NINE COMPLIANCE HURDLES ARCHITECTS NEED TO KNOW

Monkeytoe

EVERYTHING BETTER

A NOTE FROM THE DIRECTOR

We've long understood the importance of safe and effective design.

We can all agree that, at the heart of it, we want to know our friends and family are safe. Our goal should be to do what we can to reduce risk wherever possible – and that starts with good, conscious design.

At Monkeytoe, we're passionate about ensuring that a high standard of reliable, durable construction is maintained across the industry. Understanding and implementing the best practices of the code – including those tricky points that can trip up even the best architects – is the best way we can move towards zero harm while we push the boundaries of great design.

The foundation for that best practice is undoubtedly the New Zealand Building Code and the acceptable solutions it outlines. This should be only the beginning of the sound judgement that leads designers and builders like ourselves towards safer and more reliable building environments that serve their users for a lifetime.

The more we reflect on the best practices, the better chance there is of not only our work being safe, but also lasting longer and having a greater positive impact on people's lives. Read on to see why we're so invested in understanding compliance, including those elements that can often be overlooked.

Tim Prestidge
DIRECTOR OF MONKEYTOE

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INTRODUCTION

Any chance to reduce harm is a chance to improve systems and design a safer environment. What the NZBC offers is guidelines to ensure buildings and structures are safe, healthy and durable.

All that's pretty obvious, but sometimes we miss some critical points in the code that will show up in nearly every building site. We've found nine compliance hurdles that architects need to know about walkways and railings for every site.

When designing walkways, you're unlikely to be able to work with perfectly level environments – so what's considered acceptable? When can a walkway be a ramp, and when does the gradient demand that you'll need to have a flight of stairs? And as that flight of stairs becomes steeper, at what point is a ladder better suited for safety and ease? It's a complex series of questions, and creating a solution best designed to your clients' needs will depend on understanding how each aspect of the Building Code lines up.

Some information is legacy code, such as the need for handrails and the walk-off rules for ladders; the rules haven't changed much over the last thirty or so years, but getting it right can make a real difference. Take the width of a walkway, for example: the minimum width has been set for so long we can take for granted the basic requirement that we have good clearance to carry equipment between edges or handrails.

It's a good reminder that some things have been in place for years for a simple reason; they work.

Other rules and regulations have changed in the last few years, as we've learned about better health and safety practices. Working carefully around asbestos roofs has become more important, as installing walkways or equipment on this delicate material can be a real challenge. Some simple tricks can make a difference.

I think we can all agree that, at the heart of it, we want to know our friends and family are safe. So making sure we know our code – and those curly points that can trip up even the best architects – is a great way to ensure we can push towards zero harm while we push the boundaries of great design.


WHETHER YOU'RE
DESIGNING A ONE-
BEDROOM FLAT
OR THE NEXT BIG
SKYSCRAPER, ONE
THING IS CONSTANT:
THE NEW ZEALAND
BUILDING CODE.

