

**National Certificate in Building, Construction and Allied Trades Skills (BCATS)**

**Construct basic garden edge  
retaining walls as a BCATS  
project**

Unit Standard – 12939

Level 2, Credit 4

**Name:** \_\_\_\_\_





# Contents

<i>Reference</i>	<i>Page</i>
What you need to do	1
Glossary of terms	2
Retaining walls	3
Precast concrete block	5
Timber post and rail	6
Timber or concrete crib	9
Mortared stone	10
Poured concrete or concrete block	11
Preparing an order for materials	12

**Published by: Building and Construction Industry Training Organisation (BCITO)**

Level 5, 234 Wakefield Street  
PO Box 2615  
Wellington

© BCITO

All rights reserved.

No part of this work may be reproduced, adapted, modified, copied or transmitted in any form or by any means, including by way of example only, written, graphic, electronic, mechanical, reprographic, photocopying, recording, taping or information retrieval systems, without the written permission of the publisher.

## **What you need to do**

By the end of this unit you should be able to:

- calculate quantities and prepare an order for materials for basic garden edge retaining walls;
- construct basic garden edge retaining walls; and
- complete work operations.

### **How you will be assessed**

During this unit, you need to show your assessor/tutor that you can:

- calculate materials correctly and prepare an order for materials;
- set out and excavate retaining wall foundations;
- construct and finish a retaining wall;
- complete all operations safely;
- clean the work area and dispose of waste; and
- clean and store tools, plant and equipment correctly.

To achieve this unit standard, you need to construct a retaining wall between 0.350m and 1m high, with a total perimeter length of not less than 1.2 metres.

## Glossary of Terms

Term	Meaning
Batter	The angle that a retaining wall makes with the vertical in order to resist the weight of the retained material – generally in a ratio of 1:4
Course	A row of bricks or blocks
Field drain	A system to collect and redirect water away from the base of a retaining wall
Filter fabric	A cloth which filters out fine particles of backfill when laid over the drainage, preventing blockage of the system
Footing	The bottom section of a retaining wall
Granular fill	Clean gravel fill which is placed behind a retaining wall, allowing the water to flow down into the drainage system
Hydrostatic pressure	The force applied by water behind a retaining wall – the pressure is reduced by using granular fill and drainage
Low retaining wall	Any wall which provides stability and holds earth, rock etc. (up to 1.500m above ground level)
Plant	Equipment
Weep holes	Holes through the bottom of a retaining wall to provide drainage
Work operations	How you do a job

# Retaining Walls

Retaining walls perform heavy and important work. As well as holding up unstable banks, retaining walls can terrace a sloping section to provide a level garden, lawn or paving area.

The following walls require a building consent, and may also require an engineer's design:

- walls over 1.5 metres high; and
- walls lower than 1.5 metres but carrying extra loading on top, such as a driveway, a building or a steeply sloping bank.

For any construction job you carry out, it's important to:

- select and use appropriate personal protective equipment;
- use tools correctly and safely;
- clean the work area and dispose of waste; and
- clean, store and maintain tools correctly.

For any product or tool you use, make sure you read and understand any manufacturer's instructions that come with it before you start using it.

## **Good preparation**

The area where you are building the wall needs to be cleared of plant material and rubbish, and any excavation done. If you are planning a thick wall construction, such as precast concrete block, crib or mortared stone, consider the total construction space necessary, as this may require extra excavation.

## **Good foundations**

While the whole wall has to be strong enough to support the load pressing against it, it is the part below the ground that anchors it. No matter how sturdy the upper part of a wall is, if the footings or foundations are weak, there is nothing stopping the wall from collapsing.

## **Good drainage**

When an inclined area of soil or clay becomes waterlogged, it can become unstable. Therefore, one of the main tasks required of a retaining wall is to drain water out of the bank behind. If a retaining wall does not drain well, water can accumulate behind it until it collapses.

