ARB CLIMBER investigates

The wonders of modern technology have again produced an awe-inspiring apparatus, this time in the form of our boot torture rack. The carefully weighed and trimmed birch log (no really it was) sitting immediately behind the chainsaw imitates 4kg of pressure or partial chainsaw weight being applied to the bar during impact.

CHAINSAW PROTECTIVE BOOTS

European Class 1 ....mostly

...Who sniggered? You at the back there, are you belittling our test rig? This may look like the early stages of a suspension bridge, but it's simplicity is the very essence of a perfect test rig. In this case a means to replicate test after test imitating the effects of having a large chainsaw run out on your boot.... or in some cases.... in your boot!

You may remember that in issue 1 our review of the Haix Protector Pro threw up the unsettling possibility that class 1 protective Kevlar may degrade with age as it does in body armour and become less effective as a chainsaw barrier. We based this on the testing of an old pair of boots in which the saw seemed to penetrate all sections of the boot with ease. All except the tongue with its double thickness leather. Well it turns out that the question of whether Kevlar degrades with age is somewhat moot because in class 1 boots it doesn't really do much even when it's brand new! Our tests are far from scientific and we can only make summations based on the varying condition of the 17 pairs we tested but the results were surprising, if not a little alarming...

BACKGROUND TO BOOT CHAINSAW SAFETY

It is quite astonishing how hard it is to find out exactly what the test criterion for chainsaw boots is unless you're prepared to pay £96. (in the UK). Would you expect that a government department charged with public safety and coming up with safety standards that MUST be adhered to would make that information freely available? This isn't the US NFPA, a private company masquerading as a public interest body, this actually is a public body and yet such basic information has to be purchased!

We're picking on the European conformities and standards because in the US and Canada they are even more vague about what a chainsaw boot will actually protect you from, for the most part you just get a symbol - a pine tree - indicating that the boot is chainsaw protective.....really, to what level?

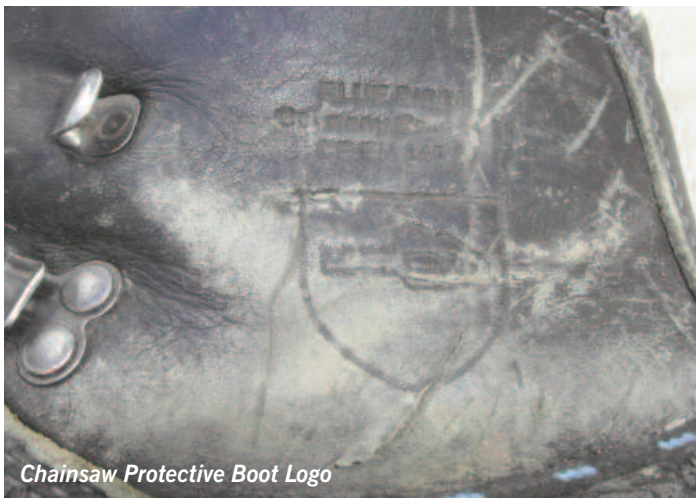
Back to the good old European Norms (CE) and perhaps there's a good reason for making it hard to get hold of, it all seems rather contradictory and somewhat arbitrary- take the most recent update issued by the British Standards Institute to take account of any new development within the EU (European Union).

That document states with regard to the little diagram stamped on the boot:
Chainsaw footwear - Pictogram - shield enclosing chainsaw (Fig.1). # - class of protection (0, 1, 2 or 3). Class 0 only applies to classification [of] footwear until December 1999, after which it will disappear.

Fair enough so there are 3 classes of protection because 0 has been phased out. But further down that document it states:
EN ISO 17249:2004 – Safety foot wear with resistance to chainsaw cutting
- Year and at least quarter of manufacture
- Pictogram (Fig. 1)
- Protection level
1 chain speed up to20 m/s
2 chain speed up to 24 m/s
3 chain speed up to 28 m/s
4 chain speed up to 34 m/s
- HRO – heat resistant outsole (optional)

So are there 3 classes or 4 classes because class 1 has always been 20m/s so that class 0 they phased out isn't the 4th class you might expect of that second list, it's actually a 5th class. Confused?