WALKWAY OR STAIRS

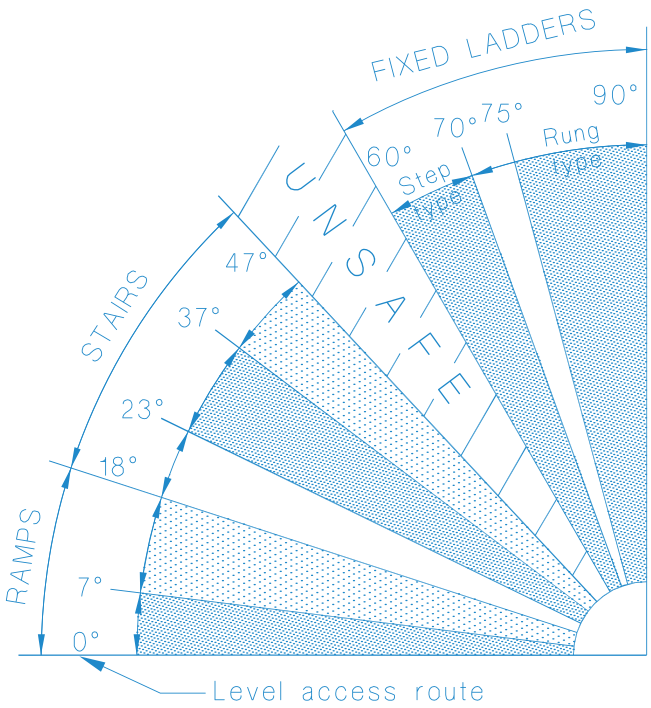
#1

If you're designing access routes – especially on roofs – you'll almost certainly have to choose between some way of transitioning a gradient. Thankfully, when it comes to designing walkways, ramps, stairs and ladders, the New Zealand Building Code offers clear indications for which of these solutions is best used, and when.

So, what's the best practice? Well, when it comes to determining whether to use a ramp, stair or ladder, the New Zealand Building Code (NZBC) D1 document covering Access Routes offers a quick-check diagram to indicate at what gradients each solution is best suited for safety and longevity.

NEW ZEALAND BUILDING CODE
/CLAUSE D1/ ACCESS ROUTES

Acceptable Slopes for Ramps Stairways and Fixed ladders



0° covers your level access walkway, while anything up to a 7° incline (i.e. a rise of 1 in 8) is a ramp with relatively easy access for those using it to manage, whether they be walking or have limited mobility.

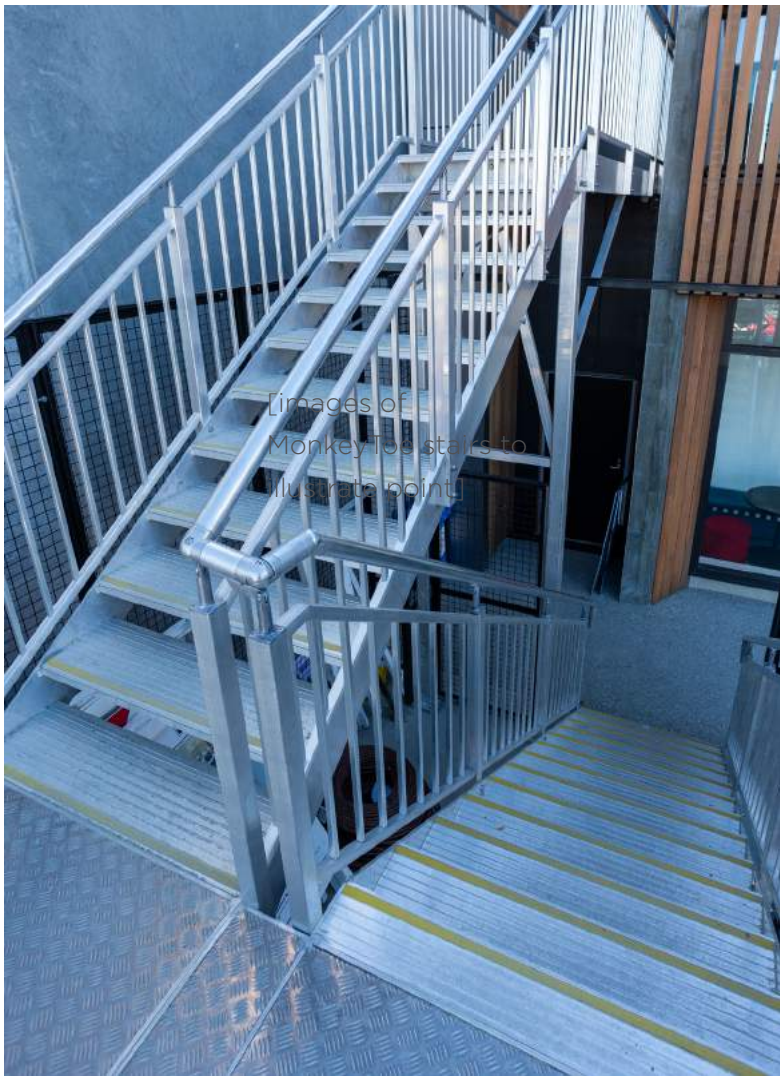
If you design a slope between 7° and 20° (i.e. 1 in 2.7 or greater), it starts becoming more difficult on ankles, so there's a higher chance of the average person slipping. Here you'll need to allow for cleats or grates to improve comfort and safety.