Drainage should consist of:

- 300mm minimum clean free-draining gravel; and
- slotted drainage pipe or weep holes at the base of the wall.

## **Construction techniques**

Retaining wall construction techniques include:

- landscape edging;
- precast concrete block;
- timber post and rail;
- timber or concrete crib;
- mortared stone; and
- poured concrete or concrete block.

## **Precast Concrete Block**

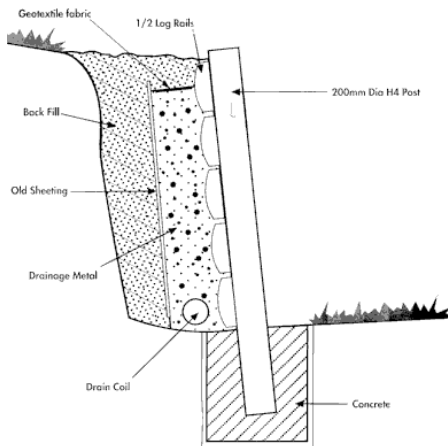
Precast concrete block walls are constructed on a compacted base course or a concrete foundation. The blocks are laid in interlocking courses, with each course stepped back.

Precast blocks are manufactured in a range of shapes, textures and colours. Some types are hollow and can be filled with soil as the wall is constructed. Other types allow the wall to be built in concave or convex curves.

Because each type of block is different, it is very important to read and follow the manufacturer's instructions, which will cover:

- foundation type;
- instructions for constructing the wall;
- maximum height; and
- amount each course is stepped back.

## Timber Post and Rail



Timber post and rail is probably the most common type of retaining wall construction. Vertical poles or posts are embedded in the ground (to act as a cantilever and provide stability to prevent overturning), and horizontal rails are fixed to the inside of the posts.

The vertical posts are treated to H5, and normally have concrete compacted around them. The depth and spacing of the posts must be to the manufacturer's design details, and depend on:

- soil type being retained;
- wall height; and
- wall loadings.

Posts are generally embedded up to 1200mm into the ground and the spacing of the posts can vary from 0.900m to 1.800m depending on the size of the horizontal rails.

Horizontal rails are treated to H4, and can be half rounds, 50mm timber plank, tongue and groove, or a combination of these.

### Materials required

- H5 posts
- H4 rails
- Concrete
- Nails – 100/125mm and 150mm galvanised
- Plastic drain coil
- Drainage gravel
- Geotextile fabric
- Bracing timber, pegs and nails



## Tools required

- Spade or post hole borer
- Shovel
- Circular saw
- Hammer
- Measuring tape, square and pencil
- String line
- Spirit level
- Sledgehammer

## Construction

Decide where the wall is to be located and ensure there is sufficient space behind the wall to attach the rails and for drainage – at least 250 to 350mm. The bank may need to be cut back to provide enough room.

Make sure the ground at the base of the wall slopes towards the end where the water is to be drained.

Set out the line of the wall.

Set out the post spacing as required by the specific design.

Excavate the post holes to the depth required by the specific design.

Place 100mm of concrete in the two end holes and set the posts on top. Make sure only uncut post ends go into the holes.

Lean the posts towards the bank, to the angle required by the specific design, and plumb when viewed from the front. Brace posts in position.

Fill the two end post holes with concrete. Tamp concrete down during placing to ensure it is well compacted.

Run string lines top and bottom between the two end posts.

Place the intermediate posts and position to the string lines. Plumb from the front and brace the posts.

Concrete the intermediate posts in the same way as the end posts.

Allow at least 48 hours for the concrete to gain strength. (The concrete must have adequate time to set before any backfill is placed which applies loading on the wall.)

Starting at the bottom of the wall, nail the horizontal rails to the back of the posts. Any joins in the rails should be made on the posts.

Construct the wall to the required height and trim the post tops.

Place a 50mm layer of clean free-draining gravel along the bottom at the back of the wall.

