



Implement a retaining wall project

AHCLSC307

By the end of this topic, you should be able to:

- Prepare for retaining wall project
- Mark out site for retaining wall
- Construct retaining wall
- Check quality of work and clean-up site

You will be directed to complete a number of activities during this presentation.
Compile your responses into one submission and email your work to training@cstc.org.au
with the subject 'AHCLSC307 Activities'

Why construct a retaining wall?

- A retaining wall is constructed to retain a difference in ground level. They are beneficial for retaining soil, reclaiming sloped land and reducing erosion.
- They can also be used to create feature walls for driveways, paths, steps, grassed areas and raised gardens (such as vegetable or planter boxes).



Before

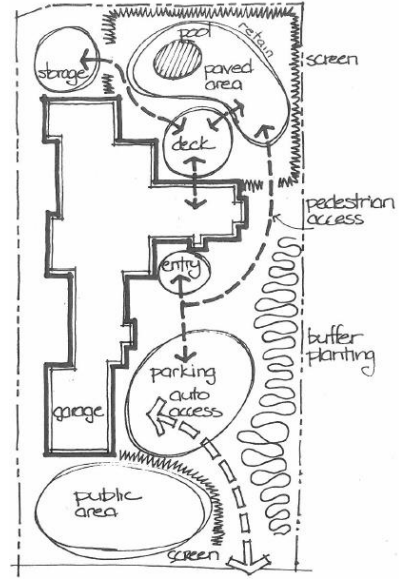


After

Preparing for retaining wall project

- To prepare for retaining wall projects, you should interpret plans and specifications
 - Landscape concept plans
 - These are a visual record of ideas
 - Usually rough freehand drawings

Activity 1: Draw a simple concept plan for a proposed landscape design which includes a retaining wall



Preparing for retaining wall project

- To prepare for retaining wall projects, you should interpret plans and specifications
 - Landscape plans

Activity 2:
Identify/list the detail
on the landscape
plan shown



Splash Pond with Dry Creek bed runoff



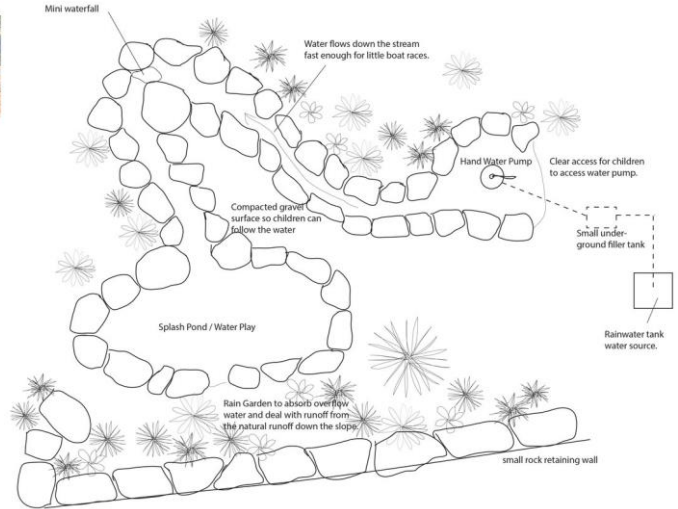
Hand Water Pump



Splash Pond with overflow Rain Garden



The site location as it currently stands



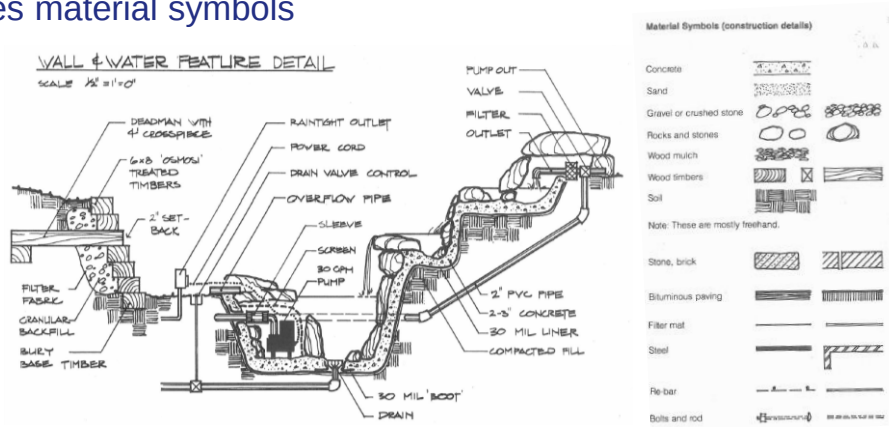
Water Garden Concept Plan
East Ivanhoe Pre School