But one thing that second list does tell us is the broad test criterion which is the one quoted by the suppliers and manufacturers when selling the boots. Class 1 is the lowest level of protection up to class 4 which is the highest level of protection.


Chainsaw Protective Boot Logo

OK, you're a general duties kind of arborist, fair bit of climbing, fair bit of ground work (unless you can possibly avoid it) and you would rather not spend your kid's college fund on a pair of chainsaw boots but do need a pair that will be comfortable, durable and do the job so you know it's going to cost you more than a pair of beach sandals.

Arborist: What have you got my good salesperson?

Salesperson: Well sir, we have this fine brown pair which are class 1 protection - that means they're able to withstand a cutting chain intrusion of up to 20metres per second.

Arborist:Excellent, that sounds really fast and I mainly use that old Husky that's slower than my mum's food processor. I'll take them.

And because you're quite an accomplished arborist and have never had any serious accidents and never had that chainsaw slip other than the odd nick out of the sole or leather, you're now onto your third pair and you swear by them. 'These are the best foot protection I've ever had' you tell all your mates. Every now and then you hear about someone who has slipped up and sawn into his foot - that'll teach him to use crap boots you say.

But hang on a minute, if you've never actually cut into your boots how do you know that they work, after all, with the benefit of hindsight you could have gotten away with your dad's slippers for your last 3 pairs. Where did that figure of 20-metres a second come from and what size chain and engine are we talking about because wouldn't that affect how easy or difficult it was for a chain to cut through the boot's protective barrier? And come to think of it, what is the protective barrier - they're like your chainsaw trousers aren't they? loads of ballistic nylon that binds up the chain before it can do too much damage?

Well actually no, for the most part they are nothing of the sort, though there are a number of exceptions. Mostly, the active chainsaw protection is a sheet of woven Kevlar fibres sandwiched between an inner comfort lining or vapour barrier like GoreTex or Sympatex, (and sometimes some comfort foam as well) and the outer layer of leather also with the occasional additional layer of foam.

Really? just a single, quite thin sheet of Kevlar, that's amazing.

It would be if it actually worked!

There's a great YouTube video that shows an actual chainsaw boot being tested in a laboratory - the lady in the white coat carefully aligns the brand new boot in some kind of vice inside a perspex cabinet before setting the 12" bar and chain going and lowering it onto the front of the boot - it whirrs around like a dirvish, touches the boot, drags some nylon fibres out and stops dead. Excellent, I bet my boots are just like that. But check it out again, listen to that 'chainsaw' does it bear a remarkable resemblance to the sound of your kid's electric train set? And that's quite a small bar and chain isn't it, I don't actually think I've got one that small, despite the rumours.

That's because you're more than likely using a high-powered 14" tree saw and a chugging great 20 or 30" medium saw for bigger stuff and you boys on Oz and NZ eucs and Californian Redwoods could probably ride your saws home they're so big. Are we starting to see a difference between the real world and standards testing?

In issue one I destroyed my perfectly good Class 1 Protector Pros for the sake of the review (photo below). Nothing very scientific, just fired up our

smallest saw, revved it and let it run out on various parts of the boot. Not sure how that compares to the 20 metres per second test criterion that these boots are intended to withstand. And frankly I don't care because this is our smallest, lowest powered saw and if the boots can't cope with that then how does 20m/sec correlate with the real world? So we wielded the saw - the toe caps did well, they're steel! The tongue did really well - that's like a double thickness of leather but the front and sides? Nadda, straight through - what was that yellow stuff it just waltzed through in a fraction of a second? foam? No, Kevlar sheet, well actually foam *and* Kevlar sheet. Jeez, that's a bit of a worry maybe Kevlar degrades with age like it does in bullet-proof vests? We mentioned that in the review thinking that we might have stumbled across an interesting phenomenon.

We wanted to test this theory and collected 16 pairs of used chainsaw boots and one brand new pair. Two may have been class 2 though they were old and the labels impossible to read and two were effectively leather work boots. Most had been retired so you can imagine the state of their soles but surprisingly all of the uppers were in pretty good nick and some would have a good few years in them if you could stand the smell.