Lay drain coil on top of the gravel.

Cover the drain coil with 250mm more gravel.

If possible, protrude the drain coil at both ends of the wall, so it can be flushed with a garden hose from time to time.

Place clean, free-draining gravel to within 300mm of the ground surface at the top of the wall. (In some situations, it may be easier or necessary to place the gravel as the wall is being constructed.)

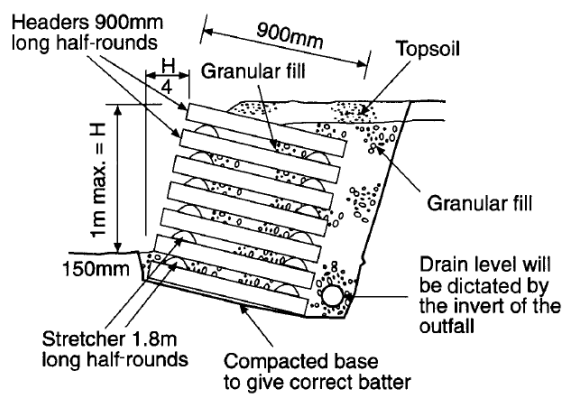
Place the geotextile fabric over the gravel to prevent the topsoil filtering down into the gravel and drainage system.

Place topsoil as required.

# Timber or Concrete Crib

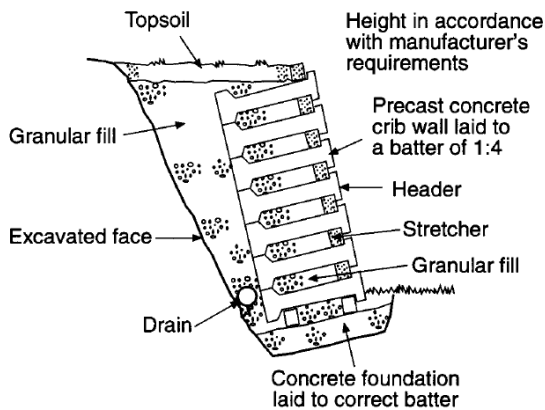
Crib walls are a type of gravity wall that can be used for low and high retaining walls.

They are usually constructed using a proprietary system, consisting of header and stretcher units locked together to retain granular fill, which provides weight to the system and prevents overturning of the wall. They can be constructed on foundations of concrete, compacted fill or sleepers.



Retainer wall maximum 1m high constructed in H5-treated half round timber

Timber crib walls up to 1.0 metre high can also be constructed in H5 half-round posts.



Proprietary concrete crib walling

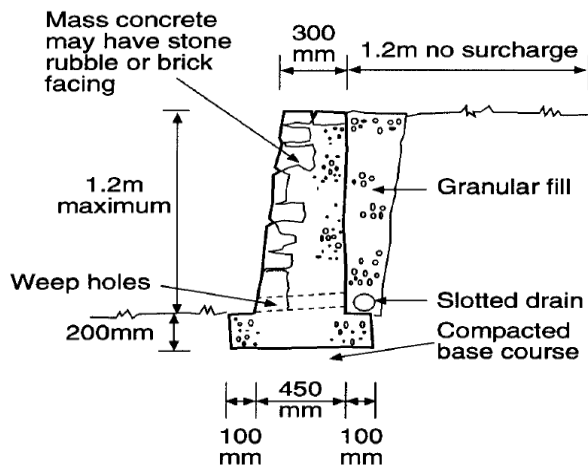
Concrete crib walls are constructed from precast interlocking units with varying patterns and sizes.

The maximum height for a crib wall depends on the:

- type of ground to be retained;
- type of backfill used; and
- condition of site drainage.

Manufacturers' recommendations for each situation and instructions for constructing the wall should always be read and followed.

