



Set out site for construction works

AHCLSC301

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

- Plan and prepare work
- Locate and mark out position of construction works
- Establish datum point and survey benchmarks on site
- Take and verify site levels

What is landscape construction?

- Landscape construction may involve a range of different tasks, including:
 - Building of retaining walls
 - Setting up irrigation systems
 - Planting in designated areas
 - Installing paths, paving and stone features
- To prepare for landscape construction, you should familiarise yourself with plans and specifications to understand the task at hand

Plans are a visual sketch of the task, specifications are more detailed notes that accompany the plans

- When familiarising yourself with the task:
 - Identify tools and equipment (e.g. surveying and levelling equipment, chalk, stringlines, pegs, hammer, tape measure, square, compass, scale ruler, calculator)
 - Calibrate tools, checking for serviceability
 - Identify any hazards and assess risks, such as:
 - Contact with underground services
 - Manual handling injuries
 - Environmental impact of proposed construction works (e.g. erosion, runoff into stormwater drains)
 - Implement controls to address hazards
 - This may be as simple as reporting hazards to your supervisor

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

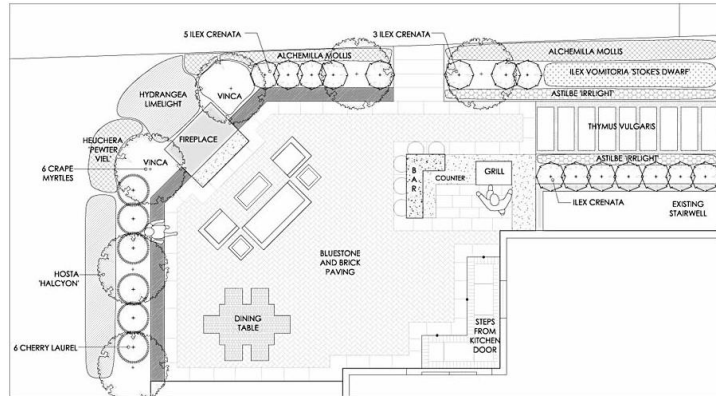
Consequences

- 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

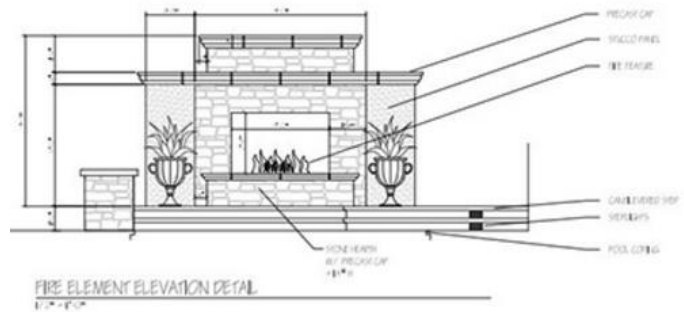
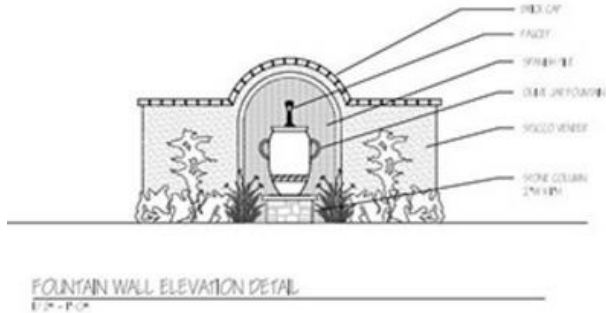
Planning and preparing for work

- There are a range of different plans that you may encounter when preparing for work, such as **site plans**:
 - Viewed directly from above, they are similar to an aerial photograph
 - They do not show vertical dimensions of objects on a site



