



THOUGHTS FROM AN AIRTIGHTNESS TESTER

An interview with Paul Jennings



Nic Schofield
Author & Airtightness Tester

I'm at the very beginning of my career in the green building industry, having recently qualified as a Level 1 airtightness tester. Currently I'm focusing on just taking one step at a time, and reminding myself that of course I'm not going to know everything yet. If I did it would be pretty boring, wouldn't it? Luckily, I'm not going it alone. I'll be working alongside the UK's most experienced airtightness tester, meaning I've got a wealth of experience to draw upon.

I thought it would be worthwhile to sit down with him (virtually, as he was at that point about as far away as possible in the highlands of Scotland!), to pick his brains and glean any pearls of wisdom that he's collected along his journey. After grappling with a transcription app (which had a challenging grasp of the English language), I thought I'd share our conversation with you.

So let's dive straight in; who are you?

Paul Jennings (trading as ALDAS), I've been airtightness testing for over 35 years, making me the most experienced airtightness tester and consultant in the UK - anyone doing it before me has retired! I started in the late 80's testing primarily testing social housing in London, courtesy of the GLC, the Greater London Council, and I've been lucky enough to work on more than half of the Passivhaus projects in the UK to date, in one capacity or another.

ABOUT US



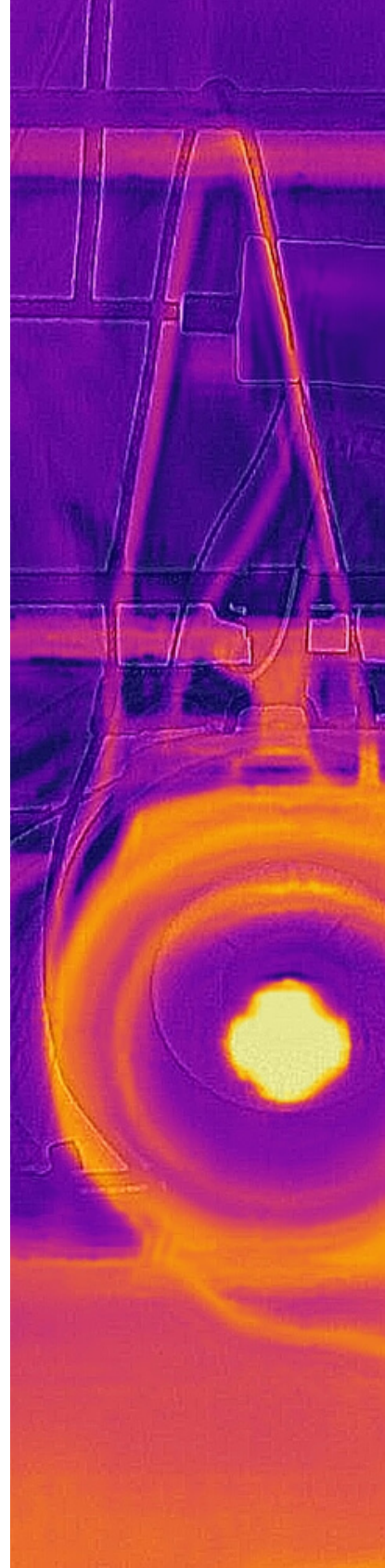
Paul Jennings - Aldas founder

How did you stumble across airtightness testing as a career?

A good question, it was a long time ago! I started a Civil Engineering degree at Loughborough University, but quickly realised it wasn't really for me. So I dropped out spent most of a year working for McAlpines building roads (guilty secret!) before starting again on an obscure course at Warwick University, 'Engineering Design and Appropriate Technology'. This seemed to appeal to rebellious, awkward and cussed students; over half of my year were drop-outs from other courses. It was a ground-breaking and innovative course, and several of my fellow students remain friends and professional associates to this day. Of course, we were a goad to the university establishment and unsurprisingly the course was discontinued a few years later!

At the end of my degree, I did a dissertation around fuel poverty working with an energy charity in London, the 'Energy Conservation and Solar Centre, ECSC'. After graduating, I went to work for ECSC on something called the 'Tenants Energy Advice Service' which was funded by the GLC. We provided technical energy and heating advice to council and housing association tenants in an effort to counteract some of the questionable (to say the least) proposals and advice that some local authorities were then dishing out. This was during the late 80's when a lot of the heating systems in old tower blocks were failing and being replaced by storage heaters, with massively increased heating costs.

