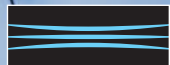


TRANSPOWER



Let's Grow Together

A design guide for
kiwifruit orchards



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About this guide

This guide is to help you plan your work around Transpower transmission lines.

This guidance can be used by any grower wanting to build crop structures around Transpower lines.

Let's grow together has been developed by Transpower New Zealand with the New Zealand Kiwifruit Growers Incorporated (NZKGI) and Horticulture New Zealand (HortNZ).

It builds on the Memorandum of Understanding signed by Transpower and HortNZ in 2013, which outlines how both organisations can work together for the benefit of growers and the National Grid.

Prepared by Transpower New Zealand in association with Horticulture New Zealand and New Zealand Kiwifruit Growers Incorporated



Our commitment to you as a landowner

Transpower is the owner and operator of the National Grid – the high voltage transmission network made up of lines and substations connecting areas of electricity generation with towns and cities across New Zealand.

The majority of our transmission lines are on, or cross, private land. Landowners are vital to help us achieve our goals for New Zealand's transmission system.

We are committed to working openly and honestly with you when planning, building, operating, maintaining and upgrading the National Grid. Building fair and respectful long-term relationships with you is a key focus and we commit to:

- Undertake all our work safely and consistent with good electricity industry practice
- Proactively inform you of our proposed plans and consult with you on their effects
- Understand and listen to your concerns, and where possible, work with you to find appropriate solutions when undertaking work on your land
- Do what we say we are going to do and give you reasons if we are unable to do so
- Minimise any disruption as much as practicable and make good or compensate for any damage that we cause
- Regard all complaints as serious and respond to them in a timely manner

Alison Andrew
Chief Executive
Transpower

We are both growing

Our top priority is safety: of our team members who work hard on the National Grid and of you, your workers and all New Zealanders.

We know that you're committed to safety, too. New Zealand has an international reputation for producing safe, high quality produce because growers like you have proactively set up initiatives demanding accountability and environmental best practice.

And — like you — we are committed to the environment. Right now, we are helping to enable a net-zero carbon future for the country.

This means growing the National Grid for a future in which there are more electric vehicles, and more industry using renewable energy. This greater electrification will help the Government meet its climate change commitment for Aotearoa New Zealand of using 100% renewable energy by 2030.

If you're interested to know more, visit our website at www.transpower.co.nz. You can read our strategy, *Transmission Tomorrow*, and our report on how we can reach a decarbonised economy — *Whakamana i Te Mauri Hiko — Empowering our Energy Future*. Both Transpower and horticulturalists are integral to the nation's economy.

So, let's grow together.





Working together to reach safe solutions

Transpower is committed to working with growers to find solutions that meet their needs—as well as protecting both public safety and our electricity network, the National Grid.

We can achieve this together by communicating and liaising about the management of orchards around high voltage electricity transmission lines. That's why it's important to design and plan your orchard with consideration of our assets—which are the conductors or wires and support structures that make up the National Grid network—and we can help you with that.

We recognise it is important your land is utilised to its full potential. Our goal is to ensure we have provided good advice about horticultural land planning around our assets.

We want to assist with maximising orchard yield and minimising disruption to orchard operations, while also allowing for safe work around transmission lines and providing for the ongoing maintenance and upgrading of our transmission lines.

With collaborative planning and design, orchards can be designed in a way that works for everyone. This includes:

- keeping you and your workers safe
- maximising yield
- reducing the risks of power outages
- easy maintenance of Transpower assets.

Support structures

The pictures on this page show common structures on kiwifruit orchards, used for crop support or protection.

Crop support structures are the structures on which crops are grown — typical examples on kiwifruit orchards are carousels or stringing poles. Artificial crop protection structures are structures constructed over or beside the crop to protect the crop from wind and climatic events.



Fig. 1: Crop support structures with stringing poles and artificial crop protection



Fig. 2: Artificial crop protection set back from transmission line



Fig. 3: Crop support structure



Fig. 4: Crop support structure with stringing poles

Why we need access to your property

How frequently will Transpower need access to your property?

Inspections of transmission lines and support structures usually take place once a year and are conducted by Transpower's service providers. They check critical safety risks like whether transmission line support structures are structurally sound, if there are any obstructions on or around the lines, and how close vegetation is growing. Transpower will consult with you if further work is required as a result of these inspections.

Other maintenance work for which we will need access to your property includes replacing conductors (wires), reinforcing concrete foundations, tower painting and insulator replacement.

Longer-term maintenance work involves the replacement of wooden support structures every 30 to 50 years. Concrete poles generally have a longer lifespan than this.

We will give you notice of our visit

For inspections and maintenance work, we will give you 10 working days' notice of our visit, or agree on an access time with you. Our access rights fall under Section 23 of the Electricity Act and your Landowner

Liaison Officer will always make contact with you first and agree on a suitable time—especially around your seasonal work like harvesting.

Emergency response access to your property

In rare situations where we have an unplanned fault or outage on our network and we may require urgent access to our assets to repair the issue.