Not to Scale
Date May 2017

inner city nature
Garden Design & Installation
M 0418 369 448
pb@innercitynature.com.au

Preparing for retaining wall project

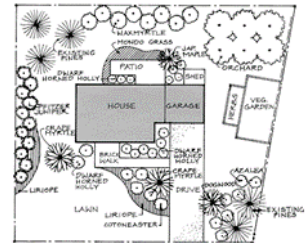
- To prepare for retaining wall projects, you should interpret construction details
 - Details the components of a structure and how they fit together
 - Provides material symbols



Activity 3: List the materials required to complete the retaining wall, by using the wall and water feature construction plan shown

Preparing for retaining wall project

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Preparing for retaining wall project

- To prepare for retaining wall projects, you should familiarise yourself with workplace requirements
 - **Building Code of Australia**
 - According to Queensland building regulations, you do not need building approval for a retaining wall if it meets the following criteria:
 - There is no 'surcharge loading' over the 'zone of influence' for the wall
 - Refer to definitions in the Building Regulation 2006 (Schedule 1 Section 3) [p.74]
 - The total height of the wall and of the fill or cut retained by the wall is no more than one metre above the wall's natural ground surface
 - The wall is no closer than 1.5 metres to a building or another retaining wall
 - It does not form part of the fencing for a pool
 - If your project does not meet all of these requirements, you must prepare a building application and have it approved by a building certifier

The Queensland Building and Construction Commission (QBCC) states that a Structural Landscaping (Trade) licensee can only construct walls of a height that does not require engineering certification under a local law (generally 1m in height)

Preparing for retaining wall project

- To prepare for retaining wall projects, you should familiarise yourself with workplace requirements
 - Local council permit requirements for landscape works
 - For example, in the Brisbane City Council area, you need approval for retaining walls built in the following circumstances:
 - Sites subject to coastal hazards, flood, landslides, waterways, wetlands, bushfire, acid sulphate soils, heritage requirements
 - Sites within environmental management and conservation zones
 - Development of dwelling houses on small lots
 - Subdivision of a site, particularly if sloped

Activity 4: Identify the requirements of your local council with regards to retaining walls

Preparing for retaining wall project

- To prepare for retaining wall projects, you should familiarise yourself with the required site safety
- Identify hazards, assessing risks and implementing required controls by any/all of the following methods:
 - **Personal risk assessment:** Considers what is to happen, what can go wrong and prevention measures
 - **Job Safety Analysis (JSA):** Analyses potential hazards completing the task on site
 - **Safe Work Method Statement (SWMS):** Outlines how activities are to be carried out safely not required
 - **Safety Data Sheet (SDS):** Explains how to safely handle, use and dispose of hazardous materials
 - **Site safety plans:** Explain emergency procedures
 - **Toolbox talks**
 - **Environmental management plan:** Consider the impacts of scope of works

Activity 5: What strategies could you implement to address environmental impacts, including spillages, dust, site cleanliness and noise?