THE TEST RIG

Our man of many talents, Adam, constructed a simple see-saw rig that would enable us to attach any saw with a ratchet strap and counterbalance it to a precise bar load when applied to the boot, in other words when you're holding the saw the amount of weight transmitted to the bar isn't simply the weight of the chainsaw because you support most of that but there is a directional force and ambient weight which will obviously vary wildly - we chose 4kg as the load at the bar end as representative of slipping with feet braced below the cut. It's as arbitrary as any test figure but it is realistic for at least one scenario. (Of course another scenario could be dropping the saw completely in which case the load would be considerably higher). The rig was placed on an 8'x4' sheet of ply/compress-board and the boots screwed through the sole and top so that they could not rotate or move away from the chain as it touched, ignore the title shot with the boot on a log, it's just trying to show off before we screwed it down.

THE TEST METHOD

We used a large saw in comparison to the norm for the 'data' in this article because it may not be as 'zippy' as a new top-handle but it's got some grunt and it's the kind of saw that could easily be used by brashing ground crew at their most unguarded, when the tree is down and the end is in sight. We already knew that the thinner, high speed chains could inflict some seriously intrusive cuts and wanted to know if a broader chain would be held up any longer albeit with a more powerful engine behind it. We followed up these main tests using the same non-pro Stihl saw that we had used in the ProtectorPro review in issue one. This is pretty much just a 'hobby' saw that lacks the grunt of a pro-saw but it gave us a good comparison with the unfairly large saw we use for the results table.

The saws were revved to full speed, lowered to within a millimetre or two of the test boot then as the chain touched the boot the trigger was immediately released and allowed to rest on the boot running out - which normally occurred within 2 or 3 seconds.

THE BOOTS

We always impacted the same point on the boot - the front, side between the toe cap and the heel counter panel. This is the 'crease' or 'flex' point on most boots and not only is it a likely area of impact it could also be the weakest because it receives most wear (due to flexing and surface contact). In order to present a realistic amount of resistance to the bar we stuffed each boot with straw - there is a big difference in the ability of a saw to intrude into an empty boot as compared to one full of a big pudgy foot. Finally we put a screw through the front and back of the sole (into the base-board) and one in the collar to keep the boot firm and motionless.

TABLE ANALYSIS (page 28)

It doesn't actually matter about the brands specifically. These are all quality manufacturers with higher class protection models than just these examples. What matters is that these are a representative sample of boots as used day-in, day-out by arborists across the world (albeit that these are all european models). We think the Elten VPCP (8) and Lightning (11) are both Class 2 boots and if so it would seem that there is definitely something to be said for enhanced protection. Haix and the other key manufacturers make higher protection level boots that could walk these tests but demand is obviously curtailed by price and making a boot to Class 1 spec allows them to produce boots at the most sought after price point. Not that any chainsaw boot is particularly inexpensive - these are specialist items made by specialist companies so they are never going to be sold at the same price as those beach sandals. The higher protection levels obviously cost more and are sometimes more cumbersome because they are a little heavier but with the two pairs tested here we didn't notice any real difference until they fared

noticeably better in the tests and we started investigating exactly what boots they were. The Elten VPCP (pictures below and assuming we have the correct name for it) appeared to have two layers of Kevlar but the most important factor to come out of our tests was not that Class 1 chainsaw protection is inadequate as the 'norm' in chainsaw protective footwear. It was that the thing that is most likely to save your tootsies and keep you thinking that your boots are wonderful is a good, thick layer of leather. Good old fashioned leather. It needs to be thick mind - not that thin rubbish poor old Scott went through in that

Ignore the white strands in this first shot they are some strands of ballistic nylon floating around from the previous test

First Hit, through leather and Kevlar layer 1, stalled at Kevlar layer 2. This looks like ballistic nylon but is strands from a double thickness sheet.