The GLC wanted to improve the energy efficiency of the housing stock, to promote better homes with better living conditions whilst creating local jobs for local people. They looked to introduce new technology and practices for energy efficiency from around the world, and considering the weatherisation programs then popular in the USA decided to encourage Airtightness Testing in the UK. We were funded through the Polytechnic of Central London (now the University of Westminster) who bought us some test equipment and paid for trainers to come over from Canada to help us get to grips with using it. Two of us then spent the best part of two years going around London testing social housing. Looking at what the leaks were, what could be done to improve them, developing standard reports and essentially pioneering the wider adoption of airtightness testing in the UK.

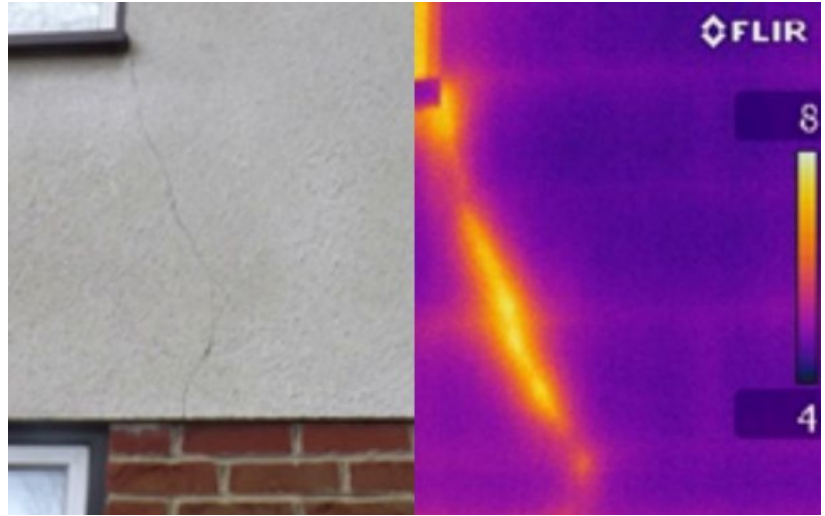


CASE STUDIES

I often find people are politely confused when I mention my job, so for the interest of the completely uninitiated, what exactly is airtightness testing?

Homes and other buildings that haven't been built to a good standard of airtightness inevitably let air move through gaps and cracks. This creates an uncomfortable living environment; no one likes a cold draught! Pumping heat into a leaky building also wastes energy and increases fuel bills and CO2 emissions. Moreover, wherever air moves, it will take water with it. Water is bad news for our buildings, resulting in condensation, mould and ultimately rot, which can lead to long term structural damage.

That's why the airtightness slogan for many years has been: Build tight, ventilate right. Ventilation, because we need to get rid of moisture, smells etc.- and in properties with older coal and gas fires (mostly in the private rented sector) air is needed to avoid the health risks of incomplete combustion.



The thing about air is it's invisible; we can't see it, so except for draughts, which are air moving at velocity, you don't feel it. So what airtightness testing is really about is using the blower door fan equipment to impose drafts on a building in order to find something that is fundamentally invisible. If it's a major leak you will be able to feel it with your hand, or see cobwebs moving. Leaks can also be identified by thermography or using various types of smoke; watching how it moves to find the gaps and cracks. Once you've found the leaks they can be fixed and the property retested to show that you've fixed them. People often worry about the pressures the fan will impose on the house, but there's nothing to worry about, your budgerigar isn't going to get sucked off its perch and the dog won't fall over.



Standard atmospheric pressure is around 100,000 Pa, we impose a range of pressures up to a maximum of 100 Pa. The target test pressure (50Pa) is about the same as if there was a 20-mph wind acting on the building. Software takes the test readings and calculates an airflow through the building. This is then divided by the surface area to give the air permeability (units m³ of airflow per m² of building envelope, at the raised pressure of 50 Pa). For Passivhaus and other low-energy projects the airflow is divided by the volume of the building to give the air change rate, more suitable when Heat Recovery Ventilation systems are installed.

Ultimately the test gives either a pass or a fail for the building, depending upon what it's aiming for.

Following a "fail" a detailed leakage examination is usually undertaken and then a comprehensive report provided documenting the test results and the leaks found.



When did airtightness become a part of building regulations in the UK?

Around twenty years ago now, in 2002, the first air tightness regulations for new build construction were introduced. Although all buildings were supposed to meet the (very lax) airtightness target, testing was limited to large non-domestic buildings, those over 1000 m² floor area. Anything smaller and the contractor just had to promise that it would have a maximum air permeability of 10; well, you can imagine how well that worked! It wasn't until the 2006 that testing for new dwellings was required. Again, the system was flawed, for larger sites only sample testing was required.