- To prepare for retaining wall projects, you should familiarise yourself with the work area
 - Identify any WHS hazards and assess risks (e.g. unauthorised persons in work area, underground services, hazardous material, machinery and tool use)
 - Consider the environmental impacts of the proposed works (e.g. erosion, redirection of water flow, degradation of land, dust, noise and flora/fauna)
- Report hazards to your supervisor within a timely fashion – especially emergency situations

Workplace risk assessment

- Risk is measured in terms of the seriousness of the possible **consequences** of the hazard and the **likelihood** that those consequences will occur, as in the matrix shown below:

Likelihood

- 1: Very Likely
- 2: Likely
- 3: Possible
- 4: Unlikely
- 5: Very Unlikely

Consequences

- A: Death or Permanent Disability
- B: Serious Injury
- C: Lost Time Injury
- D: Casualty Treatment
- E: First Aid

Matrix	A	B	C	D	E
1	E	E	H	H	M
2	E	H	H	M	M
3	H	H	M	M	L
4	H	M	M	L	L
5	M	M	L	L	L

Preparing for retaining wall project

- To prepare for retaining wall projects, you should organise required PPE, machinery, tools and equipment
 - **PPE may include:** Gloves, goggles, ear protection, wide brimmed hat, work boots
 - **Machinery may include:** Bobcat, excavator, dingo, cement mixers, brick saw, jackhammer
 - **Safety equipment may include:**
 - Bunting and barricades to reduce risks to personnel on site (e.g. marking exclusion zones)
 - Signage to convey safety messages – placed visibly in the relevant work area, at eye height
 - **Tools and equipment may include:** Mattock, pick, shovel, spade, stringlines, hammer and bolster, rubber mallet, trowels, wooden/steel floats, surveying and levelling tools, tape measure, electric grinder, masonry cutting tools, wire cutters, bolt cutters, pliers, wheelbarrow

Ensure they are appropriately selected, prepared and used for the task, following manufacturer recommendations

Preparing for retaining wall project

- The materials to be used for retaining wall projects will differ depending on the work to be completed
- However, some common materials include:
 - Bricks, masonry blocks and link blocks
 - Stone
 - CCA treated timber (e.g. hardwood, pine logs)
 - Bedding materials (e.g. concrete, rammed earth, mortar)
 - Fasteners (e.g. screws, bolts, nails, reinforcing bars)
 - Drainage materials (e.g. pipe, geo-fabric, large/small aggregate, topsoil)



It is your responsibility to liaise with suppliers to organise materials delivery to the site, according to workplace priorities

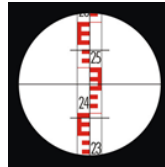
- Follow the steps outlined below when setting out the site:
 - Locate services (e.g. telephone, gas, electricity, water, cable, sewerage)
 - Contact Dial Before You Dig to check the location of such services
 - Mark out the position of the retaining wall
 - Locate existing elements/structures to take measurements from
 - Mark out the construction area using stringlines, pegs and marking paint
 - Determine the location and depth of excavations
 - Calculate requirements for bedding material and bedding course
 - Transfer levels indicated on the plan to real levels on the site
 - Excavate the selected area to the nominated depths
 - Remove any roots, soft earth or debris and compact as required



Mark out site

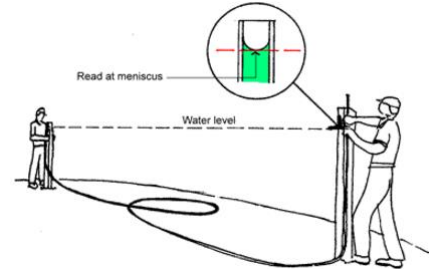


- Follow the steps outlined below when setting out the site:
 - Establish survey benchmarks
 - Benchmarks are based on established datum points
 - A datum is a level surface above or below which all heights are measured – think of it as a ‘starting point’



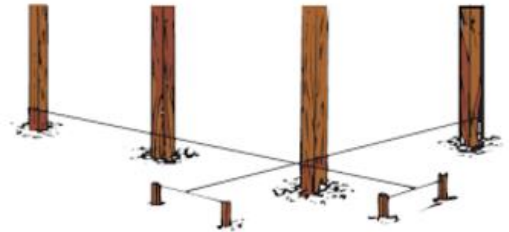
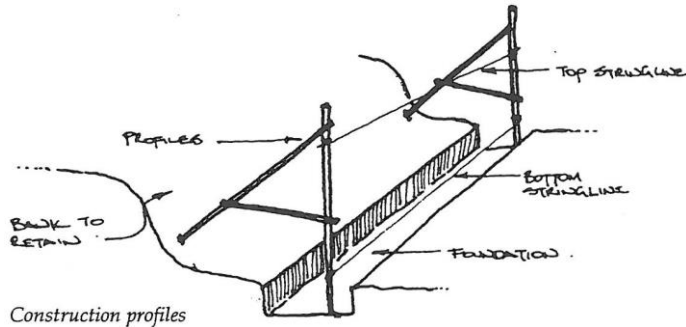
- The position of the job datum should be clearly marked on site plans
- Benchmarks are fixed points of known height to which other points can be referred
- Benchmarks should be established on positions or structures where they cannot be disturbed by construction activity