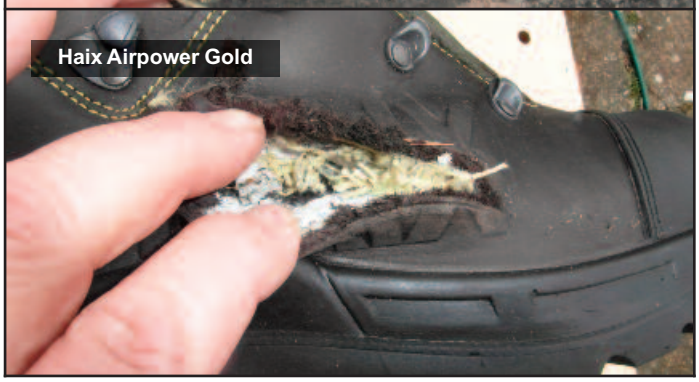
Second Hit, Chews out more of Kevlar layer 1,then into and through Kevlar layer 2 but only just nicks the orange mesh liner so the foot was safe


Haix Protector Pro#1


Haix Protector Pro#2


Haix Blue Mountain #1


Haix Blue Mountain #2


Haix Airpower Gold

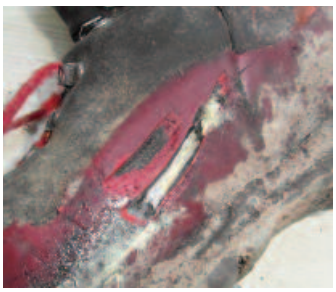
incident we mentioned in issue 1 but a stiff, thick leather. On the Lightning boots the leather is all that made it the best protected boot of all of those tested here. One obvious anomaly would seem to be the Haix Blue Ridge in test (7) - this shouldn't really be any better than the other 6 Haix Class 1 boots tested but made it to a third strike primarily because the leather held out on the first strike. In our table the difference between being 'thru to foot' on the first hit and the second hit was often far too close to call and had there been the slightest variable with the chainsaw - for instance a fraction longer on the trigger before release or slightly more impact pressure your foot would have been toast. The only ones that you could truly be happy with are those that made it to the third strike. Remember though that had we tested a different set of 17 boots we would have gotten 17 different sets of results and who knows, maybe they ALL would have survived the first hit and we wouldn't have written this article. But for the most part - these didn't and that includes, most worryingly, a brand new, high quality pair that appeared to fare much worse than the old warhorses with their stiff, beaten up leather.

When we followed up these tests with a set using the smaller chainsaw it was a slightly different story. With only one exception the leather on each boot held up the chain so that it didn't ever quite make it to the Kevlar.

Ah, see, you were wrong, my chainsaw boots do work. But wait for it...., once that leather was 'thinned out' by the first hit the second hit proceeded to go through the remainder of the leather and the Kevlar barrier easily. Of note is that the ballistic nylon models and that double thickness Kevlar Elten model again went through to a third hit. In the case of that Elten model and Lightning with its extra thick leather, they survived even the third hit. So you're still muttering that if the chain was held on the first hit that's a score for chainsaw boots. But not really - this was a small 'hobby' or 'farm' chainsaw not a pro model, and it was the leather **not** the extra protection that you think you have in Kevlar that is saving your foot. It would be interesting to try a big thick 4-season mountaining boot that's been used for several seasons - I bet that would take a first and maybe second hit? It's worth noting that the gnarlier and harder the leather the better the resistance to chainsaw intrusion seems to be (in our limited tests and observations). The new pair of boots we tested had lovely soft leather that actually is more comfortable than my dad's slippers but when tested with both saws it went through to the foot first time.

Does this mean that to look after your boots with nice oils, Thai massages and soothing words is counterproductive? Would your feet benefit more from harsh neglect of your boot leather? Remember that the religious adherence to conditioning of your boot's leather is all about its water resistance and comfort due to being more supple. No mountaineer or hill walker that gives you a 3 hour lecture on how best to apply Grainger's boot wax in order to care for your leather, is concerned about an angry chainsaw.

On the Meindl (Red) boots there is a very substantial rubber rand. We had two pairs of these and that rand obviously gets smoother and less rubbery with age but it remains a substantial



element of the boot. It's obviously very well made as well because there is no undue delamination on either pair. Out of interest we

tried the smaller chainsaw on this rand and it held out 3 times before the saw finally penetrated everything on the fourth hit. A rubber rand is not something you normally associate with enhanced chainsaw protection but, just like the thicker leathers, it does seem to have that effect.