Above 20° and slopes become impractical, so stairs are your best solution. It's little wonder that the NZBC suggest stairs for gradients between 23-37°, given that this brackets the 20-30° of your common roof angle. A set of lightweight aluminium stairs – complete with cleats or grates – are the best and safest solution for allowing traffic over roofs.

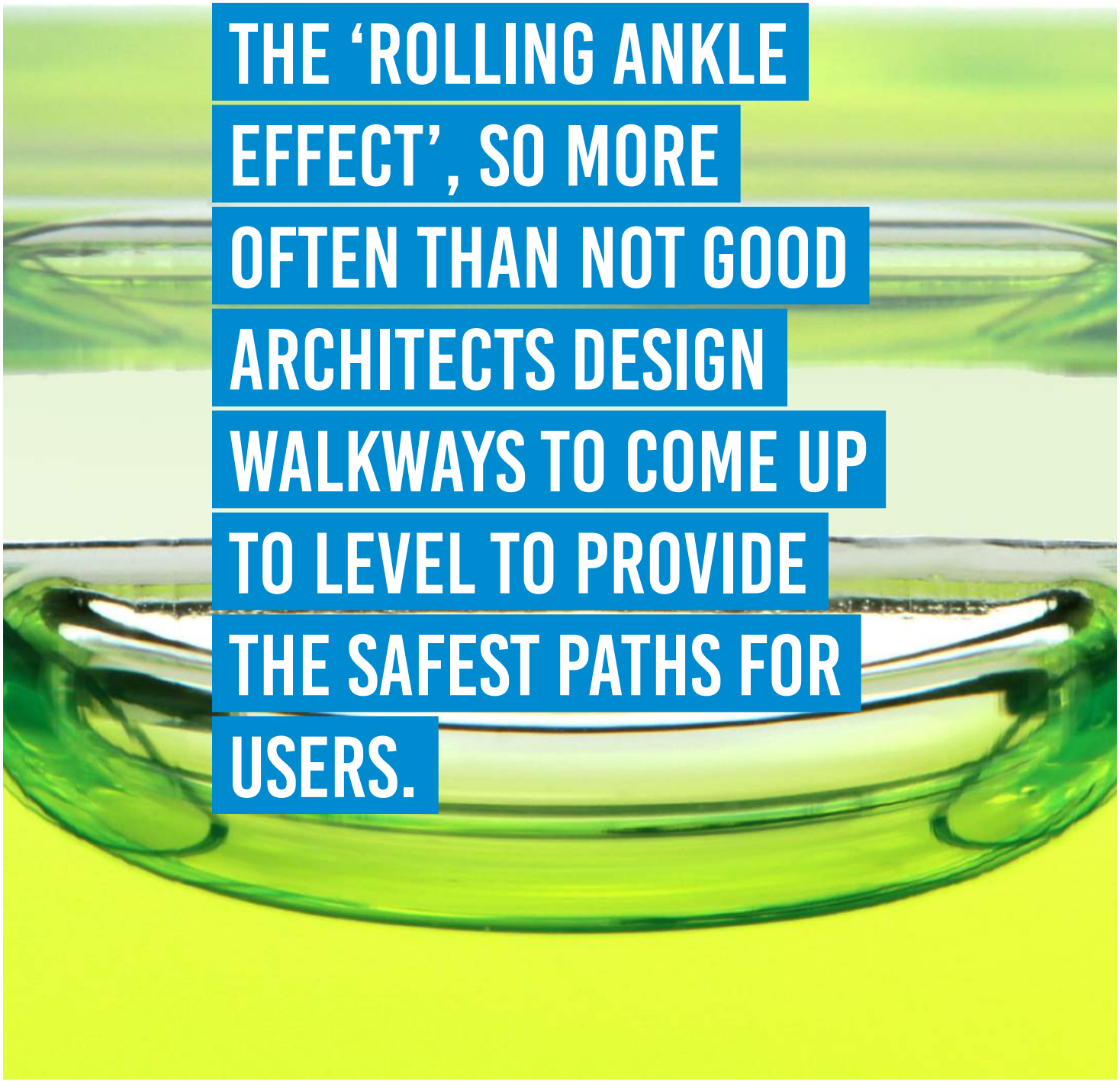
STEPS & STILES
Egress stairs

Stairs up to 47° are best suited for low-traffic service areas. 47-60° is considered an 'unsafe' angle, neither suitable for steps nor stairs – most people won't be able to navigate them comfortably in this awkward middle ground and, if it's uncomfortable, it's unsafe. For this sort of gradient, go for a combination of stairs and/or ladders with platforms.

Beyond 60° and you have fixed ladders designed according to need – depending, for example, whether the ladders are used frequently with gear or loads, or just personnel.



Aluminium Egress Stair at Bayley's House Queenstown.