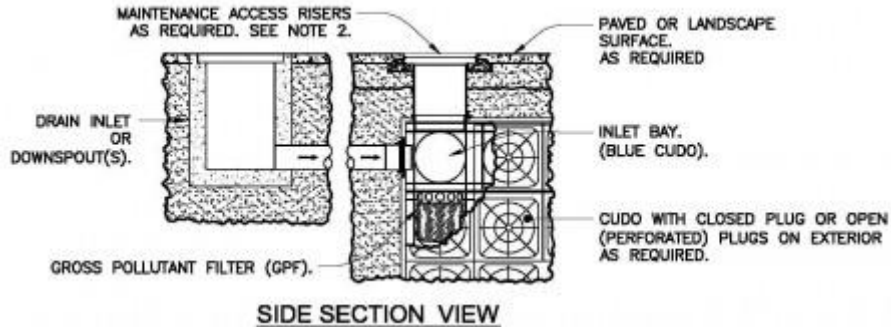
Planning and preparing for work

- There are a range of different plans that you may encounter when preparing for work, such as **elevations**:
 - They provide a view of an object from the side
 - They include vertical dimensions



Planning and preparing for work

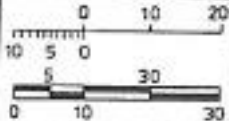
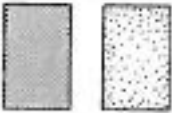
- There are a range of different plans that you may encounter when preparing for work, such as **sectional views**:
 - They provide a cutaway view of an object in any plane



- When reading plans, be aware of the following information:

Feature	Description
Title block	Identifies: - Project name and type - Project location - Number, date and revision version of the plans
Scale	Identifies the size of the plans in relation to the actual site. For example a scale of 1:100 means that 1cm on the plans reflects 100cm (or 1m) on site
North point	An arrow which indicates the direction of north in relation to the site
Legend	A key which identifies the meaning of certain symbols and/or shadings on the plans

- Example drawing symbols:

MISCELLANEOUS ARCHITECTURAL SYMBOLS			
NORTH POINT		GRAPHIC SCALES	
GRASS		NEW TREES	
PLANTED AREA		EXISTING TREES	
		TREES TO BE REMOVED	

- Site plans and specifications should be used to identify:
 - Existing site features (e.g. roads, buildings)
 - Position of proposed construction works
- Site plans should be compared with other available plans for confirmation
 - **Surveyors' plans:** Identify site levels, boundary lines, existing vegetation, easements, rights of way
 - **Engineers' and architect plans:** Show other proposed works in detail
 - **Council plans:** Identify lot number, locality and site features
 - **Dial Before You Dig plans:** Identify the location of services (gas, water, telephone, electricity, sewer, stormwater)

- Before commencing any work, you must orient yourself with the site:
 - Check the accuracy of the scale on the plans with what you see
 - Locate where the services are (i.e. above and below ground)
 - Find the north point
 - Find the property boundaries
 - Identify major site features, which can be used as points for marking out the site, such as:
 - Buildings
 - Driveways
 - Fences
 - Paths
 - Trees and shrubs

- Using the correct scale, you are to transfer scale measurements from the site plan to the site, taking note of:
 - Dimensions
 - Lines
 - Straight lines can be formed by joining two points
 - Curved lines can be formed by joining several points
 - Circular lines can be formed by arcing off a point
 - Shapes (e.g. rectangles, squares, triangles, irregular shapes)
 - Angles

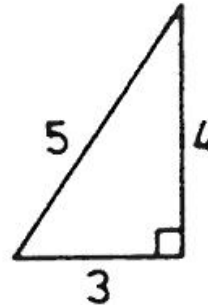
Marking out works

- Mark out the shape of the proposed construction works on site
 - Use chalk on hard paved surfaces
 - Use stringlines and pegs over soil or turf
 - A long garden hose may also be useful for marking out shapes on both hard and soft surfaces
- Use the chainage and offset method to locate points
 - Establish a primary base line parallel to the features (chain line) and measure the distance to the features from this known line
 - This 'offset' measurement should be an exact right angle to the chain line
 - Measuring how from the left to the right of the chain is known as the 'chainage'

