

RETAINING WALLS Frequently Asked Questions

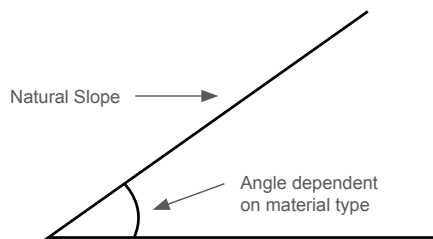
- Retaining walls in general
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Retaining walls in general

1. When is a retaining wall needed?

A retaining wall is used where there is not enough space for a natural slope.

2. When can the natural slope be used instead of a retaining wall?



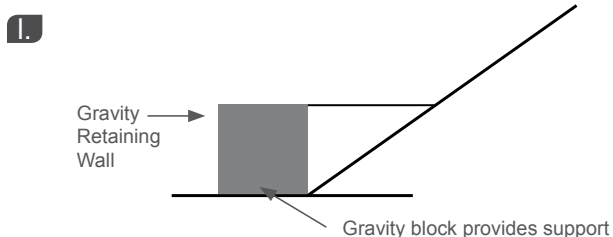
The natural slope at each site is unique and is dependent on the natural strength of the ground or soil. Soil will fall at a natural angle or slope, and the steeper the angle the more difficult it is for the slope to remain stable. A natural slope can be used when there is sufficient space.

3. How does a retaining wall work?

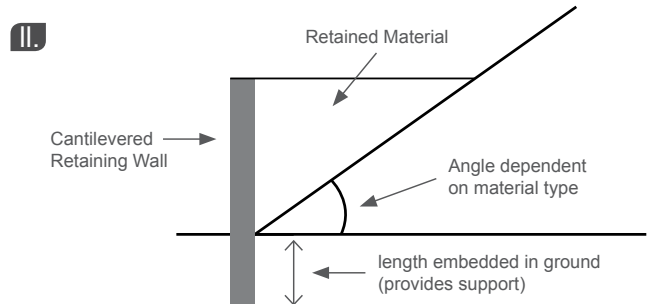
A retaining wall has to be designed to withstand the load behind it. In simple terms, a retaining wall has two 'loads' acting on it—a vertical load such as property, and a horizontal load from the weight of the soil behind the wall.

4. What types of retaining walls are there?

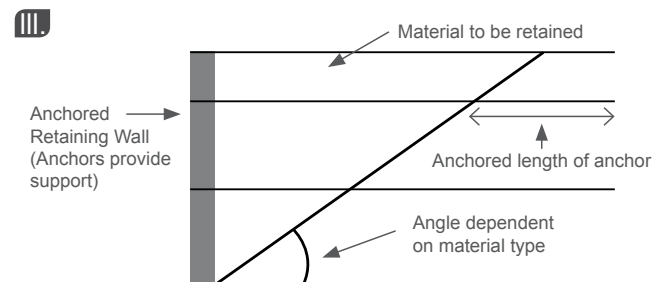
There are three main types of retaining wall:



- I. A **gravity wall** relies on the weight or mass of the wall itself to retain the soil behind it (i.e. the vertical load is greater than the horizontal load). A gravity wall acts like a dam and needs to be as wide as it is high to have sufficient mass to support the soil behind it.



- II. A **cantilevered wall** relies on a section of cantilever buried in the ground to provide a structural footing to retain the soil behind it (i.e. the footing helps support the horizontal load). This footing means that a cantilever wall requires less mass and area than a gravity wall but its capacity is limited by the strength of the cantilever section and the capacity of the ground it is buried in.



- III. An **anchored wall** uses anchors to tie the retaining wall into the rock or soil behind the wall (i.e. the stays help support the horizontal load). The support gained by tying into the soil or rock behind the wall means that an anchored retaining wall can be of any height, provided there are sufficient anchors of suitable length.