WHEN WALKWAYS ARE SLOPED, YOU INCREASE THE RISK OF THE 'ROLLING ANKLE EFFECT', SO MORE OFTEN THAN NOT GOOD ARCHITECTS DESIGN WALKWAYS TO COME UP TO LEVEL TO PROVIDE THE SAFEST PATHS FOR USERS.

LEVELLING WALKWAYS

#2

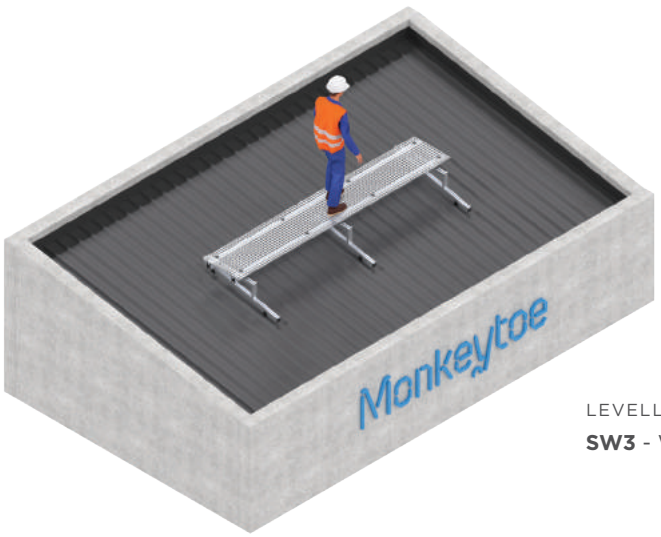
Ideally, if you're designing a walkway that's perpendicular to the roof pitch, you'll be aiming for a walkway as close to level as possible.

For the same reason that slopes need to become steps if they have a gradient of greater than 7°, when a walkway is running perpendicular to the roof pitch and that roof pitch exceeds 7°, the walkway must be levelled.

This is another situation where minimising the difficulty for people also increases the safety.

Given that most new roofs are 5° or less, it's become very easy to design walkways that are not only under that 7° limit but, with some extra consideration, can be made level.

Levelled Smartwalk Walkway at Pacific Coil



LEVELLED 7-50 DEG.
SW3 - Walkway

WHEN DO I NEED HANDRAILS?

#3

We've long known that any drop that's deemed a hazard requires a handrail or barrier to limit the chance of an accident or harm.