Health and safety obligations when we visit

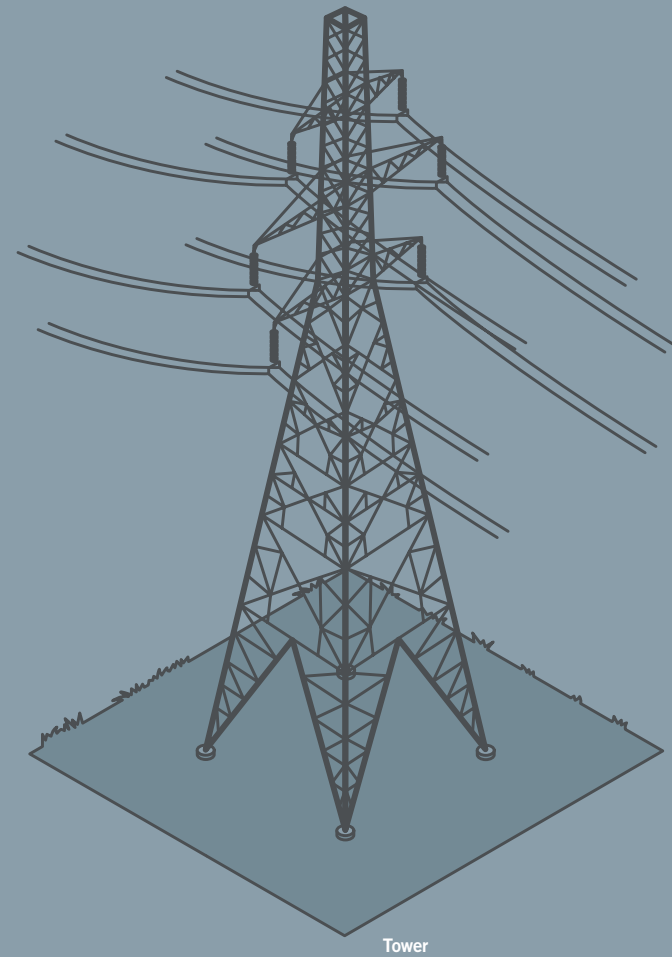
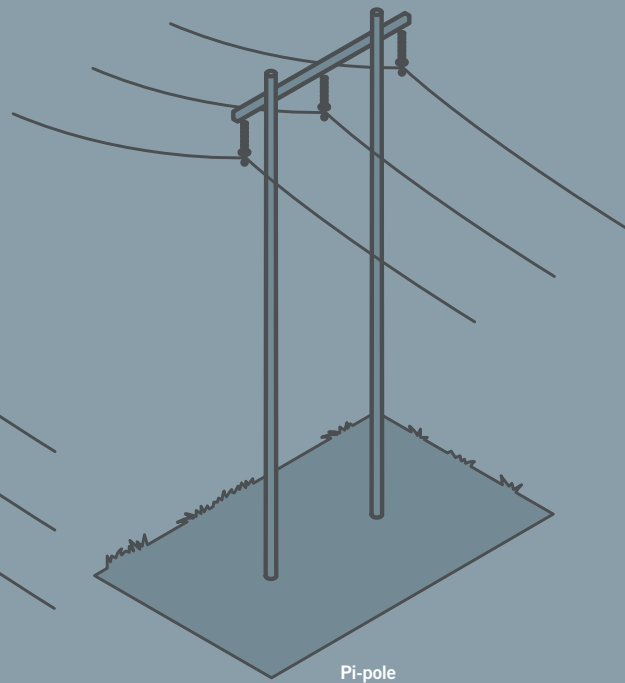
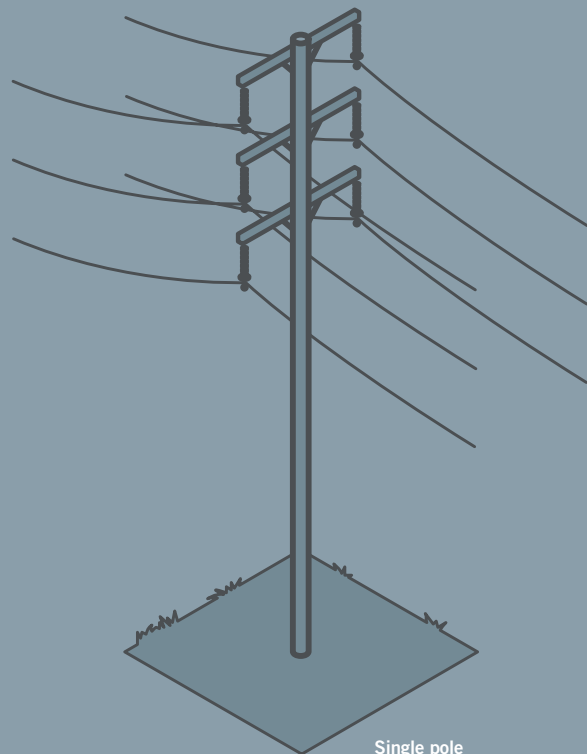
Taking into account what Transpower tells you about the time, type and location of the work to be undertaken on your land, you have a key health and safety responsibility.

As a landowner you are obliged to inform Transpower of any known hazards in the vicinity of where our service providers will be working. These are hazards that Transpower workers would not normally expect to encounter, and/or hazards that could cause the workers serious harm).