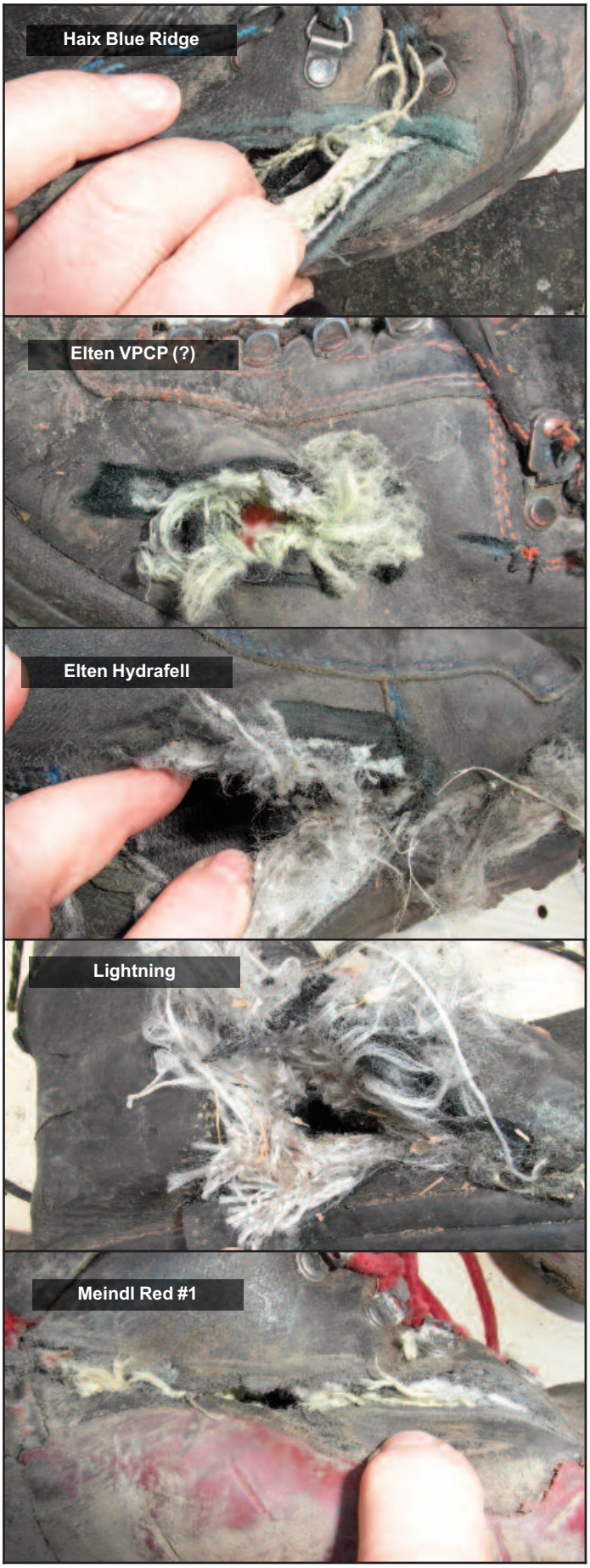
The two work boots performed differently. The Makita leather looked pretty good for a second and then gave up abruptly. But not as abruptly as the V12 Power Wear work boots (whatever they are?) We had to check that we hadn't accidentally substituted my dad's slippers because these gave up with just the threat of the chain and look at the carnage compared to the proper chainsaw boots.

CONCLUSIONS

Based on this limited set of tests it would be hard to draw a definitive conclusion that manufacturers wouldn't decry as not representative enough and probably contrary to their own test results but we can only tell you what results we actually got with a wholly reasonable impact by a saw typical of those in use every day by professional tree workers. So, if you asked our opinion we would surmise that Class 1 protective boots are a mostly illusory level of protection that may work for a glancing blow but even that is more likely going to be due to the holding power of the leather which can slow things up just enough to give the Kevlar half a chance at stopping the chain, although we saw little evidence of the stopping power of sheet Kevlar. On the whole we would be looking at class 2 or class 3 boots for any meaningful chainsaw protection. And these are readily available from all the manufacturers in our tests so it's partly us as buyers who are to blame for being too cheapskate to stump up for higher level protection and partly the fault of standards testing classifications that fail quite miserably to properly illustrate what the test criterion really means.....glibly saying 20m/second without also introducing chain width, power unit and weight of impact is virtually meaningless even allowing for the fact that you have to start somewhere.