Given the NZBC F4 3.1 (Safety from Falling section) spells out the '1 metre' rule, it's often treated as law; if someone could fall 1 metre or more from an opening or floor, a barrier is needed. Barriers in this instance need to be continuous, rigid and strong – think aluminium railings.

Any drop of more than a metre needs a barrier and, on a set of stairs or a walkway, the handrail is considered part of this. If you're providing a railing along a staircase or walkway – some graspable support – then set the rail at a minimum height of 900mm from the floor level or the stair pitch line.

In addition to drops of 1 metre or more, or with balustrades and handrails, a barrier or rail is often a matter of choice; your client may have a 300mm drop designed in front of a feature – constructing a barrier or handrail limits the chance of that drop being used as a step. After you've allowed for F4.3.1 and D1 however, it's really a matter of professional opinion.

LEVELLED 7-50 DEG.
WM4 - Walkway with Single Handrail

Aluminium Walk-way Mounted Handrails at Bunnings Hamilton.

WHAT DO I DO WHEN MY ROOF HAS SKYLIGHTS?

#4

When dealing with residential skylights, there's generally no access limitations; the NZBC specifies moisture tightness and little else, and residential skylights can often be walked across thanks to their thickness and dome shape.

When facing skylights on a larger scale, a bit of common sense will go a long way – especially when it comes to providing barriers and handrails for the best safety. This is because large skylights are considered 'open edges', and therefore under similar rules as any drop of over a metre.

Larger skylights, such as on commercial buildings, can be trafficable – that is, able to be walked across – or non-trafficable.

It's possible to have a skylight's that tough enough to handle the weight of a person while still letting in enough light, but they aren't especially common. Getting a material that's trafficable and transparent enough is often relatively expensive, so the easier solution is to create a non-trafficable skylight with good precautions in place.

It's worth allowing for commercial safety-rated mesh (such as Ausmesh), as this makes a great precaution in case someone does treat the skylight as trafficable. It shouldn't be assumed to explicitly make a skylight trafficable – it's impossible to tell while standing on the roof whether safety mesh has been used. Instead it's a safety belt, a precaution in case the skylight breaks.

The best solution – and one that covers trafficable and non-trafficable skylights as well – is to use a lightweight railing at two metres from the open edge and at a minimum height of 1000mm as per NZBC F4 Paragraph 1.1.1 and Table 1. That way you've set up the safest solution for any circumstance.

LADDER CLEARANCES: TOES & CAGES

#5

Getting up and down ladders is a matter of safety as much as access. One of the most important aspects of ladder design is making sure there is enough foot clearance on each rung to ensure people can navigate the ladder in as safe a way as possible.

This is another instance where the NZBC makes clear the distances required for best safety and usability. If you're designing a rung-type ladder, D1 5.3.1-e-iv tells you the toe clearance to any wall or solid object behind the stair needs to be a minimum of 200mm.

The 200mm rule gives good space for the average foot. The rung is likely to fit into the nook of the sole right in front of the heel, which allows a healthy clearance to the toe even with heavy boots on.

Likewise, you need to allow plenty of space behind a user to allow them to climb ladders – with or without equipment – without knocking obstructions to the rear of them. Look up D1 5.3.1-e-i and you'll see it defines the clearance as 750mm between the rungs and any obstruction behind the climber.

One way of achieving this back clearance is with a ladder cage, which will need to be 700-750mm from the rungs for a rectangular pattern or 750-800mm for a circular pattern design. [Fig. 21]. This will give good clearance and reduce the chance of harm.

Ultimately, you want to minimise the chance of knocking something or having someone slip; when safety fails, it costs lives. Get it right and everyone's safer.

Caged Ladder
at Saatchi and Saatchi
Auckland

HOW WIDE IS A WALKWAY?

#6

This is a situation where the NZBC isn't explicit. The information is non-specific on how wide an access walkway should be, so most people turn to the 1992 New Zealand Standards and Australian Standards document on fixed platforms, walkways, stairways and ladders: NZS/AS 1657:1992. 'NZ/AS' or '1657', as it's often called, is considered an acceptable supplement where information is lacking in the NZBC.