- Follow the steps outlined below when setting out the site:
 - Establish profiles to conform to the designated tolerances
 - A profile is a temporary fixture (e.g. timber pegs with cross boards attached) which assists in determining a structure's position and intended height
 - Stringlines are positioned from profile to profile in the exact position, height and batter of the wall
 - Water levels may be used to ensure each profile is at required height



Mark out site

- By sighting through two stringlines (i.e. one at the top of the wall construction and one at the bottom), a plane or finished face can be seen
- This is the face of the retaining wall to build

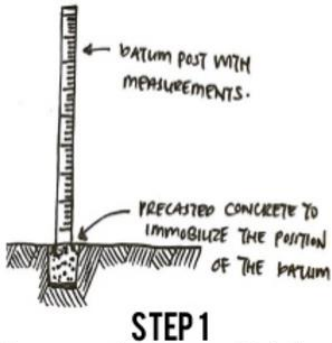


Construct retaining wall

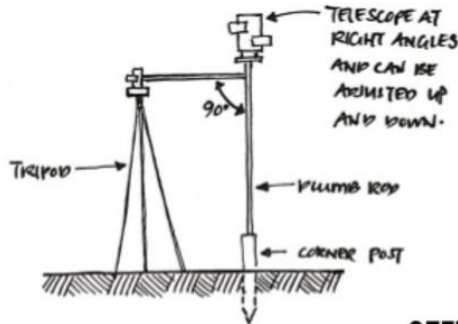
- It is essential that footings are constructed when installing a retaining wall
 - The footing is responsible for securing the wall structure into the ground to stabilise movement of the wall
- A foundation is the excavated trench or hole into which the footing is placed – it is responsible for supporting the retaining wall structure
 - It is necessary for the foundation to be excavated to a stable base material
 - An uneven base will affect the levelness and appearance of the finished retaining wall
 - If there are any areas that are soft fill, they should be compacted and filled with a roadbase-type material and levelled

Construct retaining wall

- The excavation works for foundation and trenches are mainly to establish the size, shape and direction of the entire structure frame
- Foundation trenches are also essential as they serve to establish the width and position of the walls using the profile boards that have been set up as guidelines and reference points

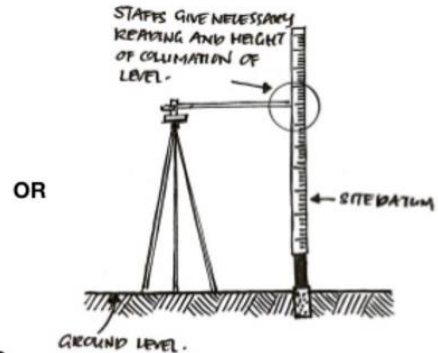


A temporary site datum post is being set up at a strategic spot as to act as reference point.



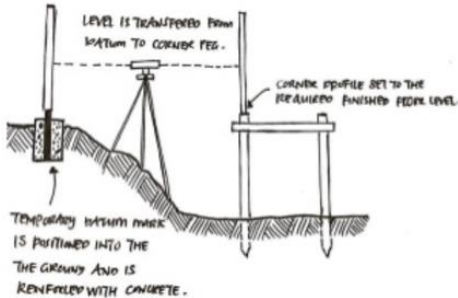
STEP 2

A tripod holding the construction levelling telescope (dumpy level) is used to obtain perpendicular angles with the help of the plumb rod being attached onto the corner post or with the help of a site datum.