We are frankly amazed that it has taken this long for something as fundamental as whether your boots will actually do what they say on the tin to come out. But this isn't the first time it's cropped up. While researching the test criterion for this article we came across a chap on a forum who had experienced EXACTLY the type of impact we have been discussing with exactly the same results as we had and had complained to the manufacturer that the boot didn't appear to stop the chain at all. The result: a candid reply that the boots were made to meet the Class 1 test requirement regardless of whether that 20m/sec criterion actually meant anything at all in the real world. That forum string quickly petered out and was never mentioned again!

The manufacturers are not to blame at all, they all make excellent boots that WILL do the job you require of them. The problem lies with the fact that in Europe at least, the class 1 rating makes it the most affordable and generally the lightest boot to comply with HSE or OSHA chainsaw cut-protection requirements. And that will ALWAYS be the case - there will always be an entry level boot that costs less and performs less well than those boots in the higher classes. You just have to know and accept that the boots you are wearing do NOT make your feet impregnable fortresses against a chainsaw cutting into your foot. They may not even withstand a meaningful hit from your smallest, crappiest saw. We might even surmise that you're better off with an old pair with leather that's toughened up through years of abuse and neglect than you are with a new pair or a well maintained pair, but that's largely conjecture that deserves to be tested.



	BOOT	CUT 1	CUT 2	CUT 3	Star Rating	NOTES
1	HAIX Protector Pro #1	thru leather	thru kevlar thru to foot		⬥	
2	HAIX Protector Pro #2	thru leather, nicked Kevlar	thru Kevlar thru to foot		⬥	
3	HAIX Protector Pro #3	thru leather	thru Kevlar nicked Gore-Tex thru to foot		⬥	
4	HAIX Blue Mountain #1	thru leather thru Kevlar thru to foot				
5	HAIX Blue Mountain #2	thru leather thru Kevlar thru to foot				
6	HAIX Airpower Gold	thru leather thru Kevlar thru to foot				Brand New
7	HAIX Blue Ridge	nicked leather	thru leather	thru kevlar thru to foot	⬥⬥	Although anomalous this is how we would like to think Class1 boots perform
8	ELTEN VPCP (?)	thru leather thru Kevlar layer1	nicked Kevlar layer 2	nicked orange liner,	⬥⬥⬥	2 layers of Kevlar. A small scratch to skin but otherwise held out.
9	ELTEN Blue (?)	thru leather thru Kevlar thru to foot				
10	ELTEN Hydrofell #2	thru leather	thru Kevlar thru to foot		⬥⬥	Nylon Strands
11	LIGHTNING (?)	nicked leather	nicked leather	thru leather nicked liner	⬥⬥⬥	Class 2, very thick leather. held out before hitting nylon strands (we think)
12	MEINDL Red #1	thru leather nicked Kevlar	thru Kevlar thru to foot		⬥	
13	MEINDL Red #2	thru leather	thru Kevlar thru to foot		⬥	
14	LAVORO	thru leather thru Kevlar liner intact	thru to foot		⬥	Nylon strands. Possibly a Class3 boot but it was impossible to decipher
15	MEINDL Active	thru leather thru Kevlar thru to foot				
16	MAKITA work	thru leather thru to foot				
17	FARM BOOTS 2	thru leather thru to foot				

[GET-OUT CLAUSE: please don't write in and complain that we should have done this or that or that 4kg is unreasonable or a big-ass saw and a hobby saw are not representative or that your hillbilly-bashers could withstand an impact from a Sidewinder missile - it's all arbitrary -you can never cover all of the scenarios unless you had a stainless steel boot or maybe chainmail sock. (Actually, that's not a bad idea?). We are simply pointing out that our particular chainsaws cut into our foot rather too easily on all except 3 of these 17 popular boots and that in all cases it was the leather more than the Kevlar that was doing the protecting. Only when the Kevlar became more substantial, as it does in higher class rated boots or it uses a thick wad of ballistic nylon did the boots perform how we would have hoped a normal Class 1 boot would].

Our Thanks to Tommy at Honey Brothers, Yvonne at Clark Forest and Haix Boots (Germany).

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