And Transpower's workers and contractors are responsible for keeping everyone on your orchard safe from any harm as a result of their work. Safety is always our top priority.



National grid support structures



Which type of structure used to support the transmission of electricity throughout Aotearoa New Zealand is on your orchard?

These three most common types of support structure carry the conductors—or wires—that transmit different voltages of electricity.

These three most common types of support structures carry the conductors—or wires that transmit different voltages of electricity.

Safe orchard design varies depending on which type of National Grid support structures you have on site, and the voltage of the line which can vary from 66 kilovolts to 220 kilovolts.

What all the support structures have in common, however, is the need to allow good access for our inspections, maintenance and emergency response.

Regulations

These are the relevant regulations that govern orchard design and the National Grid.

Electrical Safe Distances

The New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP34:2001) details the safe setbacks for earthworks, building orchard structures and activities such as operating machinery near the lines—both during construction and once your orchard is operating. NZECP34 is a regulation under the Electricity Act and compliance is mandatory.

This legislation sets safe separation distances from the bottom of a conductor (transmission line) to the top of your orchard structure. And if you have artificial crop protection and/or stringing poles, this regulation will give you a maximum safe height for its construction.

The safe separation distance varies across the National Grid, depending on a range of factors including the voltage a line carries.

The length of the span between support structures is another factor, because the greater the distance between the structures, the more the line can sag and swing in the wind. Amount of sag can also be influenced by the air temperature and the time of day. Did you know, for example, that a line sags more during the morning and evening electricity demand peaks?

Who to contact for more information:

Your Transpower Landowner Liaison Officer can give you compliance advice, such as an accurate assessment of how high you can build your orchard structures.

District Plan consents

Even if your proposal complies with NZECP34, you may still require resource consent under the District Plan.

Who to contact for more information:

Your local district or city council.

Tree regulations

Flashover can also occur from electricity lines to vegetation, including kiwifruit crops. This is important to consider in terms of the height of your vines, shelter belts and other vegetation. The Electricity (Hazards from Trees) Regulations regulates the distance that trees need to be from the lines. Trees need to be at least 5 metres (4 metres clearance and one metre notice zone) from the closest part of the conductor.



Orchard design concepts

A close-up photograph of a hand holding a single kiwifruit. The background is a soft-focus orchard with many other kiwifruits hanging from the trees, illuminated by warm, golden light.

Having identified which type of National Grid support structure is on your orchard, take a look at the orchard design concepts that follow. They are based on the fact that each type of structure has different requirements for access, maintenance and safety.

Planning your design

Find your Transpower Landowner Liaison Officer

Visit www.transpower.co.nz to find information for landowners including the contact details for your local Landowner Liaison Officer in the Keeping You Connected section.



There are many different design aspects to be aware of depending on the type of transmission line and support structure on your land.

Transpower's Landowner Liaison Officers are here to help you.

Wherever you're growing in New Zealand, we have a dedicated person ready to support you and others in your area in the safe design of your orchard.

We encourage you to seek Transpower's advice on decisions such as safe heights and setback distances well before you start building or planting.

Your Landowner Liaison Officer can provide advice on these five key factors that should be considered when designing your orchard:

- Keeping your staff safe around transmission lines — people's safety always comes first.
- Complying with mandatory safe separation distances for structures and vegetation from transmission lines and transmission line support structures.
- Ensuring Transpower's access to transmission lines and transmission line support structures is maintained (for annual inspections, general maintenance and emergency maintenance); and
- Minimising induction through safe design and earthing.
- Providing advice about when and engineering assessment/engineering expertise is required.

Learn more at transpower.co.nz

Download information sheets, booklets and more at www.transpower.co.nz by searching 'Landowner guides' or for these titles:

Stay safe around transmission lines

The Development Guide

Working on Your Land

Health and Safety: Responsibilities of Landowners / Occupiers

Horticulture work around transmission lines

Trees and Transmission Lines

EPR Guide



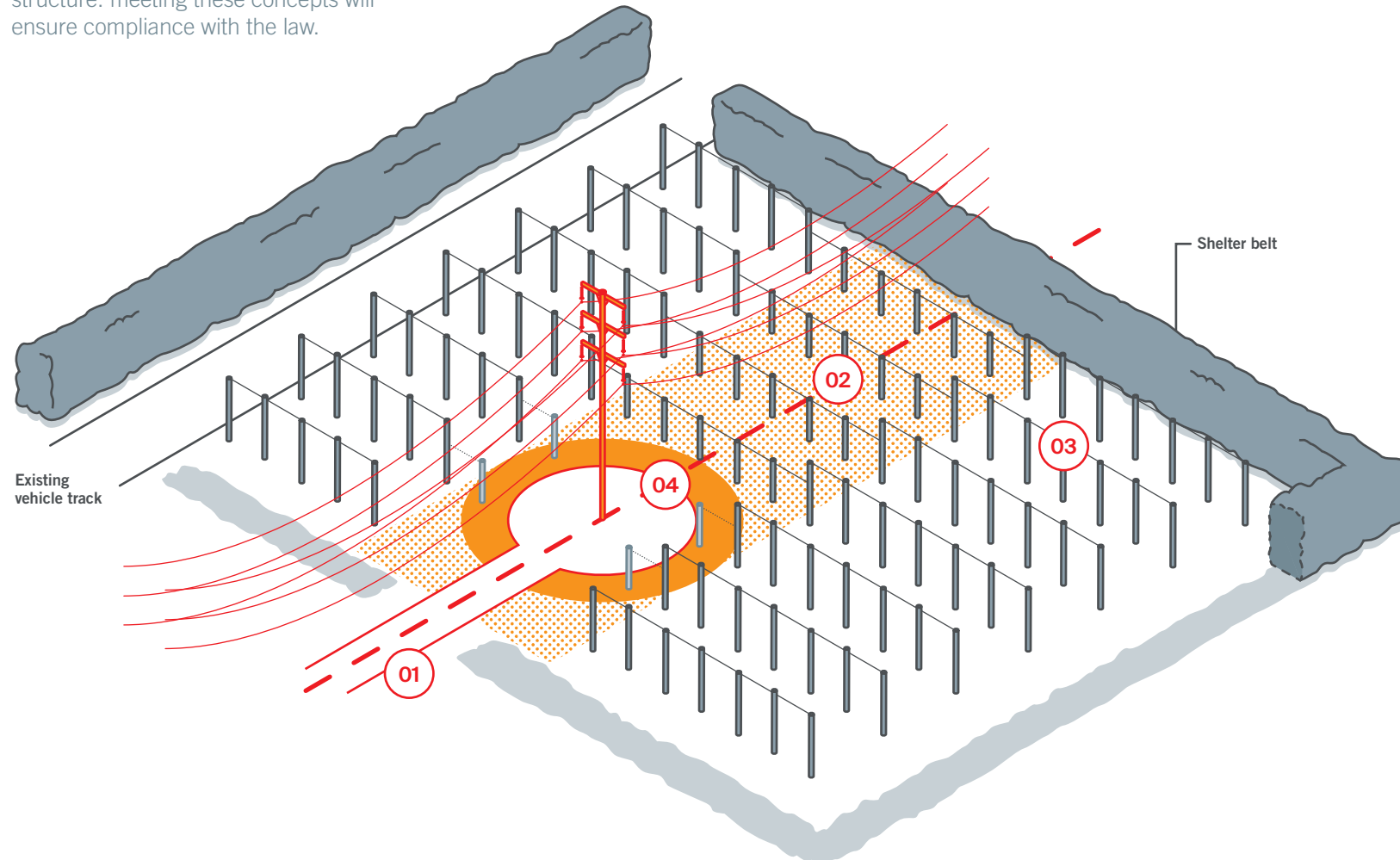
Our Health and Safety information sheet for Landowners can be found at transpower.co.nz/safety/keep-safe/safety-horticulturalists-andpickers.

Orchard design concept 1: Single poles

This is an example of an orchard layout with the crop structures at right angles to the transmission line.

The diagram explains what must be considered to ensure access and safety for all workers on the property. In addition to setbacks, clear vehicle access must be provided to the single pole support structure. Meeting these concepts will ensure compliance with the law.

Fig. 4: Why is so much space needed to be kept clear around the single pole?
This photo shows National Grid workers replacing a pole. It gives you an idea of the size of the equipment needed to do this. Occasionally—in an emergency response, for instance—this work may need to be carried out at short notice. As you can see here, replacement poles can not be installed in exactly the same place as the old structure—another reason for the space needed around the pole.



01 Access

Open access of five metres on at least one side of the single pole must be left to enable vehicle access for routine inspections and maintenance, as well as emergency response.

02 Vertical clearance distance

There are mandatory minimum clearance distances from the wires that your structures will have to meet. The clearance distance will vary depending on a variety of factors, including the voltage of the line.

03 Layout

The crop support structures are laid out with the crop at right angles to the transmission line. The crop can be located directly under the wires, but remember that vertical clearance distances apply. These restrictions come from the New Zealand Electrical Code of Practice, which sets minimum safe separation distances between the top of your structure and the bottom of the transmission line. Read more about this on the inside back cover.

04 Clear space around support structures

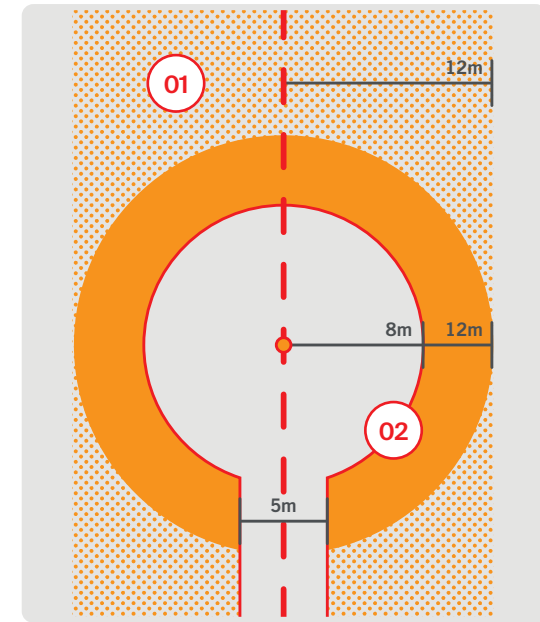
Factor in a clear space around National Grid support structures as per ECP34 regulations.