With a few honourable exceptions I can say from experience that volume builders were known to cheat and game the system – not much has changed with regard to that! Builders routinely only picked the best dwellings to test, or sometimes only applied sealing works to the ones that they were going to test. UK construction culture, especially at scale, mitigated against good air tightness. Sites were often driven by the completion requirements so that invoices could be issued, prioritising speed and often sacrificing quality. To compound matters further, the amount of time and money that local authorities could spend on building control was being reduced. For a long time, air tightness testing was seen as a pain, something builders had to get past rather than an accepted part of quality control in the building process.

Do you think things are improving now?



Yes; albeit slowly but yes, they are. With the latest regulations that came into force in June this year, the maximum air permeability has gone from ten to eight. Although an improvement, it is in all honesty still very poor and needs to be seen as a backstop, the worst possible outcome, definitely not something to aim to achieve. Another element of the new building regulations, is the 'carbon target' which aims to reduce emissions from new builds by at least 75%. Luckily, this goes hand in hand with airtightness as it's much easier to achieve the carbon target if you can get your air permeability significantly and robustly down. With this in mind most new builds from now on will actually be aiming for targets of between 3 and 5, which is much better.

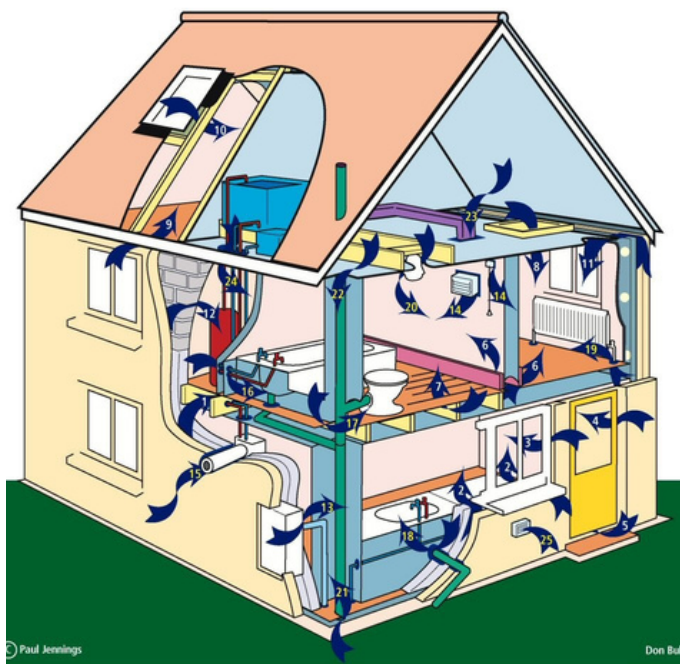
It is also now mandatory for all new builds to be tested, hopefully getting rid of the historical sampling loopholes. The importance of robust airtightness cannot be underestimated; we really ought to be seeing the introduction of retests after the defects period (normally one or two years) to ensure the air tightness is being done well enough to withstand the test of time.

GET TRAINED

Do you think the building industry is getting on board with the idea of good air tightness?

Compared with the early years, a lot of builders these days have witnessed an air tightness test and with the new regulations coming in, soon that will be every builder. This is a great step forward. We always used to say, and it's probably still true, that the first air tightness test that a builder experiences really is transformational. Being able to feel the leaks and find the problem areas really helps put the jigsaw of airtightness together and can be a lightbulb moment for many. What we ought to be doing now is making sure that every architecture student, every construction student, basically everyone involved in the building process, has experienced an air tightness test so they know where buildings can leak, and what to do about it. The skills required for this are incremental, not enormously transformational, it's more in the way that you approach the build, a change in thinking, which is easily achieved with training, improved site ethos and better guidance. Getting to grips with the basics by investing in hands-on training courses as well as onsite training is far better than the disheartening feeling when someone like me comes along and says 'sorry you've failed' followed by the time consuming, and often expensive remedial works required to get the building to pass.

Let's design buildings which make it easy to do the airtightness, let's not make it unnecessarily difficult for builders to achieve. It requires joined up thinking, looking at the project as a whole with airtightness at its core, with everyone on board. There is a whole pile of communication around this; from air barrier diagrams of the whole house, right down to a detail on an A3 sheet focusing, for example on just one small corner. It's these details that ensure a project will be achieve its aims; but you need well trained people on site, who understand why it's important and are prepared to stick to the details without cutting corners.