## Mortared Stone



Mass concrete or rubble gravity retaining wall

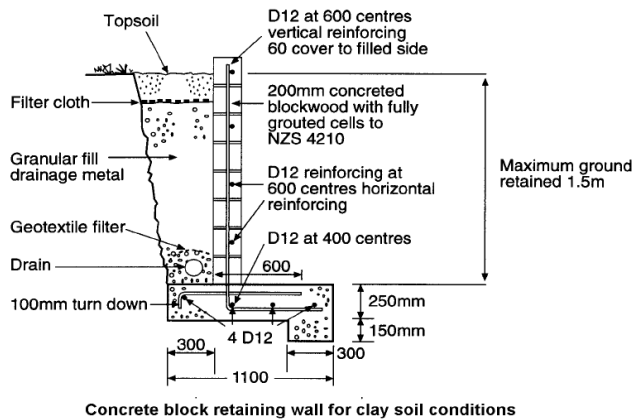
Mortared stone walls rely on their weight and a low height to width ratio for stability against overturning or horizontal slipping.

This type of wall can be constructed on a compacted base course in mass stonework, concrete or a combination of both.

They should generally be designed and built by experienced designers and contractors.



## Poured Concrete or Concrete Block



Poured concrete or concrete block retaining walls are stabilised by a wide T or L shaped footing, which is crucial to the strength of the wall. They require steel reinforcing and must be built to Building Code standard, even if a building consent isn't required.

They should generally be designed and built by experienced designers and contractors.

## **Preparing an Order for Materials**

The first step is to calculate the quantities of the materials required and will depend on:

- the construction method being used;
- the design drawings and specifications;
- the finished height and length of the wall; and
- any allowance for wastage, for example, if a material is only available in a fixed length.

When placing an order with a supply merchant for building materials, the following information will be required. This will ensure that the right materials are supplied to the right place at the right time, and the correct information is supplied for budget and accounting purposes.

The order should be clearly written or typed, and include the following information:

- date of order;
- customer's name account number and billing address;
- job identification or number;
- order number;
- supply merchant's name;
- description of goods required and quantity;
- address where the order should be delivered;
- date and time required;
- any other delivery details; and
- authorised purchaser's signature.

Send the order to the supplier allowing enough time for them to prepare and deliver it. (You should also keep a copy of the order for your records.) It's a good idea to follow up with a phone call if you don't receive confirmation that the order has been received.

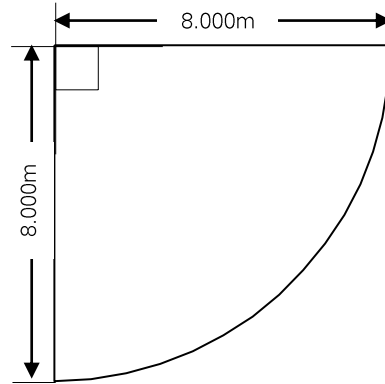


# Activity

- 1. The circular section of a small residential garden (shown) is to be retained using 0.500m landscape edging.

The edging is to be set in a trench of concrete 0.100m wide and 0.150 deep.

Calculate quantities and prepare an order for materials for this job.




---

---

---

---

---

---

---

---

---

---

- 2. What do you need to consider if you are planning a thick wall construction?

---

---

---

---

- 3. Describe how to assemble a length of landscape edging.

---

---

---

---



4. What determines the depth and spacing of the posts for a timber post and rail retaining wall?

---

---

---

---

5. What is the minimum level of timber treatment required for the following:

Retaining wall uprights?

---

Retaining wall horizontal members?

---

6. Why should you allow at least 48 hours for the concrete in the post holes to gain strength before backfilling?

---

---

---

7. What is hydrostatic pressure?

---

---

---

8. What type of protection is required for fixings for a retaining wall?

---

---

---



9. What is the purpose of the drainage coil at the base of the inside of a retaining wall?

---

---

---

10. Why is it necessary to leave a space behind a timber post and rail retaining wall?

---

---

---

---