Fig. 5: Example of insulation break
Regularly spaced wooden support structures can provide insulation for inductive metal materials used in the orchard

01 Vertical clearance distance

There are mandatory minimum clearance distances from the wires that your structures will have to meet. The clearance distance will vary depending on a variety of factors, including the voltage of the line and how far the wires might swing out. In many cases it won't be possible to have artificial crop protection or frost fans directly under or beside the wires, because of the risk of 'flashover' and the ability to work safely at height.



02 Height-restricted area

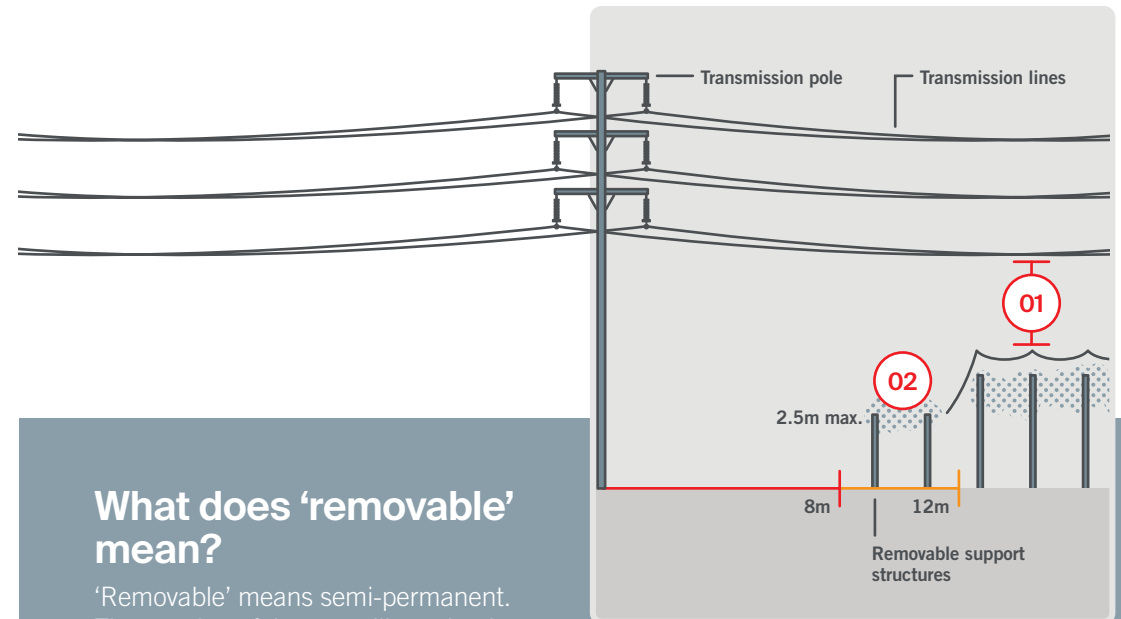
Inside the orange area:

- Crop support structures must be set back 8 metres from the pole, but able to be removable out to 12 metres (i.e. be removable if located between 8–12m from the pole). In some circumstances you might be able to locate your structures closer to the pole, but you'll need to discuss this with Transpower
- In this 8–12m zone, crop support structures and any crop protection should be no taller than 2.5m high
- Height restrictions are to protect from flashover and ensure safe working on the crops and on the pole.

Insulation

Another important thing to consider in your orchard layout is the use of metal materials, which are 'conductive'. Within the 12-metre zone either side of the transmission centre-line, make sure that any metal wires on your orchard structures that are parallel to the transmission line are broken and insulated at least every 10 metres. You can do this by inserting insulated breaks in the wires, using plastic or ceramic insulators, or having an insulated section of support such as timber.

Transpower can give you advice on installing insulation and how many breaks might be required — contact your landowner liaison officer (see page 18).



What does 'removable' mean?