5. What effects do earthquakes have on a retaining wall?

Earthquakes place additional horizontal load on a retaining wall. In an earthquake the wall and the soil behind a wall moves horizontally back and forth. When the shaking stops, the wall comes to rest (i.e. stops moving) at a different time from the soil or load behind it. In simple terms the soil and the wall act as separate elements. If the horizontal load then exceeds the design capacity of the wall, it can fail (i.e. collapse in part or full).

6. Why does an anchored retaining wall perform better in an earthquake?

The ground anchors help resist the horizontal loads that result from an earthquake. As an anchored retaining wall is tied in to the soil or rock behind the wall, the soil and the wall move as a single mass rather than as two separate elements.

7. What is a public wall (that Council will fix) or a private wall (which is the property owner's responsibility)?

Council has completed an inventory of retaining walls to confirm which are public and which are private. Public walls will be repaired, where necessary, through the SCIRT infrastructure rebuild. Private wall repairs will be the responsibility of the property owner.

8. If my wall is a public wall, when will it be fixed?

SCIRT has prioritised the repair of retaining walls that have impacts on roads, underground services, such as wastewater and water supply, or have a risk of failure that could cause public safety or access issues. Nearby residents and property owners will be advised well in advance of any work to rebuild a wall. You can also keep an eye on the SCIRT website (www.strongerchristchurch.govt.nz) for SCIRT's schedule of works, which will set out the broad timeframes for the rebuilding of infrastructure throughout the city.

9. If my wall is a public wall, who will fix it?

The five SCIRT Delivery Teams will rebuild the walls: City Care, Downer, Fulton Hogan, McConnell Dowell, and Fletcher.

In general, work in Lyttelton will be undertaken by City Care and Fulton Hogan; work in other areas of the Port Hills will be undertaken by Downer, McConnell Dowell and Fletcher. This will enable the Delivery Teams to establish themselves in the community and develop strong relationships. It will also minimise the number of laydown sites needed throughout the Port Hills.

10. I have private property (e.g. a garage) attached to a public wall. What will happen to this when the wall is repaired?

During the design process SCIRT will undertake a site visit and investigations to identify any services, utilities and structures potentially affected by the retaining wall rebuild. We will be able to discuss any issues regarding these with you once we know the design of the wall. Each wall is unique and will be dealt with according to its individual circumstances.

11. What public retaining walls are under construction?

All SCIRT works underway are listed on the website at www.strongerchristchurch.govt.nz (search for "retaining walls").

12. How long will it take to rebuild all the public retaining walls?

The SCIRT programme of works, including retaining walls, is expected to take to 2016.

13. How long does it take to rebuild a retaining wall?

Each wall is unique and construction times will vary depending on a number of factors such as access to the site, ground conditions, the height of the wall and services behind the wall e.g. water, wastewater, utilities. Some complex walls may take up to one year to rebuild, while others will be finished in a few months.

14. How is SCIRT organising the rebuild of retaining walls?

SCIRT's goal is to achieve the most efficient rebuild with the least impact on the community. It will group damaged public walls together into logical geographically based packages. Each section of wall within the package will be prioritised, with the highest priority walls completed first, followed by the other walls.

15. The public wall on/near my property is in poor repair. Can you prioritise its repair?

It is important that SCIRT consistently follows the prioritisation process put in place for the rebuild as this is in the best interests of the people of Christchurch. If a wall is deteriorating and poses a safety risk, please contact Christchurch City Council who will organise for temporary stabilisation until the permanent repair can occur.

16. I can't move back into my house until the public retaining wall is fixed, so will my wall be prioritised?

Higher priority will be given to those walls that pose risk to public safety, access, protection of services and properties.

17. If my wall is some way off being rebuilt, will you do any temporary or maintenance works?

If the wall is deteriorating and poses a safety risk, please contact Christchurch City Council who will organise for temporary stabilisation under its maintenance contracts until the permanent repair can occur.

18. Will you repair the road once the wall is repaired?

In most cases, once the retaining wall is repaired the road above or below will be repaired.

