 9001 registered, so they have to have an operating quality system in place, and the AS/NZS 9001 auditors are required to audit the operation of the APAS scheme when they come through and do their annual audit. Part of the rules of the audit are they have to look at whether samples are being taken every 200 tonnes or whatever the criterion is, samples are going to the lab, test results are coming back, and all the test results are being processed using the APAS scheme. One of the rules of APAS is that every test result has to go in “good”, “bad”, or “indifferent”, whether the plant had a bit of a whoopsy one day or something went horribly wrong, every test results has to go in. We did debate allowing plants to leave some test results out, for instance if they’re doing a trial or some such thing that wasn’t part of normal production, but in the end we thought it would get too messy, so every test result has to go in for whatever reason, although the APAS Working Group that has a look at these things every now and then, we've given ourselves the ability to ignore or tolerate some test results if they can be shown to be inappropriate – for example if some mix was produced in a trial and was never supplied to a customer, then maybe it should not be considered.

But everything has to be reported and the ISO auditors are charged with making sure that every test result is going into the system and nothing inappropriate has been done – not that we would ever do such a thing. A copy of the audit report is required to be sent to the APAS Working Group for analysis. The APAS Working Group is a panel of hardworking dedicated individuals who meet every four months and review the data that has come out of all the asphalt plants – and it’s absolutely fascinating, because we get to see what’s happening over all the industry, and we’re sworn to secrecy, in blood as it were, because we all get to see each others test results and our compliance rates – very interesting. We’ve gone through four APAS rounds now. Industry submits data to Roading New Zealand every four months and is reviewed by the gang of four. What we’re seeing is that once now that people are starting to grapple with process control and testing and looking at their test results and actually thinking about what’s happening, (looking at trends), quality or at least compliance rates are going up across the country, so APAS scores are improving. Which is exactly why the scheme was put in place.

In larger centres, such as Auckland, process control had been in place for some time and there’s less of an effect up there because they were doing what I guess we’ve developed but in other regions, smaller regions, where I guess people haven’t had the support or the lab next door or whatever, giving the tools to these guys to look at their test results and look at their processes has given them control and allowed them to head off problems before they actually take place. So it’s been amazingly successful. What I hear all the time is that people in the industry are enthusiastic about it, and it works for them, and I feel pretty good about that.

This is what the APAS spreadsheet looks like – this is real data. If anybody is from Fulton Hogan, Auckland, I apologise for putting their data on the screen, but these are real numbers out of the last APAS round. Here we have all their mixes up here, and the compliance scores are calculated in these columns here. These are particularly good test results too, but I have to say, in the market that these guys are operating in, they’ve really got their act together in respect of quality, and certainly we’re drawing aggregates from this plant from Winstone’s Hunua Quarry, and they have really got their act together with aggregate consistency and quality – extremely good – and that reflects through in the APAS scores. We’ve got consistency and the grading sitting in the envelope – so, well done Mr Winstone. Similarly, Winstone’s Whitehall. Fulton Hogan recently did an overlay contract at Rotorua Airport, and we were drawing asphalt from a third party supplier (Allied Asphalts in Rotorua, who make mix using Winstone’s Whitehall) and I understand that the gentlemen from Whitehall are using APAS tools to manage their aggregate quality, and we had tremendously good asphalt quality test results out of the plant, because the aggregate quality was being managed and it was consistent.
Anyway, things to bear in mind, and this is perhaps more, this slide was aimed more towards the asphalt producers, but it applies equally here. APAS is an industry initiative. We’ve done it ourselves as Roading New Zealand, and it’s intended to make our life easier as an industry. We’ve provided some tools that allow people to look at and manage their quality without doing any more work, without doing any more testing, without spending any more money, we’ve just provided some tools and some criteria. And it’s intended to make life easier for them, and it seems to be turning out to be the case. It’s designed to assist the industry to supply demonstrably compliant mixes without adding any extra costs or complication. There’s nothing in APAS that hasn’t been there since at least 1975. And this was the beauty of APAS. It took us an awful long time to get there, but in the end we’ve built a scheme around what’s already happening. And as I’ve been saying, logic would suggest that asphalt producers will be requesting the same level of process control from the aggregate suppliers, and I know the people are doing it out there. And I’ve given you a couple of examples that I’m aware of. I’m sure there are more, and certainly in the lab that I’m involved with in Nelson, we’re keeping a very close watch on the Nelson quarries and the rock that’s being supplied by my esteemed colleague Mr Taylor, and at the end, in the final analysis, and we haven’t got brave enough to do it yet, but it’s intended that the status of all the asphalt plants, whether they’re APAS accredited or not, will be posted on the Roading New Zealand website for all the world to see – and that will be a bit interesting.

So that’s APAS – I hope that I’ve explained enough about it. I could go on for ages, but I’m sure that those who haven’t fallen asleep already would be asleep by then. So I guess time for some questions.