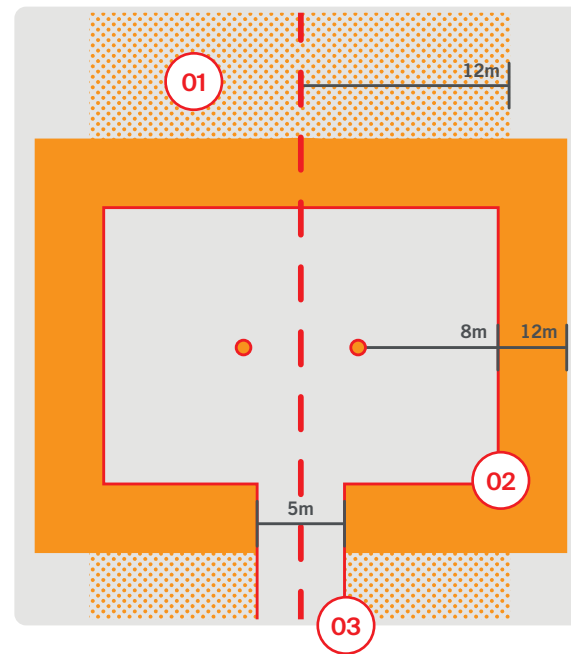
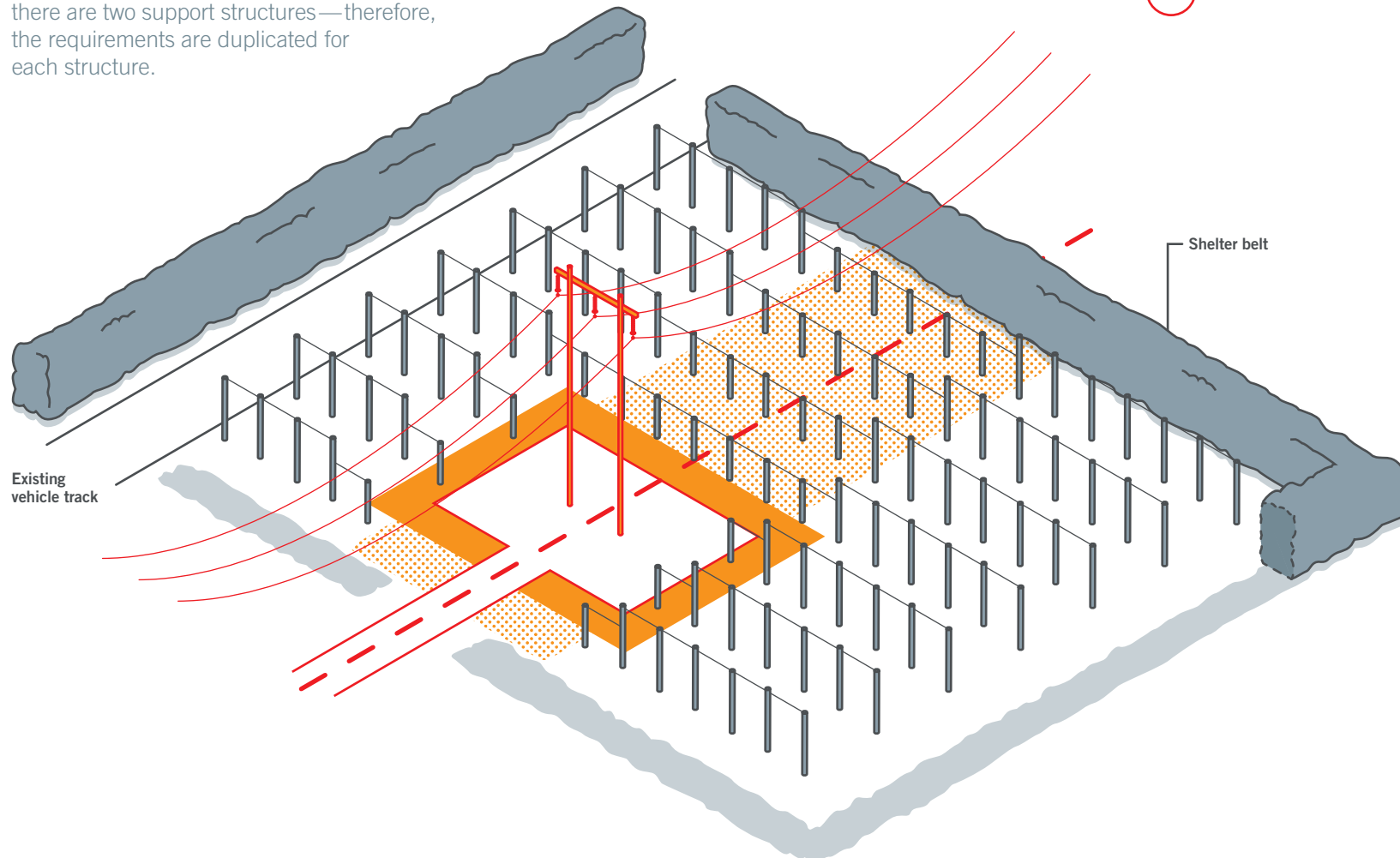
'Removable' means semi-permanent. That section of the row will need to be separately tensioned to allow that part to be moved out of the way if required, without collapsing the entire row. There are various ways that this can be achieved.

Orchard design concept 2: Pi-poles

Pi-pole structures are common in kiwifruit growing regions.

They are so-called because the configuration of the two poles holding up the transmission line looks like the mathematical pi (π) symbol.

The same setback requirements apply around pi-poles, as to single poles, but the shape of the setback is different because there are two support structures—therefore, the requirements are duplicated for each structure.



01 Vertical clearance distance

There are mandatory minimum clearance distances from the wires that your structures will have to meet. The clearance distance will vary depending on a variety of factors, including the voltage of the line and how far the wires might swing out. In many cases it won't be possible to have artificial crop protection or frost fans directly under or beside the wires, because of the risk of 'flashover' and the ability to work safely at height.

