

Don't jump through hoops

So-called safety cages on fixed ladders are more likely to break employees' limbs than break their fall, warns Dr Dave Merchant

EVERYONE KNOWS portable ladders are dangerous things. They cause nearly 1200 major injuries and 13 deaths each year and, until the Work at Height Regulations (WAHR) arrived in 2005, they were often neglected in terms of maintenance, user training and inspection. Luckily, the campaigns are working and, while accident rates aren't dropping to zero yet, they're going in the right direction. So portable ladders should no longer be quite as dangerous.

But what about fixed ladders — the ones that everyone forgot? A fixed ladder sounds simple enough: it's a ladder, and it's been fixed to something — a building, a chimney or the back of a van — so by definition it's not portable. It has ladderish qualities — rungs and stiles — and people climb it.

Usually they give access to rooftops or loft space inside buildings, but they also appear on radio masts, wind turbines and industrial machines, and in thousands of underground shafts and inspection pits. In most cases they are steel, but they can be made of alloy or even wood. Some have hoops, some have fall-arrest wire systems and some are rusting into dust, but our problem is that the creators of the Work at Height Regulations seem to have mislaid their opinion of them.

Schedule 6 of the WAHR, which deals with ladders, is clearly thinking about *portable* ladders and steps — saying, for example, "A mobile ladder shall be prevented from moving before it is stepped on."

Only point 9 of the Schedule seems relevant to fixed ladders; it specifies a rest platform if the ladder is over 9m high. Of course that, in turn, would confuse someone tasked with using a 10m portable ladder.

Ruled out

The HSE has published excellent guidance on the use of ladders in its Safe Use of Ladders and Stepladders (INDG 402, available from www.hse.gov.uk/pubns/indg402.pdf), which starts by saying "... this guidance does not apply to fixed ladders ..." You won't get any insights on their use, safety or the standards of construction required — or, for that matter, if there even *are* any.

In fact there are two, both semi-optional and very complicated to interpret. The Machinery Directive standard BS EN ISO 14122-4:2004 applies to fixed ladders used as "means of access to machinery", and BS 4211:2005 applies to all the rest. When a ladder counts as "access to machinery" and what "machinery" means is a whole different problem, but whichever BS/EN you pick, they certainly ask for more rigour than you're likely to find in practice, both in design and testing.

Both, for example, say all fixed ladders over 3m (or within 3m of an unprotected edge) should have a fall-protection device, and that should preferably be a safety cage of specified shape and tested strength or, if not, a PPE-based fall-arrest system used with a harness. The Approved Code of Practice that came with the Workplace (Health, Safety and Welfare) Regulations required fall-arrest systems on fixed ladders over 2.5m tall, but that section was, ironically, revoked by the WAHR.

Legacy ladders

So what's the problem? Well BS/EN standards talk to people making and installing *new* ladders, not the people using them or unsure what to do with old ones. If we're building a new wind turbine tomorrow, we

use EN 14122-4, but how about a ladder in a factory that was installed in 1950? There will be no CE mark, no standards, no paperwork and no idea if users need to wear harnesses or not when they climb it. So — do they?

The WAHR simply don't say. They aim to reduce the "risk and consequences of a fall" by measures to control or prevent falls from height. That's brilliant but, because it's unrealistic to prevent a fall from a *portable* ladder using the normal methods of barriers or PPE, fall protection on ladders isn't mentioned at all. You can therefore quite happily climb up a 20m portable extension ladder and replace a light bulb without a harness or a trampoline below, provided you use three points of contact, set the ladder at an angle of 1:4, and don't spend all day up there admiring the view.

In contrast you can't stand on the edge of a 20m unprotected rooftop for the same amount of time without barriers or a harness, but the risk and consequences of a fall are identical. As the WAHR text is picturing portable ladders as it talks, there's no tie-in with those pesky BS/EN/ISO standards or the Machinery Directive, or any idea they even exist.

So what's clear so far is that:

- a *new* fixed ladder has lots of BS/EN/ISO standards that insist on fall protection
- you can climb portable ladders without a fall protection system
- if you climb a fixed ladder and it already has a fall-protection system you should use it simply because it's "supplied PPE" and workers have to use what they're given
- if you climb a fixed ladder without PPE or a cage ... err ...



This gap in the regulations creates some strange anomalies. Think of a 20m *fixed* ladder running up the side of a building. If you say “this is a ladder”, then you don’t seem to need a fall-protection system.

Of course, you can choose to have one, and those BS/EN standards would insist on it being fitted if the ladder was new, but it’s not prescribed in the WAHR so you don’t seem to need to retrofit an *old* one. If you say “this is scaffolding but in the shape of a ladder” then you *do* have an absolute requirement to use fall protection under the same Regulations.

Few people are daft enough to shin up 20m without some kind of safety system, but what if the ladder was only 4m high? The WAHR no longer have a minimum height, so to the letter of the law and the standards, the requirements in each case are identical. Falling from 4m can easily kill you — nearly 30% of all fatal falls occur from below 2m.

Three ways to go

So what should you do? Well, for starters you need to make sure all your *new* fixed ladders meet the appropriate standards, and that’s not too difficult even though few

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people seem to bother. Then you need to decide what to do with *old* ladders — and there are three options for your staff.

1. They only climb fixed ladders if they’re using a PPE-based fall protection system.
2. They only climb if they use a PPE-based system or if there’s a compliant safety cage.
3. They climb anything, with or without fall protection, as it’s only a ladder.

Options 1 and 2 sound safe and sensible, but will cost a fortune if you have 500 ladders to replace or upgrade, and in the meantime you can’t work.