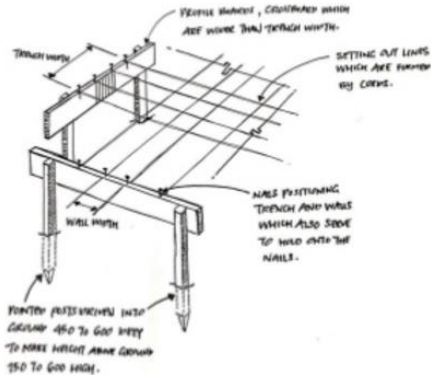
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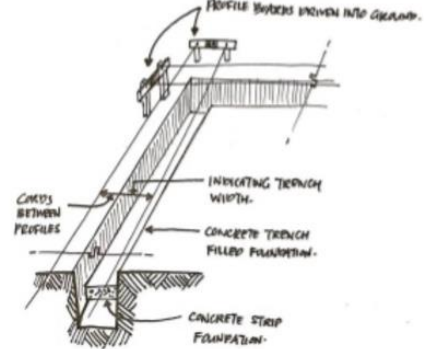


STEP 3

The well levelled telescope will be then used to act as surveillance in order to make sure the profile boards are well levelled.



STEP 4



STEP 5

Construct retaining wall

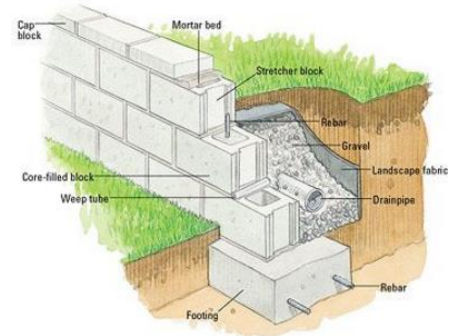
- When preparing footings, consider:
 - The structure being built
 - The type of ground being built on
 - The height and length of the wall
 - Material types
 - Drainage requirements
- Steel placed into the foundation should be:
 - Kept off the bottom so there is adequate concrete around the steel
 - Positioned in the centre of the concrete



FOR EXAMPLE

A concrete block retaining wall's main structure consists of core filled concrete blocks. Because of the high proportion of concrete, it may be necessary to include steel reinforcing to give the wall extra strength. Also, either steel rods or steel reinforcing mesh can be used in the footings.

TYPICAL CONCRETE-BLOCK RETAINING WALL



Construct retaining walls

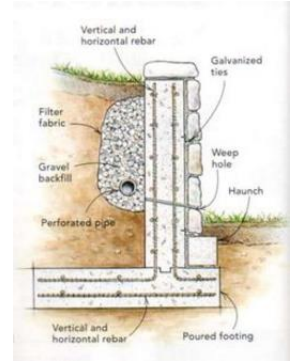
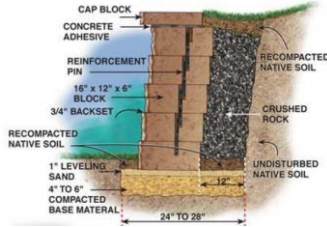
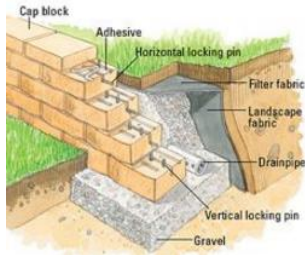
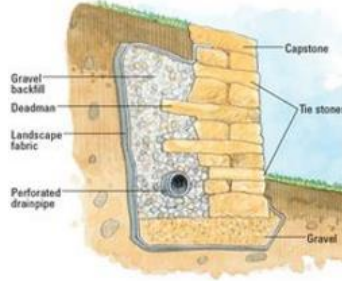
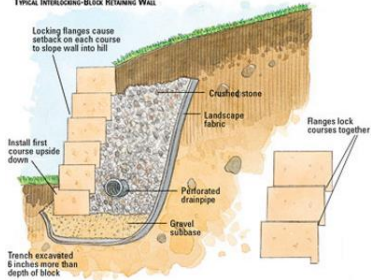
- The concrete should be poured into the foundation continuously, rather than in small sections, to avoid cracking
- Ensure finished heights are maintained
- You may also complete the following process (optional):
 - When the concrete almost fills the foundation, blocks can be placed into the wet concrete and to the face of the wall (stringline)
 - It is important to place the base layer of block at this point so the first part of the wall is keyed into the footing