19. Will you reopen the road once the wall is repaired?

In most cases, once the retaining wall is repaired, and all safety issues resolved, the road will be reopened.

RETAINING WALLS

Frequently Asked Questions

Retaining wall design

1. Why do you do investigations for a retaining wall before you rebuild it?

To undertake the design of the wall SCIRT first needs to determine the ground conditions around and beneath the proposed wall through geotechnical investigations. These investigations along with information on the location and condition of adjacent services are used to determine the extent of the design and possible rebuild solutions.

2. Can I have a copy of the investigations or tests you did on the wall outside my property?

SCIRT can provide you with the factual report of the investigations done on the wall outside your property if you request this. This report does not include any interpretation of the results.

3. How are you making the wall design more resilient?

The earthquakes in Canterbury have resulted in changes to design standards for retaining walls so that they better withstand any future seismic activity. This means that the design standards are more stringent, for example 'crib walls' no longer meet the design standards in many instances. These changes in the design standards are a good outcome for the people of Christchurch, as any new or rebuilt walls will be more resilient.

Many of the damaged "walls" provided protection to the soil surface only. The new walls are being designed and constructed to withstand future seismic activity. The structural walls will be rebuilt using several construction techniques and will be designed to the current Building Code and New Zealand standards including the revised hazard factors for Christchurch.

4. Are you designing the wall to the most recent earthquake standards?

Yes, the walls will be designed to the current Building Code and the New Zealand Standards, including the revised hazard factor for Christchurch.

5. Do you look at different retaining wall options when designing the retaining walls?

The first part of the design process is called the concept design where consideration is given to alternative options. Alternative options consider features such as buildability, resilience and cost effectiveness. Once a solution is determined the detailed design is undertaken. This involves discussions about the impacts of the design with property owners for features such as ground anchors. The construction team work closely with the designers to resolve buildability challenges, temporary works and construction planning before the final design is complete and construction can commence.

6. What are the options for repairing or rebuilding a retaining wall?

There are a number of options for repairing or rebuilding a retaining wall. There are also a number of constraints that typically limit the options for repair. The height of the wall, its location, and the load it supports all influence the repair strategy. Having to meet the current design standards for retaining walls also helps define the options for repair.

7. Can I influence the design of the wall outside my house?

The design of retaining walls follows a process to provide the most resilient, cost effective solution. Due to the expertise required to complete the design of retaining walls there will be no input from the community on the design of the walls. Where required, walls that were previously built with red stone are being reconstructed in such a way that they can be refaced at a later date.

8. Can I get you to design and build my private wall while you are doing the public wall outside my house?

SCIRT is involved in the repair of public infrastructure (e.g. pipes, roads and retaining walls) only and is not involved in the repair of private infrastructure.

9. Can you design the wall to take into account the rebuild of my house, or changes I have planned for my property?

Public retaining walls will be designed and constructed to provide for a 'nominal surcharge load'. This means that the public walls will be designed and constructed to support a load equivalent to light residential construction. If the proposed construction on your site is different from this you will be required to demonstrate at the time of building consent that the construction will not compromise the wall. This is normal practice and this process existed before the earthquakes.

10. What is being done with the historic red rock on some retaining walls? Will it be reinstated once a wall is rebuilt?

The red rock is being carefully removed and stored securely. SCIRT will repair the retaining walls in such a way that they can be resurfaced (for example with the red rock) at a later date. SCIRT has the responsibility to make the wall structurally sound. Council and the Historic Places Trust will decide on the future facing of the walls.

11. There are other utility services located near the public retaining wall. Will your design take account of these?

Before SCIRT undertakes any retaining wall repairs we do a thorough investigation of the land immediately around the wall. This includes locating other utility services.



RETAINING WALLS

Frequently Asked Questions

Ground anchors

1. What is a ground anchor?

A ground anchor is a metal bar that is inserted into a pre-drilled hole in the slope. The metal bar is encased in cement grout which fixes the anchor in place as it hardens. One end of the anchor goes into the slope behind the retaining wall, and the other end is set into the retaining wall.