**WHERE BUILDINGS
LEAK**

It's absolutely true that prevention of air leakage problems (by good design) is so much better than curing them. There has to be more of a 'no blame' culture within the building industry. Everyone makes mistakes, but let's own up, deal with them, learn from them, and move forward. Communication is key. What you don't want is mistakes to go unnoticed.

We had a set of newbuild Passivhaus houses near Stansted which were failing miserably when we tested them. Only to discover this was because there were three holes drilled through the inner leaf to fit one boiler flue! Obviously, they made mistakes with the boiler positioning, but nobody had thought to mention the two redundant holes that constituted a massive leak through to the cavity in the external wall. Or an early Welsh Passivhaus where, after all the airtightness works were complete, the satellite TV engineer came along and drilled a finger-sized hole right through to the outside, through which you could see daylight!

Is there a person on site who's in charge of the air tightness?

It's actually very rare. If it's a self-build project, quite often people get obsessed about this, normally the homeowner. Whilst I was at the best house I've ever tested, a cross laminated timber house, the homeowner jokingly told me he had threatened to kill his electrician for making extra holes. That's how passionate he was about air tightness! Currently, we think it's the third most airtight house in the world. Passion obviously works.

There is also the relatively new and developing site role of the 'air tightness champion'. A person who takes on the responsibility of making sure the air tightness happens correctly on site. We run training courses, and support people in this position. It's a role that requires both authority and knowledge. You have to be able to work well with people, to gain their respect so they understand why your role is important to the build, to get them to buy in to the process. You have to be willing to keep an eye out for things that may affect the airtightness. One of the things we say to people, when we're training, is that if you walk onsite, and see somebody cutting a hole in the wrong place, you have to know the job well enough to be able to say, "stop, don't do that!" and back it up with an explanation of why as well as how to do it correctly.

Even with the best architects doing airtightness, there are always questions that have to be resolved onsite to ensure a good result. Traditionally, this devolves to the site manager who's often already too busy with too many other things. When a site has a good air tightness champion however, they can ensure that these queries are dealt with in a timely manner so things aren't missed. Good airtightness needs good communication especially now that targets are becoming more onerous.



AIRTIGHTNESS CHAMPIONS TRAINING

Without proper planning and good communication projects will fail and I frustratingly see examples of this all the time. I've worked on an EnerPHit (Passivhaus refurbishment) project where I saw the kitchen being put in, then taken out because they hadn't done the airtightness, only to then have to take it out again because they had to modify the sealing behind the kitchen units. That's wasted hours, wasted materials, wasted money, all of which could have been avoided with proper planning.

If you want to hit your target you simply must ask the following questions:

- Is the airtightness delivery process planned?
- What are the products and techniques relied upon for airtightness?
- Is there a continuous air barrier, considered in three dimensions?
- Is the airtightness continuous and joined up, are there any gaps or lack of clarity?
- Are people being supervised properly?
- Are operatives on site following the airtightness design?

That's why having airtightness champions on site can make all the difference!

Any other things you'd like to add before I leave you to crack on with your never ending 'to do' list?

The whole mass market needs improving; in volume building especially a lot of old and bad habits need to be retired and replaced with effective sealing by trained staff who have enough time to do their job properly. So often the demands of the program on site steamroller over the requirement to deliver quality – and that can be a costly and painful experience for builders new to onerous airtightness targets. Nationally, we're aiming to build 300,000 new homes a year and at the moment less than 2% are Passivhaus, the gold standard which really does deliver good airtightness. But the real market isn't the new builds, it's the existing building stock.

Depending on whose figures you take, the UK has approaching 30 million buildings, mostly dwellings that need fixing up; that's a lot of work for people. We need a call to arms to help fuel the green building revolution. Building and fixing up homes is valuable work, it's making people's lives better and generally people who do it feel like they're doing something worthwhile, because it is. Whether it's an investigation to find where the problems are (and dealing with them), passing on knowledge via training courses and events, or helping to design projects to ensure they are not only airtight and well ventilated, but generally pleasant and environmentally friendly places to be, I find my work as an airtightness tester and consultant very satisfying.



Airtightness Testing

Aldas are the most experienced Airtightness testers and consultants in the UK. We undertake bespoke and complex testing and leakage investigations, also thermographic inspections. For challenging and major projects requiring exceptional airtightness, Aldas will work with you to develop a solution.

**AIRTIGHTNESS
TESTING**



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