Under Section 3.1.5 you'll see what dimensions are considered minimum for best practice for widths.

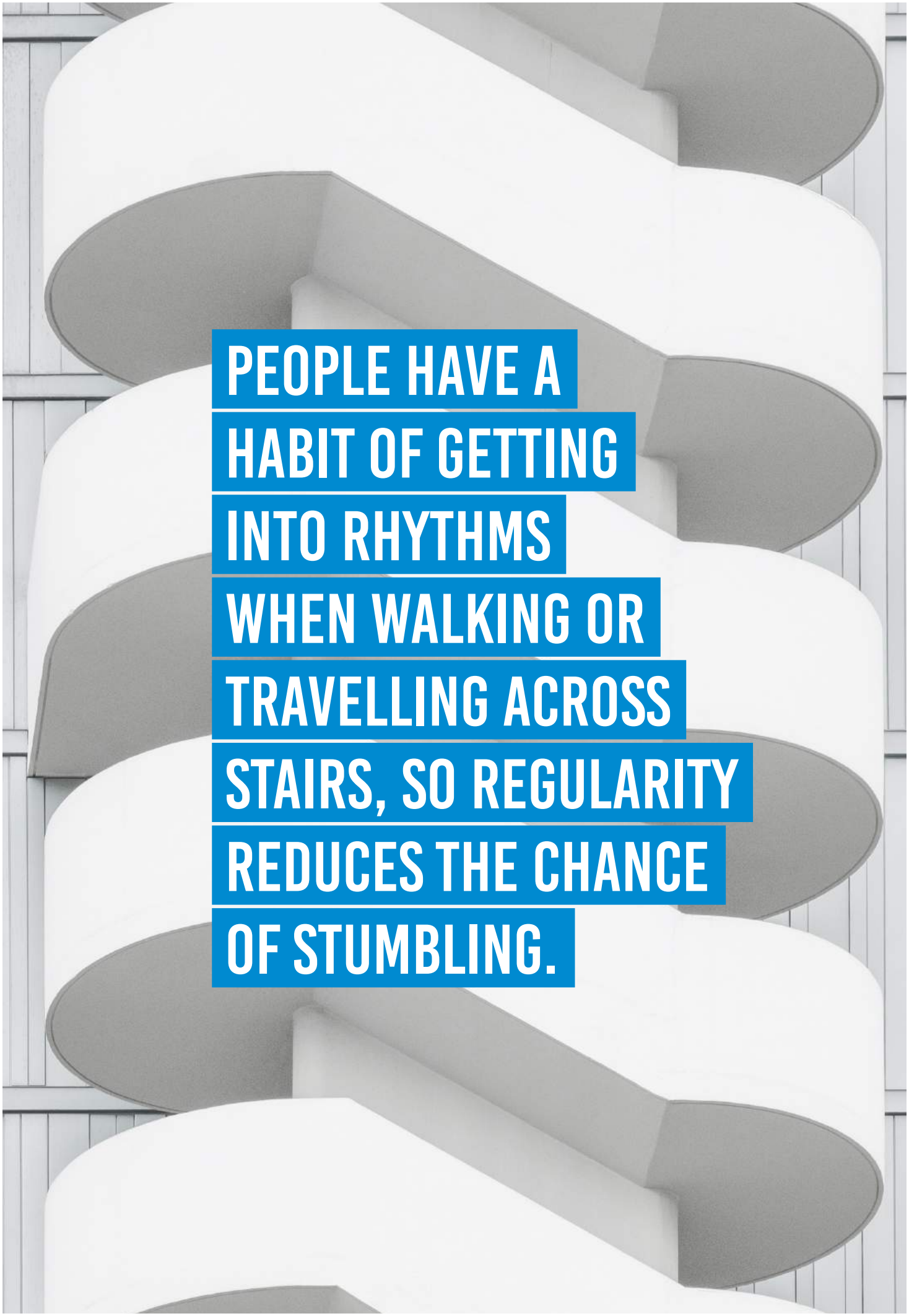
According to 3.1.5.1, a 'platform' should have a minimum clear width of 600mm. This is often considered the best practice across New Zealand – it's a good width to start designing platforms and walkways, since it allows the average person to comfortably stand or walk while carrying equipment.