2. How are ground anchors installed?

A hole (approximately 185mm in diameter) is drilled into the slope using a purpose built drilling rig. The ground anchor is inserted into the centre of the hole. Cement grout is pumped into the hole around the anchor and left to set. The other end of the anchor is set into the concrete block of the retaining wall with grout. Exact measurements for the diameter of the hole drilled, the anchor length, the anchor depth and the method to secure the anchor to the wall may change from site to site.

3. Why are ground anchors needed?

Ground anchors are needed to transfer the horizontal load acting on a retaining wall back into the ground or rock where the anchor is fixed. In simple terms the anchors will hold the retaining wall in place in the event of an earthquake.

4. Why is the use of ground anchors the best option for many retaining walls?

Ground anchors have been chosen as the design solution for some retaining walls in Christchurch for three reasons:

- They are an optimal design solution for retaining walls under the post-earthquake design codes.
- They provide increased resiliency for future earthquake events.
- They can be used successfully on high retaining walls.

5. Will ground anchors affect my property?

The anchor installation will produce a small amount of vibration which is unlikely to be felt in the properties above due to the depth of the installation. The anchors are below ground level and generally will not interfere with the property. In locations where the ground anchors go onto private property, Council will contact the owners regarding obtaining consent for the anchors.

6. Can the anchors cause any damage to our land in the event of another earthquake?

Ground anchors allow a retaining wall to be more resilient to earthquakes, and therefore less likely to fail. The ground anchors and retaining wall will not 'pull away' taking private land with it in the event of another earthquake.

7. Where do these anchors sit and how many do you have to use?

The location and number of ground anchors varies according to the location and height of the retaining wall, and the soil/ground conditions.

8. How deep do you need to drill the anchors?

The depth of the ground anchors varies from site to site. Generally drilling is undertaken until rock or solid ground is reached.

9. Are ground anchors used anywhere else in NZ?

Ground anchors were used in the construction of a number of retaining walls in the Central Motorway Junction project in Auckland. Locally, ground anchors have been used to repair retaining walls at both Dublin Street and Sutton Quay in Lyttelton. These repairs took place before the Canterbury earthquakes, and both sections of wall where the ground anchors were used did not fail in the recent earthquakes.

10. Who is liable for any damage to my land/property if the wall and the anchors fail?

A public retaining wall, including any ground anchors, remains the property of the Christchurch City Council. Any future maintenance or repairs are the responsibility of Council.

11. Who pays for the maintenance of public retaining walls?

This is the responsibility of Council.

12. Do the anchors need any maintenance?

Once the anchors are installed they require no maintenance. Should there be any future large earthquakes, Council will inspect the retaining walls to make sure they are safe and functioning well.

13. Can I plant trees over the anchors on my property?

This will depend on the depth and number of anchors on your property, which also varies from property to property. Generally you will be able to plant small tree species and shrubs over the anchors as the anchors are at some depth below the ground (i.e. they are not at the surface). We will be able to discuss this with you once we know where and how many anchors are proposed for your property.

14. Can I build over the anchors on my property?

This will depend on the depth and number of anchors on your property, which also varies from property to property. It will also depend on the foundation design for any structure you are proposing. Generally you will be able to build over the ground anchors as they are at some depth below the ground; however any foundation design may need to take the anchors into account. We will be able to discuss this with you once we know where and how many anchors are proposed for your property.

15. Will it affect any resource or building consents in the future when I have anchors?

Any future resource or building consents will be subject to standard Council processes. When assessing any applications Council will consider the effects of the proposal on the retaining wall.

RETAINING WALLS

Frequently Asked Questions

Property owner consent process for ground anchors

1. Why do you need a property owner's consent for ground anchors?

Section 181 of the Local Government Act 2002 (LGA), sets out a legal process by which Council can seek to construct or repair public infrastructure (in this case a retaining wall) on private property.