02 Height-restricted area

Inside the orange area:

- Crop support structures should be set back 8 metres from the pole, but able to be removable out to 12 metres (i.e. be removable if located between 8–12m from the pole). In some circumstances you might be able to locate your structures closer to the pole, but you'll need to discuss this with Transpower
- In this 8–12m zone, any structures must be no taller than 2.5m high
- Height restrictions are to protect from flashover and ensure safe working on the crops and on the pole.

03 Access

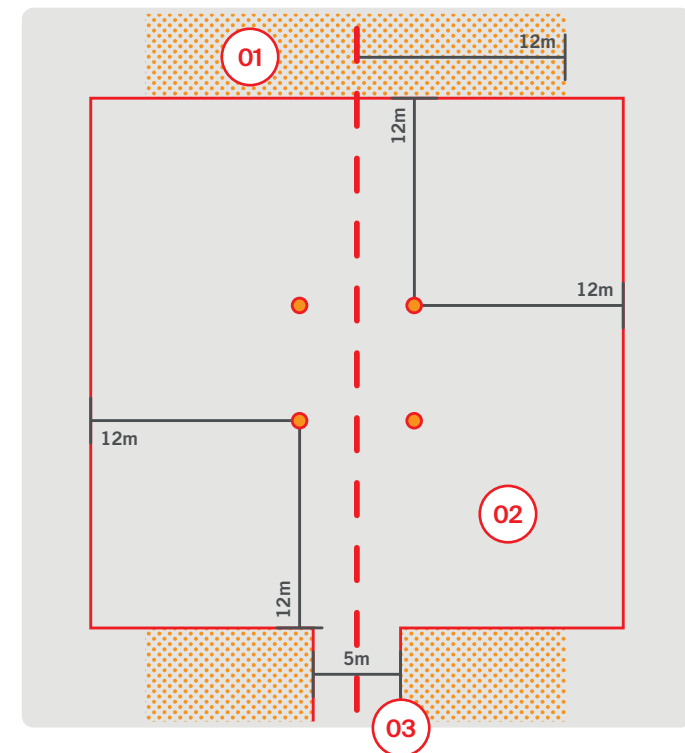
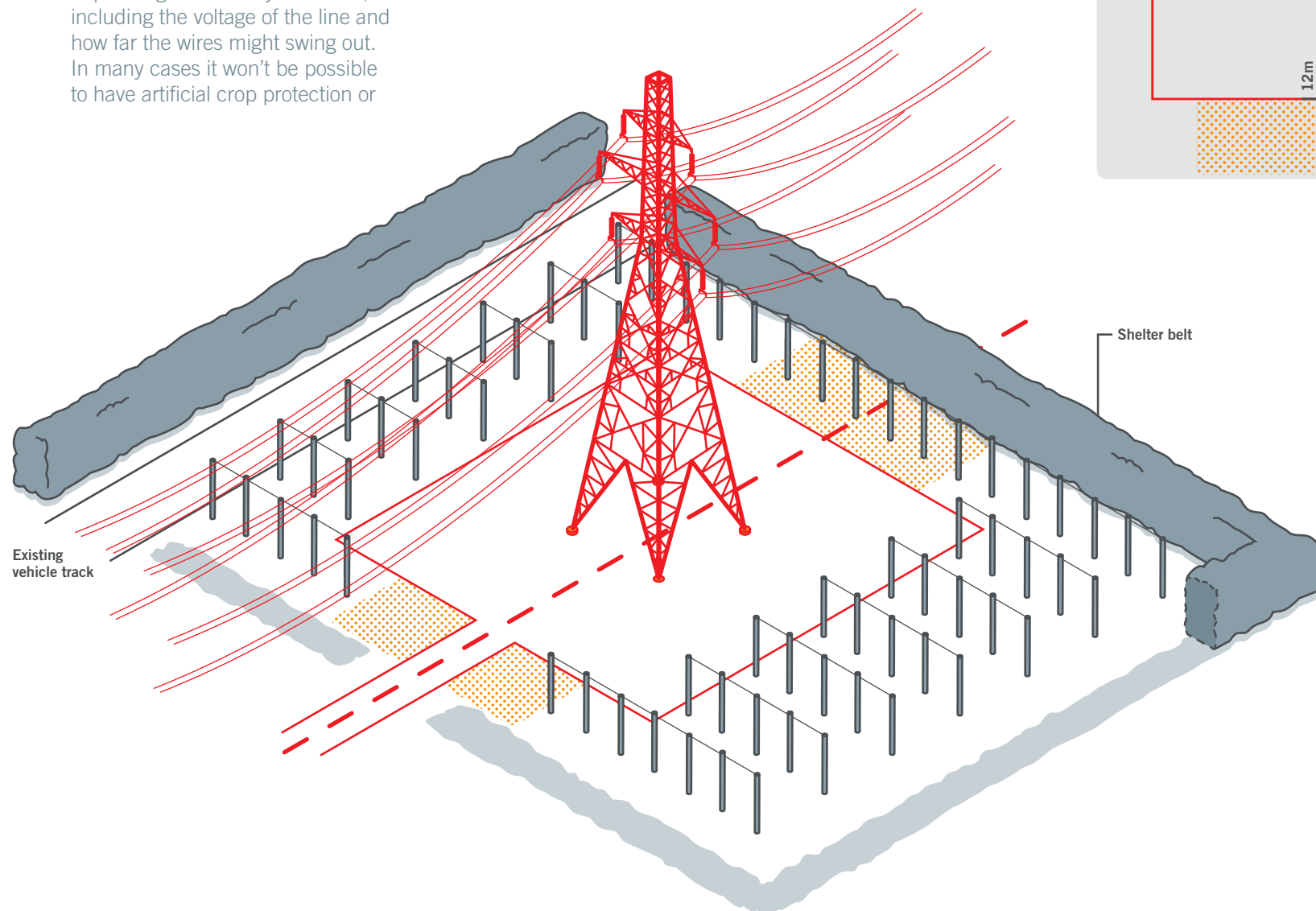
Open access of 5 metres on at least one side to enable routine inspections and maintenance, as well as emergency response.