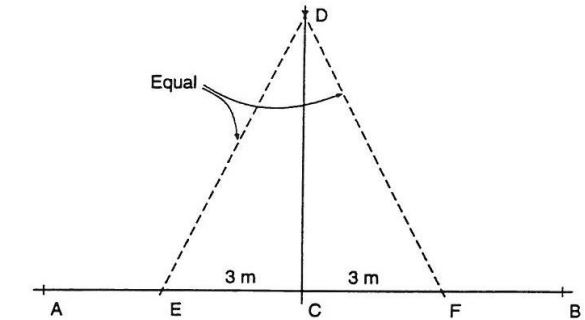
A large area can be divided into smaller areas using base lines

- To mark out a right angled triangle, use one of the following methods:
 - Use a steel square
 - Follow the 3:4:5 rule
 - The triangle's hypotenuse squared will equal the sum of the squares of the other two sides of the triangle

$$3^2 + 4^2 = 5^2$$



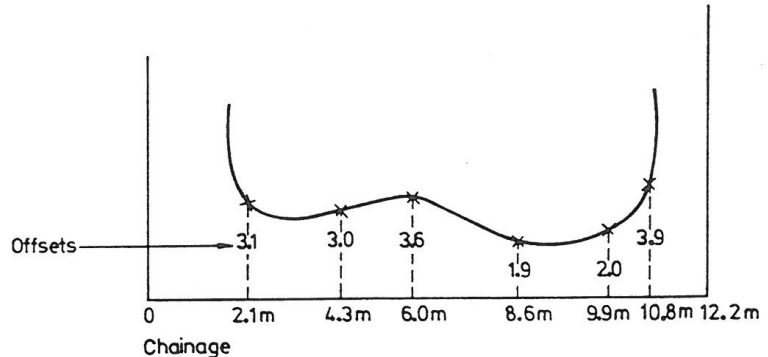
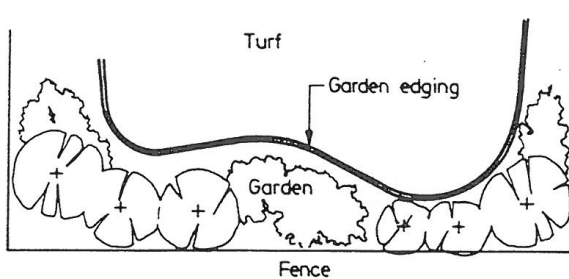
- To mark out an isosceles triangle, use the bisection method:
 - One the stringline A B, Peg C is driven into the ground to represent the intersection of the external walls. A line is laid on the ground with one end attached to Peg C.
 - Two other pegs (E and F) are driven at equal distance (e.g. 3m). A tape is attached to Peg E and stretched to a suitable measurement (e.g. 6m) and returned to Peg F making the measurement DE and DE equal (e.g. 6m)
 - The string line is then fixed so it passes through Point D, making a right angle at C



Setting up a right angle using an isosceles triangle.

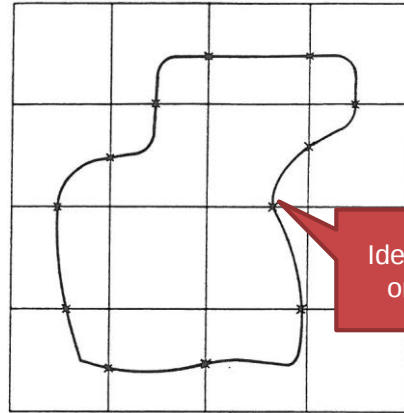
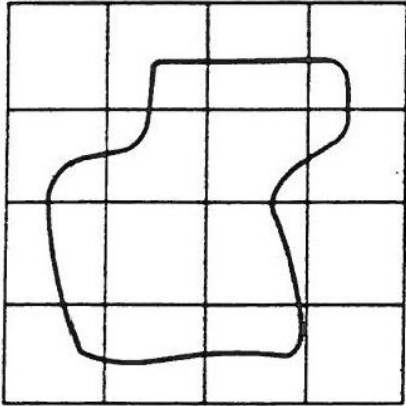
Marking out works