If the repair of the retaining wall requires the placement of public infrastructure on private property (for example ground anchors) we need the property owner's consent to do this. We use the Property Owners Consent Form for this.

2. What if I don't want the ground anchors?

No works will take place on private property without the property owner's consent, or until the statutory processes set out in Section 181 have been completed.

Section 181 of the LGA sets out a formal notification and objection process which allows a property owner to object to having public infrastructure on their property.

We work with property owners to gain their consent to repair or rebuild the retaining wall. At this stage we have not started the formal notification and objection process.

If we cannot gain consent from all affected property owners we may commence the formal notification process. We will advise all property owners in writing who have not been willing to give consent or who have not responded, when this formal process starts.

3. Why are you not using easements for ground anchors?

For the first few retaining walls that required ground anchors an easement was used to enable these to be installed on private property. Section 181 of the LGA has now been amended to include retaining walls as public infrastructure that Council can place on private property. Previously, Section 181 only enabled water supply, stormwater and wastewater infrastructure on private property.

The LGA was amended to allow Council to progress the earthquake rebuild of retaining walls. The easement method had no formal objection process. If a property owner did not wish to consent to the works, the wall potentially would not be repaired. By having a formal notification and objection process there is a set way forward for the repair of retaining walls where private property is affected.

4. Do all retaining walls need the property owner's consent?

Walls that don't affect private property will not require property owner's consent.

5. Will you pay compensation for me to give consent?

Council is not offering compensation in return for locating public infrastructure on private property, as these retaining walls are providing a level of service to your property, and others in the area.

6. What if I don't give consent?

Generally construction cannot begin until all property owner consents are in place. In some places preparation work can begin in areas where property owner consents are not required.

7. What if I sign the consent for my property and the neighbours don't sign theirs; will you still repair the wall outside my property?

Generally construction cannot begin until all property owner consents are in place. In some places preparation work can begin in areas where consents are not required.

8. I can't get my house repaired until the wall is fixed and my neighbours won't give consent; can't you just fix the wall anyway?

The construction methodology for repairing the retaining wall typically requires us to build the retaining wall from the bottom up along the entire length of the wall, so all property owner consents must be in place.

9. I don't want to give consent to have ground anchors on my property; will Council buy my house?

Council is not proposing to purchase any properties in respect of repairing damaged retaining walls.

10. I only part own the property. Do you need all the other owners to sign the property owners consent form?

Yes, if the property is in a multiple (or joint) ownership then all owners of the property need to sign the agreement.

11. Will having ground anchors on my property affect its valuation?

It is considered that there is no significant effect on the value of the property. The 'cost' to the property value is considered to be offset by the resilience benefits in terms of land stability and maintaining levels of service.

12. What do I do if I need a private retaining wall repaired/replaced on my property but I have a ground anchor easement and ground anchor in the way?

We will work with individual owners in these circumstances to ensure the repair of the public retaining wall does not adversely impact on the repair of the private retaining wall.

RETAINING WALLS

Frequently Asked Questions

Property owner consent process for access

1. If there are no ground anchors, why do you need my consent?

We may need the property owner's consent even if ground anchors are not being used. This may be where part of the repaired retaining wall (such as the footing) is on private property, or where we need access across private property to repair the wall.

Where part of the retaining wall is on private property we need all property owners to sign the Property Owners Consent Form.

Where we need access across private property to repair a retaining wall we need all property owners to sign an Access and Restoration Agreement.

Any situation where we work on private property or require access across private property will require the property owner's consent.

2. What if I don't give consent?

Generally construction cannot begin until all property owner consents are in place. In some places preparatory work can begin in areas where property owner consents are not required.

Construction effects

1. Who will rebuild public retaining walls?

SCIRT is rebuilding retaining walls on or which support public land. Rebuilding retaining walls on private land are the responsibility of the land owner who should contact their insurer.