Construct retaining wall

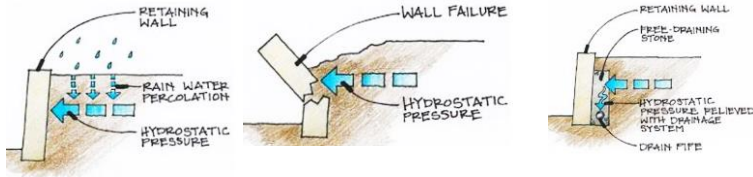
- Variations in block and stone construction designs

TYPICAL INTERLOCKING-BLOCK RETAINING WALL



Drainage

- A retaining wall requires drainage to be installed
 - Drainage types include surface and subsurface

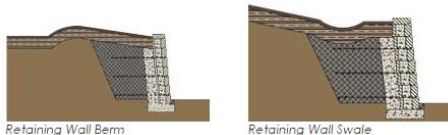


Consequences of poor drainage:

- The wall will act as a dam
- Cracks in the wall due to erosion under the base material
- Walls sinking or moving
- Blocks shifting out of alignment
- Wall failure



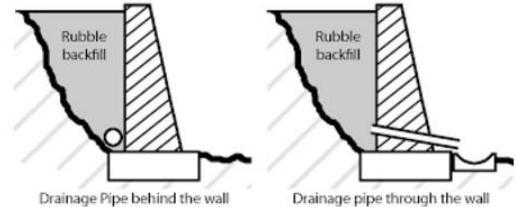
- Installing adequate drainage



Activity 6: List the components for four (4) common surface drainage systems used in landscape construction: Spoon, Channel and grate, Pit, Contour

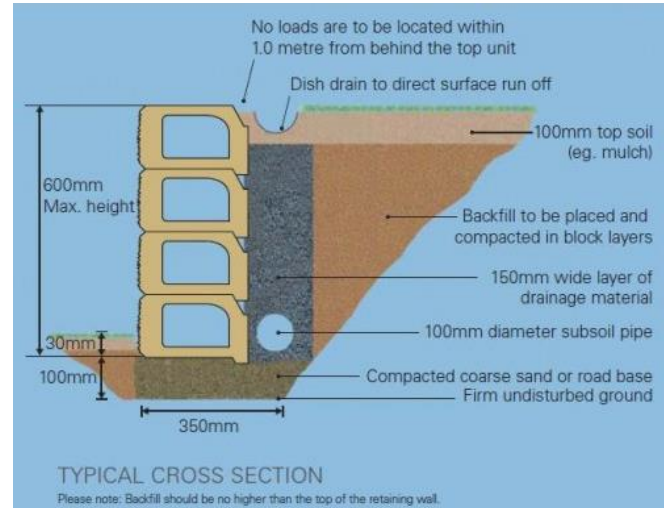
- When do I need drain pipes?
 - All walls taller than 1.2m
 - Sites with poorly draining soils
 - Alongside paved areas
 - Water lines, mains or fire hydrants
 - With slopes above the wall
 - On multi-tiered and terraced walls
 - All commercial and municipal projects

Activity 7: List the advantages and disadvantages of drainage behind and through the built wall (as shown below)