Anything narrower could be a hazard, especially in a hurry.

Keep in mind that 3.1.5.2 requires the minimum distance between handrails on a walkway to be no less than 550mm, or 600mm if a fixed structure is less than 100mm from one or both sides of the walkway. If in doubt, more is better, hence why 600mm is the industry standard.

The gold standard of the NZBC D1 requires that a handrail can be considered a 'minor projection' provided it doesn't project more than 100mm into the access route. Designing walkways with rails should take both into consideration, as this may affect the overall width of your design in order to first accommodate NZBC and then NZS/AS 1657 standards where needed.

Smartgrip Walkway
at Queenstown Airport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WHEN DO I NEED A STEP? #7

When establishing a walkway – whether that be service or private – the key is uniformity where possible. People have a habit of getting into rhythms when walking or travelling across stairs, so regularity reduces the chance of stumbling.

While a ramp can be the best solution for transitioning a gradient, sometimes a series of levels – with a step or two introduced – can be a more efficient or more attractive way to establish a walkway.

Let's say you're transitioning between two levels that are 400mm different in height. Since steps need to be regular and within + 5mm, that's 2x 200mm steps that should be built in so that the user has the best chance of stepping without issue.

It's worth noting that NZBC D1 Figure 11 determines that the rise between two steps can be no more than 220mm (i.e. for service stairways, up to 47° gradient). If a step or two are the best solution to changing height, then dividing the difference into a whole number of steps each no greater than 220mm is your best bet.

THE 2M WALK-OFF RULE FOR LADDERS #8

In virtually every ladder description and image in the NZBC (or AS/NZS 1657, for that matter), there's no specification for ladder walk-offs. Does that mean you don't need to allow walk-offs at all?

The answer is a definite no. While the NZBC and 1657 don't specify a clearance for ladder walk-offs, NZBC does require an 1800mm landing to arrest falling users in D1 4.3.6(c).

However the industry standard – passed down from the older '3m drop/2m back' rule – is to allow a minimum of 2m from the ladder base before any obstruction or railing.

Since it's a long-established standard, 2m is the rule for most inspectors.

In any case, a greater clearance for safety is best, for much the same reason as the idea that ladders need cages behind them. Should the worst happen and someone or something fall from a ladder, the 2m puts them away from any obstruction that might cause more damage.

Think safety and adopt the best practice with a 2m clearance.