- To plot an irregular border, mark out the chainage and offsets on the plan and then transfer them to scale on the site
- For example, for the irregular border on the garden bed shown below:



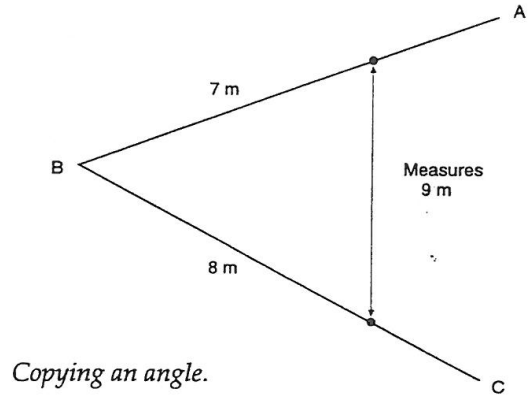
Marking out works

- To plot an irregular shape, draw a grid over the shape on the plan
 - The grid may have to be located by the chainage and offset method
- Set out the grid to scale on the landscape site



Identify points
on the grid

- Where it is necessary to copy an angle, but there is no need to measure the degrees, construct a triangle using the two sides of the angle and measure the distance between the points on each side
 - Measure a convenient distance along BA and BC from B and mark these distances with a peg
 - Measure the distance between the pegs to establish the third side of the triangle
 - The angle ABC can be copied using units of 7, 8 and 9 for the lengths of each side of the triangle



- Vertical measurements are required when setting out landscape works
 - For example: To construct pavements, walls and structures (e.g. pergolas, mounds, paths)
- Vertical measurements often need to be taken in a horizontal plane – measurements known as ‘levels’
 - The main reasons for taking levels in landscape construction include:
 - Determining the height above sea level
 - Determining areas and volumes in cut and fill operations
 - Determining any changes in slope or gradient of the land
 - Determining contours of the land
 - Providing the means for safe and efficient construction of landscape structures
 - Achieving falls for drainage of stormwater from pavements
 - Achieving falls in pipework or for installing sumps and drains

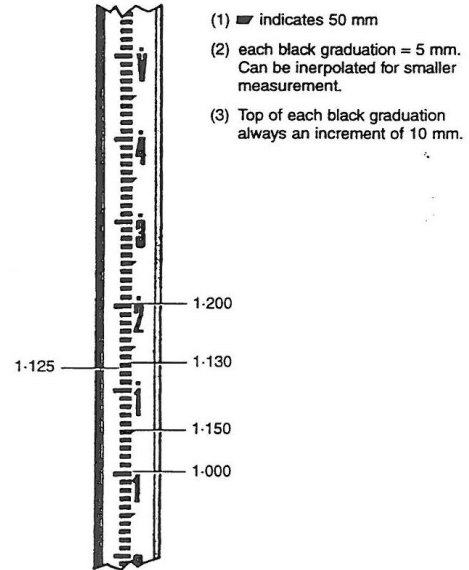
- In order to take levels, a datum must first be established
 - A datum is a level surface above or below which all heights are measured – think of it as a ‘starting point’
 - Datums are assigned a value (i.e. 10 0000, 10000, 100, etc) – which may be set by a surveyor or simply be a nail in a fence post which all levels are referred to
- The job datum level is indicated by the symbol followed  100 000 by the numerals for that level
 - The position of the job datum should be clearly marked on site plans