Personally, I’m happy with the third option in some situations: where the ladders are very short, where there’s no risk of a second fall through a surface or over an edge, and where using fall protection would create new hazards (climbing with lanyards means you’re more likely to fall in the first place as you’re holding on with one hand).

On a tall ladder, the benefits of protection outweigh the possible problems, so in my opinion you should insist on it.

If you go with the PPE-based route there are several choices of system, depending on the situation. The “best” option is fall arrest on the ladder itself — EN 353 compliant fall-arrest systems or retractable reels that conform to EN 360. They will stop someone in a very short distance and don’t need the ladder itself to be especially strong, but are going to require basic user training,

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harnesses and inspections. Installation costs are similar to cages and scale down the higher the ladder, but the main benefit of wires, rails and reels is that the user has both hands free to climb at normal speed, so is more likely to use them and less likely to fall in the first place.

Alternatively you could give workers a Y-shaped, twin-tail, fall-arrest lanyard and tell them to clip to the rungs as they climb,

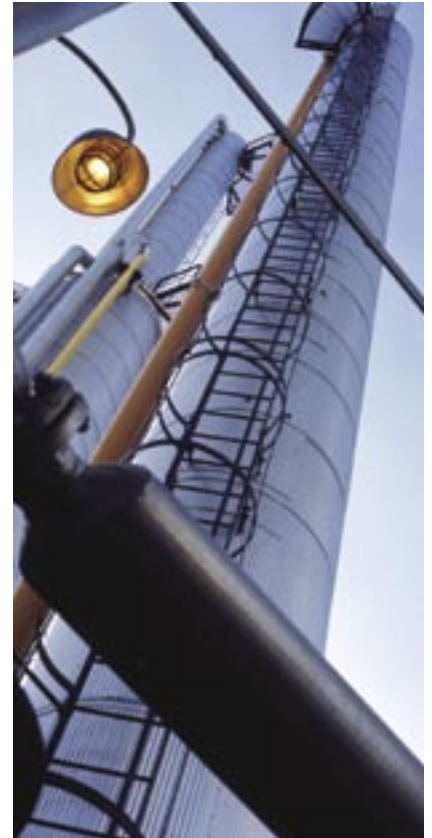
but that’s not an option on ladders with alloy rungs where the strength is insufficient (a lanyard can apply over half a tonne during a fall, so anything they’re clipped to must be able to support 1200kg).

Climbing like this is also noisy, slow and tiring, and so workers often don’t use the lanyards at all if nobody’s watching. Finally, lanyards can still let someone fall *several metres* before stopping them, and the ground may be somewhat closer than that. The advantage is we can climb a ladder without needing to alter it, so it’s an option on someone else’s property, *if* the ladder’s strong enough.

The truth about hoops

Hooped ladder safety cages seem the obvious answer, surely. After all, the standards promote them and you can forget about all those pesky harnesses. They’re the most common fall-protection system on fixed ladders, especially on buildings. A question though: what are cages for? To catch someone if they slip? To prevent falls?

Well, no. They’re to stop miners being crushed by their kibbles. In the dark origins of safety cages they are nothing to do with fall arrest or prevention. They are



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only “safety cages” in their original uses underground, to stop miners being hit by iron buckets full of coal and so they can sit on the hoops to rest when climbing hundreds of feet every day. In recent times they suddenly became a device for “preventing falls” but without any reasoning behind it.

In 2004 the HSE funded some research, published as RR 258 — Preliminary Investigation into the Fall-arresting Effectiveness of Ladder Safety Hoops (www.hse.gov.uk/research/rrhtm/rr258.htm), where crash test dummies were dropped down caged ladders of the older BS 4211:1987 design to see if they worked.

They didn’t, and the majority of times the dummy fell to the floor or struck the cage in a way that would have caused major injury to quite sensitive places.

That report has been published on the HSE website for a while, but hasn’t been promoted too strongly as obviously it raises some questions, not least “Why the heck is BS 4211 promoting cages if they’re so dangerous?”

After all, it’s only an experiment and, despite the results, nothing has changed in guidance, standards or law in the three years since it was written. We have a strange situation where the law doesn’t

seem to apply properly, the officially published research shows a huge safety problem, and nobody is prepared to admit there’s an elephant in the room.

One of the criticisms of RR 258 was that the dummy couldn’t react like a living person, so we’ve been extending the research with computer simulations where the dummy has natural reactions: trying to grab for rungs, writhing when hurt, and so on.

The preliminary results show two things; that the RR 258 data is correct in showing you can’t expect cages to arrest a fall before causing major injuries, and also that the design of the cage is critical.

Cages with five or seven vertical slats perform best (any more and it becomes a smooth tube so the body simply slides through) and the three-slat designs, extremely common in the UK from the old BS 4211:1987 specifications, are the most likely to cause decapitation.

In my opinion offering a ladder cage as fall arrest is insane; it may offer a (false) sense of security but if you fall it’s probably the cage that kills you.

I’d happily climb an uncaged ladder without a harness, but if I saw a cage I’d want PPE to protect me against it. If you’re

climbing fixed ladders, caged or not, the one thing you should take away is you have a few awkward questions that need answering.

If you still want to treat ladder cages as “fall arrest” systems, remember your only rationale is that if someone falls and one or more of their limbs passes outside

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the cage and gets trapped, that will reduce the velocity of the fall by removing that limb and so making them somewhat lighter, or shorter, or both. They will probably hit the ground in several pieces and if they don’t it will be because they have been stopped by a steel bar arriving between their legs at about 20mph.

And, if you’ve made it this far, you won’t be able to say you weren’t warned.

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