WHAT TO DO ABOUT AN ASBESTOS ROOF

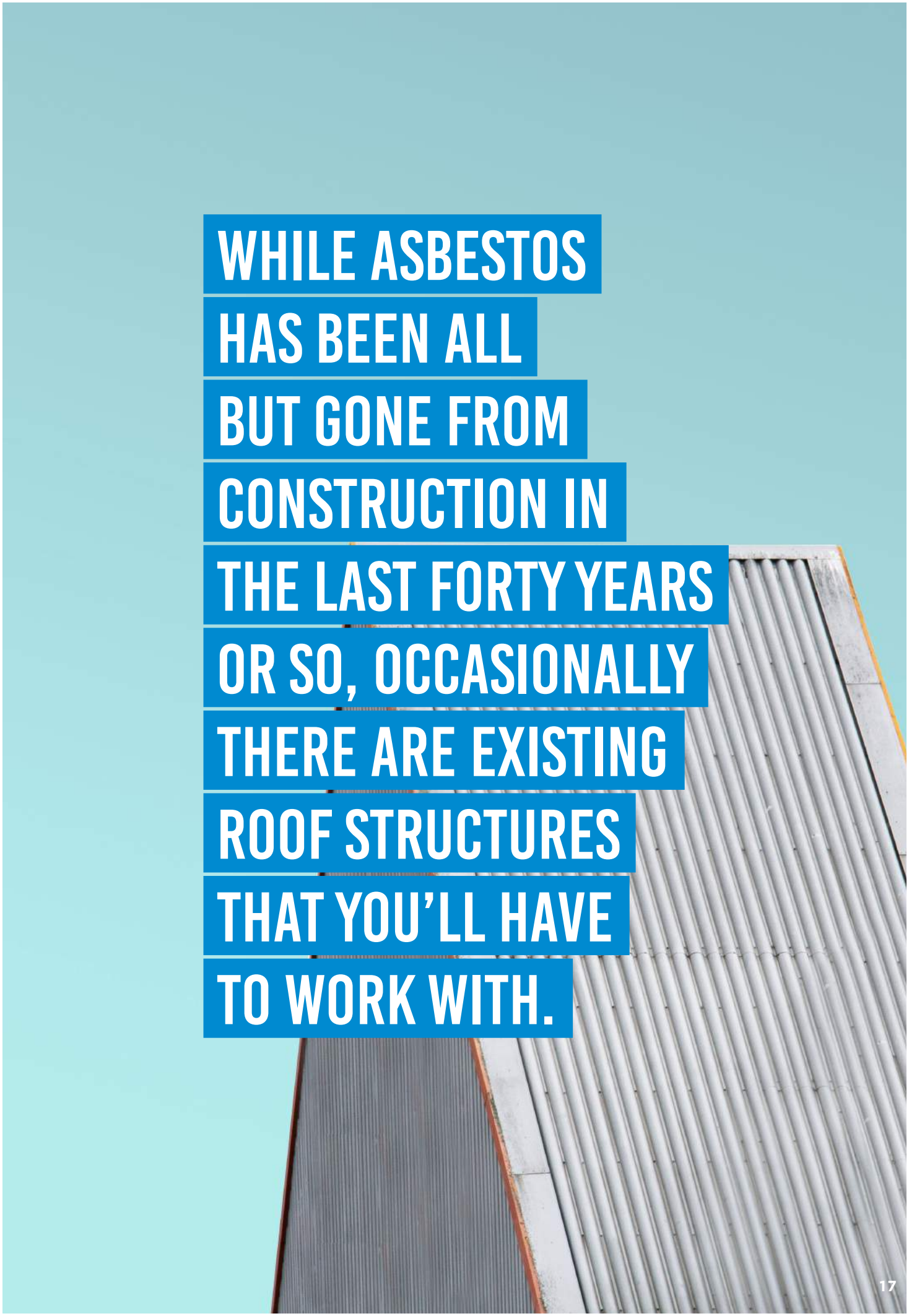
#9

Despite its valuable fire-retardant properties, asbestos and its fibres are now known to cause serious and ongoing health issues. While asbestos has been all but gone from construction in the last forty years or so, occasionally there are existing roof structures with asbestos that you'll have to work with.

Adding a walkway or stairs can be a great way of maximising the life of an existing roof, but working with asbestos is unenviable and frankly best avoided. It's inherently brittle, so there's no chance of either walking on a roof with it or using the roof itself for any form of support without it giving way, potentially causing major health and clean-up issues.

There's also the limitation of installing a high-quality aluminium structure onto a building with older timber battens, which are the likely structural backbone of buildings with an asbestos roof. These may not be up to par when it comes to handling the additional weight of walkways and equipment.

If the building is sound, you're best to bring in asbestos specialists who can take on the responsibility of drilling holes so that your structure can be installed. Allow a double-sided handrail the entire walkway over the roof to reduce the chance of someone attempting to treat the roof as trafficable, and you'll be good as gold.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