- The datum is related to bench marks which are fixed points of known height to which other points can be referred
- Bench marks should be established on positions or structures on site according to site plans or specifications
 - Bench marks are located where they cannot be disturbed by earthmoving equipment or by construction activity
 - The symbol for a bench mark on plans is an equilateral triangle

- It is not necessary for a landscape constructor to have the skills of a qualified surveyor
 - However they will be required to take and verify site levels with established datum point and survey bench marks
 - Levelling can be described as a survey operation using a levelling instrument to determine the difference in height between points from a horizontal plane
- Set up levelling equipment and check for accuracy of readings, adjusting instruments which are out of specification
 - Levelling equipment may include either:
 - An Australian metric staff or
 - A Metric 'E' staff

Site levels

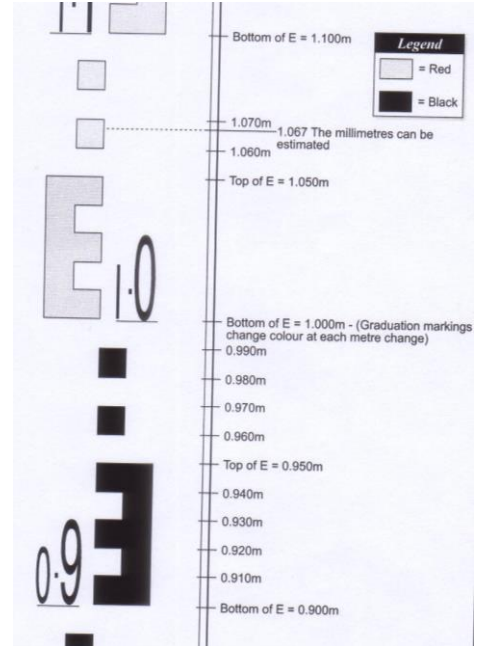
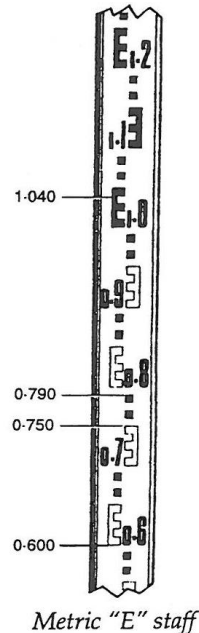
- The Australian metric staff is graduated in metres, with increments of 5mm
 - To assist in reading the staff, red dots are placed over the 100mm marks
 - For measurements between 1m and 2m, one red dot appears over the 100mm mark
 - Between 2m and 3m there are two red dots and so on



Australian metric staff

Site levels

- The Metric 'E' staff is graduated in metres, with increments of 10mm
 - Major graduations occur at 100mm intervals and are denoted by numbers
 - Minor graduations are at 10mm intervals and form coloured squares
 - The lower 50mm of any 100mm block are joined together by a band to form the distinctive 'E' pattern



- Levels should be checked occasionally using a 'two peg test' to ensure they are correctly adjusted
 - Place two pegs in reasonably level ground between 50 to 100m apart
 - Set the level up midway between the pegs
 - Observe the readings on pegs A and B
 - Set the level up again on an extension of the line between the pegs and close to one of them
 - Obtain new readings on the pegs
 - The difference should be the same as before – if not, the level is out of adjustment and should not be used until corrected by an experienced surveyor or technician

- A range of levelling equipment may be used, such as:
 - Automatic levels
 - Stringline levels
 - T-bar levels (for drainage lines)
 - Water levels
- When using an automatic level, take note of the following:
 - Ensure that the tripod is set up on stable ground
 - Consistently check the bubble level to ensure it is centred

- Be sure to appropriately care for tools and equipment
 - In the course of surveying, tools and equipment may be affected by mud, water or dust
- Cleaning can be carried out at the same time as using items
 - For example: Keeping an oily cloth close at hand when using steel tapes or keeping a damp cloth nearby when using plastic or fibreglass tapes