Orchard design concept 3: Towers

01 Vertical clearance distance

There are mandatory minimum clearance distances from the wires that your structures will have to meet. The clearance distance will vary depending on a variety of factors, including the voltage of the line and how far the wires might swing out. In many cases it won't be possible to have artificial crop protection or

frost fans directly under or beside the wires, because of the risk of 'flashover' and the ability to work safely at height. Flashover occurs when electricity 'jumps' from the line to another conductive surface such as wood or metal.



02 Clear area

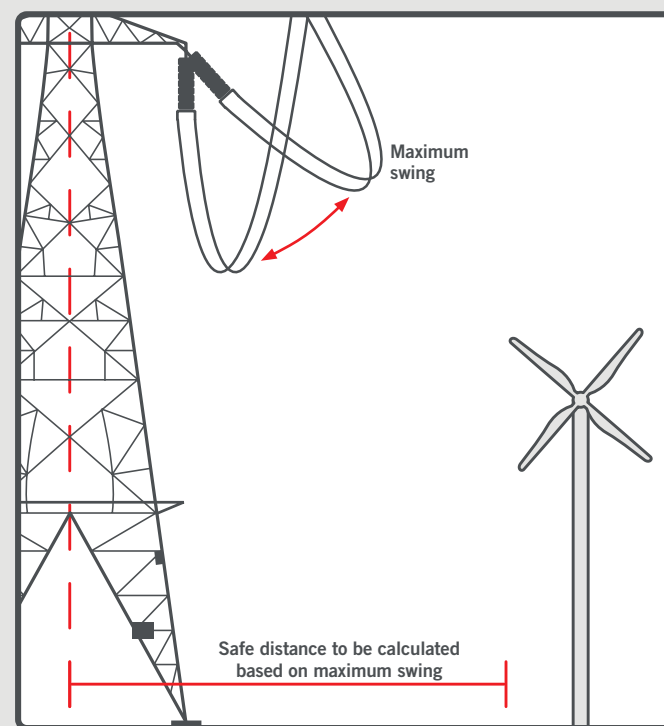
No structures in this area. Because towers have very large underground foundations, all of your structures need to be set back at least 12 metres from the tower legs on all four sides. This is to allow for access to the entire structure, and to protect the structure from damage which could result in it becoming unsafe.

03 Access

Allow for open access of five metres on at least one side to enable routine inspections and maintenance, as well as emergency response.

Keeping your orchard safe

Take into account these critical safety measures when planning your orchard design.



Non-conductive materials

For any taller strainer posts, carousels, stringing poles or irrigation equipment, it is best to use plastic or non-conductive materials within the dotted orange area 12 metres either side of the centreline. If non-conductive materials are impractical, Transpower can advise you on how to make your structure electrically safe.

Earthing

Any orchard support structure using metallic wires near the transmission line may need to have dedicated earth bonds attached to prevent a build-up of inductive charge.

Standard agricultural electric fence earthing products including earth stakes, clamps, crimp terminals and steel wire are generally suitable for this purpose.

Transpower can advise you on the type and location of earthing required.

Irrigation

When irrigating, be aware of the heights and materials you're using. If you're planning to dig an irrigation pond, make sure that it won't permanently cut off existing vehicle access to a transmission line structure. You need to let Transpower know of any alternative access arrangements you make.

Earthworks

Be aware that earthworks you undertake near National Grid support structures have the potential to destabilise them.

New earthworks such as stopbanks, roads and stockpiles under or near the National Grid lines can also reduce safe separation distances between transmission lines and the ground, creating a potential hazard to people, vehicles or mobile plant passing beneath them.

Frost fans

In high wind conditions, the wires can swing out and strike tall structures. You can work with Transpower to ensure that the position of any tall structures is clear of the wire's maximum swing. The maximum swing of the wire is a technical calculation that varies depending on a variety of factors.

Contact us

Planning a new orchard? We recommend that you contact your Transpower Landowner Liaison Officer first.

They can help support you to create an orchard design that's safe for you, your workers and the public.

**P: 0508 LANDOWNER
(0508 526 369 637)**

E: landowner@transpower.co.nz

W: transpower.co.nz

You'll find information for landowners and developers including the contact details for your local Landowner Liaison Officer in the Keeping You Connected section.