The five SCIRT Delivery Teams will rebuild the walls: City Care, Downer, Fulton Hogan and McConnell Dowell and Fletcher. These will be the people on the ground who you will see rebuilding the walls.

2. How long will the rebuild take?

SCIRT's programme of works is expected to take about five years to complete.

3. How long will each wall take to construct?

Each wall is unique and construction times will vary depending on a number of factors such as access to the site, ground conditions, the height of the wall, services behind the wall e.g. water, wastewater, utilities. Some walls may take close to one year to rebuild, while others will be finished in a few months.

4. What type of equipment will you use?

Each wall is unique and the equipment needed will vary depending on the location of the wall and how the wall will be rebuilt. Typical equipment includes trucks, cranes, ground anchor rigs, compaction equipment and general construction vehicles.

5. Will the construction be noisy or cause vibrations?

SCIRT contractors will try to minimise their impact on residents as much as possible. Residents located close to work may experience more dust, noise or construction vibrations associated with the rebuild activities, as well as increased construction related traffic.

6. What impact will the rebuild have on my property?

The design and construction methodology for each wall will take into account proximity of properties. As this will involve heavy engineering equipment the construction may affect residents, depending largely on how close property is to the retaining wall being rebuilt.

The details of how construction may impact on your property will be discussed with you by the contractors in detail before works begin in your area. In a number of instances it will be necessary to extend ground anchors into an adjoining private property to provide the structural strength and support to the retaining wall. The number and depth of ground anchors will vary depending on the height and location of the retaining wall. The ground anchors will generally be 2 metres or more below ground level. We will make contact with the owners to get approval before starting this work.

7. What if you have to move/replace landscaping and other utilities to construct the wall?

Once the retaining wall rebuild is complete we will restore the affected part of the property as near as reasonably possible to the same condition as it was prior to the works commencing.

RETAINING WALLS

Frequently Asked Questions

Construction effects continued

8. Will I be safe in my home while you are repairing the wall?

Safety is SCIRT's number one priority. In some areas the work will be fenced off to restrict access to the work area to authorised people. We ask you to stay clear of work sites and keep children and pets at a safe distance. Prior to construction beginning SCIRT will work with you to ensure you are safe in your home during the rebuild of the retaining wall. If it is decided that it is not safe to be in your home during construction, SCIRT will work with you to find alternative accommodation.

9. Will my house suffer more damage from the construction of the retaining wall?

It is unlikely that the construction of the retaining wall will cause any damage to your house.

10. If my property is damaged during construction who will pay for the remediation?

As with a typical construction process, any damage as a direct result of the construction works will be the responsibility of the contractor to remediate.

11. How will you manage the traffic during the rebuild of the wall?

A Traffic Management Plan will be put in place for each work site when traffic is affected. The goal with temporary traffic management is to strike a balance between safety and convenience. While safety around SCIRT worksites is the number one priority, it is also important to minimise disruption to residents and road users.

A number of temporary traffic changes will be needed where walls are being rebuilt, mainly for the safety of workers and the community. This may include temporary road closures and detours. On street parking may be reduced where work is underway.

12. If I can't get my car onto my property during the repair where should I park it?

Due to the nature of the repair works, you may temporarily not be able to access your property by vehicle. SCIRT will work with residents to find a suitable car parking location prior to works beginning.

13. What is happening with red rock from the outside of the retaining walls?

Provision is being made for future decorative wall facings. For walls that have already fallen down, the red rock with heritage value is being securely stored for future use. For heritage walls that are still standing but require rebuild, the extent of the wall will be recorded by an archaeologist, then carefully deconstructed. The red rock with heritage value will be removed and securely stored for future use. SCIRT has the responsibility to make the wall structurally sound. Council and the Historic Places Trust will decide on the future facing of the walls.

14. What if EQC want to repair my house during the rebuild of my retaining wall?

If you know when the rebuild of your property is scheduled for, please let us know when we move into your area to rebuild a retaining wall. We will try to accommodate your construction works as much as we can.