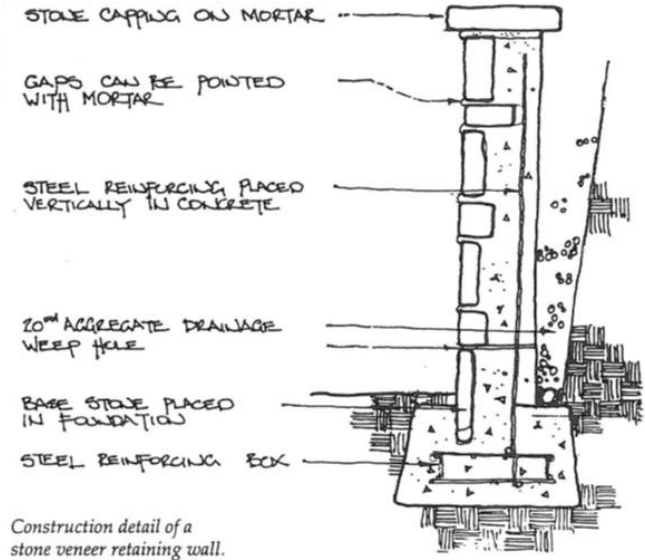
Retaining wall drainage

- Subsurface drainage is installed usually around the first or second courses of blocks
- Conduit / ag-flow pipe / weep holes should be placed at various points in the wall to allow sub-surface water to exist
- This may not always be aesthetically pleasing, hence a rubble drain behind the wall is the most general method



Construct retaining wall

- Continue building the wall
 - Continue to lay the remainder of the courses, as per plans and specifications
- Block and stone retaining walls should be finished/capped
- Methods include:
 - Simple mortar capping
 - Brick or paver set in mortar
 - Cut stone set in mortar



Activity 8: Explain the following terms: Batter, Angle of repose

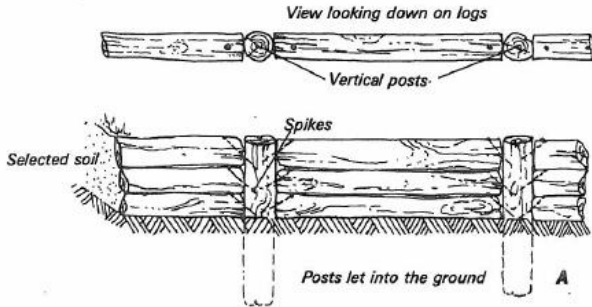
Construct retaining wall

- For stone veneer retaining walls, concrete will be placed behind the retaining wall face
- It can be placed in various ways:
 - Some contractors will have formwork in front of and/or behind the wall
 - Others will backfill as they build up
- When placing concrete, the mix should flow or be assisted with a trowel
 - Use a trowel to mould the concrete in and around the joints and crevices
 - Never throw or force the concrete around the back of the stone as it may dislodge the stone from its position

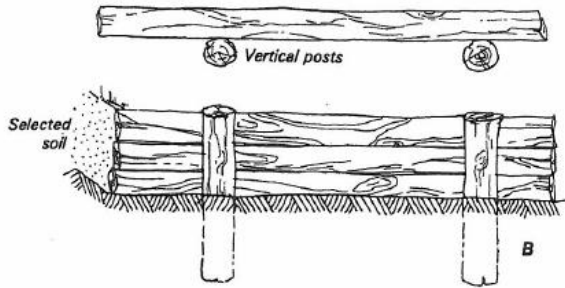


Construct retaining wall

- Examples of timber retaining walls



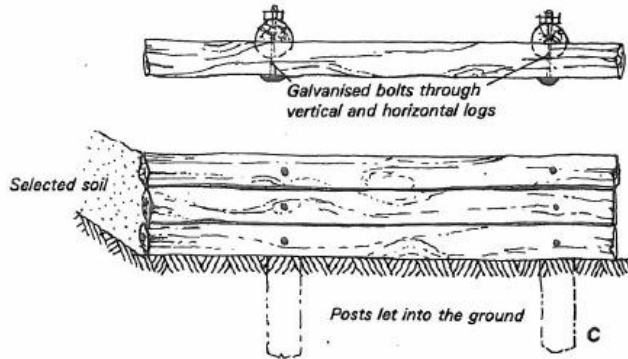
Horizontal logs spiked to vertical posts



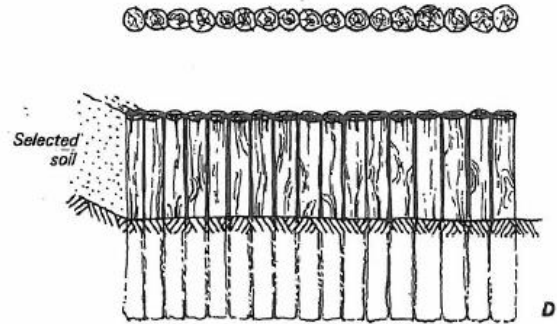
Horizontal logs supported by vertical posts fixed at the front

Construct retaining wall

- Examples of timber retaining walls



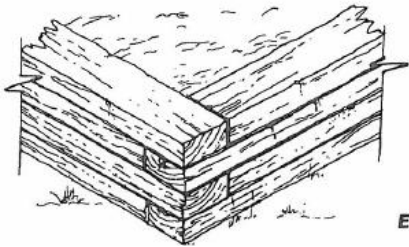
Horizontal logs bolted to vertical posts at the rear



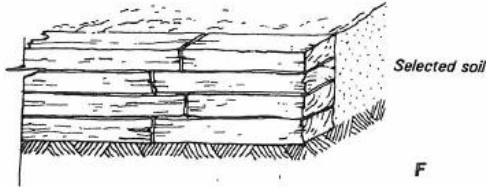
Vertical logs let into the ground

Construct retaining wall

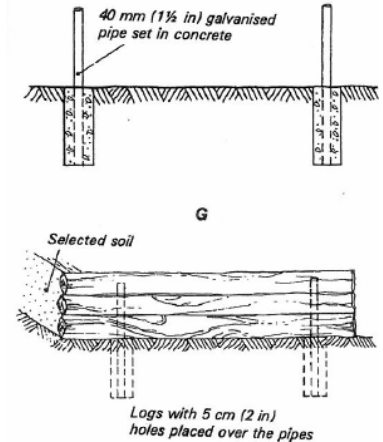
- Examples of timber retaining walls



Old railway sleepers overlapped at the corners

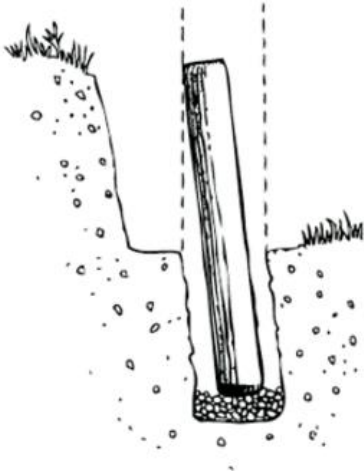


Sleepers overlapped on a straight wall



Logs supported by galvanised pipes

Construct retaining wall



Activity 9: Describe what is happening the in sketched diagram and the photograph shown

Construct retaining wall

- Additional construction materials for retaining walls may include:



Construct retaining wall

- Additional construction materials for retaining walls may include:



Construct retaining wall

- Additional construction materials for retaining walls may include:



HOW TO BUILD A RETAINING WALL FROM RECYCLED TYRES.

Quality check and clean up

- After completing retaining wall construction, you are required to complete the following practices:
 - Compare the quality of the finished works with the plans and specifications
 - Record and/or report your work outcomes to your supervisor
 - Clean up the work site
 - Shut down, maintain, clean and pack away machinery, tools and equipment
 - Follow manufacturer's specifications and supervisor's instructions
 - Report faults that are discovered in logbook and/or site records



Quality check and clean up

- After completing paving work, you are required to complete the following practices:
 - **Dispose of materials that cannot be reused or recycled**
 - Separate soil and waste material (e.g. organic, inorganic and recyclable piles)
 - Ensure that you follow the enterprise guidelines (e.g. JSA and SWMS for handling and disposing of waste)
 - Follow Safety Data Sheets (SDS) and environmental plans to ensure environmentally safe practices



Activity 10: Have team members take photos and videos of your involvement with retaining wall construction. Be sure to include all stages of construction.

Maintaining retaining walls

- Retaining walls should be maintained
- It is important to provide your client with after care instructions, these may include the following:
 - Conducting a thorough annual inspection of the wall
 - Correcting any settling or grading problems around the wall
 - Taking notice of any wall movement and then taking corrective action
 - Movement may include settling, bulging or rotation
 - Controlling weed infestations early to stop the spread
 - Carrying out any wall treatments (e.g. cleaning, aging, lacquering)



Offer your client with a quote for after-installation maintenance services