

# **Carpentry**

## **Level-II**

# **Learning Guide-31**

**Unit of Competence: apply basic leveling procedure**

**Module Title: Applying basic leveling procedure**

**LG code: EIS CRP2 M08 LO1-LG-31**

**TTLM Code: EIS CRP2 M08 TTLM 0919v1**

## **LO 1: Plan and prepare**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Obtaining, confirming and applying Work instructions to prepare *basic* leveling activities.
- Following safety (ohs) requirements
- Identifying signage and barricade requirements
- Selecting tools and equipment
- Identifying environmental requirements
- Applying statutory and regulatory authority obligations

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, **upon completion of this Learning Guide, you will be able to:**

- Obtain, confirm and apply Work instructions, including plans, specifications, quality requirements and operational details, from relevant information to prepare for basic leveling activities.
- Follow Safety (OHS) requirements are in accordance with safety plans and policies.
- Identify and implement signage and barricade requirements are.
- Select Tools and equipment to carry out tasks consistent with job requirements, check for serviceability, and rectify or report any faults prior to commencement.
- Identify Environmental requirements are for the project in accordance with environmental plans and statutory and regulatory authority obligations, and are applied.

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 4.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5, Sheet 6, and Sheet 7”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4, Self-check 5 Self-check 6 and Self-check7” respectively.

<b>Information Sheet-1</b>	Obtaining, confirming and applying Work instructions to prepare basic leveling activities.
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## 1.1. Introduction

As with all jobs in building and construction, the task of levelling requires careful planning and preparation – not only because it helps to get the task done efficiently, but it also ensures that it's done accurately and precisely. The levelling process helps create a geographic profile of the site, so it's very important that this is carried out correctly. It's one of the very first steps in the building process, and all aspects of the construction rely on it. Mistakes made at this point will affect later stages of the construction process and can be very costly. Later sections of this guide cover the actual processes involved in carrying out levelling operations. In this first section, you'll look at things that must be considered before the process begins, such as:

- Work instructions and task requirements
- Your materials, tools and equipment
- Environmental requirements.

### • Work instructions

**Work Instructions** are documents that clearly and precisely describe the correct way to perform certain tasks that may cause inconvenience or damage if not done in the established manner. That is, describe, dictate or stipulate the steps that must be followed to correctly perform any specific activity or work.

A document describing specific activities and tasks within the organization. It contains the greatest amount of detail.

Whenever you're given instructions for a task or project, you'll need to make sure that you clearly understand what you have to do. Instructions may be provided in written or verbal form, or sometimes a mix of the two. Being able to give and receive instructions effectively is an important part of communication on the worksite. Here are a few tips to help you out if you're given instructions that are unclear or incomplete or if you have trouble understanding them.

- ✓ **Take notes.** It's hard to remember everything by keeping it in your head. Writing a few notes helps remind you what needs to be done.
- ✓ **Ask questions.** Don't be afraid to ask for more information or for clarification on something. Something simple like, 'I don't quite get what you mean by...' or 'Could you tell me a bit more about how to...' is a good way to get the details you need.
- ✓ **Be aware of language.** You may be teamed up with people from other countries or cultures who don't speak English as well as you do. This can sometimes make communication difficult, but be patient. Listen carefully, speak clearly, take notes and ask questions until both you and the other person(s) are sure the instructions and/or information have been communicated correctly.
- ✓ **Confirm the instructions before you start the task.** Never walk away feeling unsure about what you've got to do. A good way of confirming is to say something like, 'OK, before I go, I'll just check I've got this right...', then refer to your notes, run through the key points or steps, and ask for confirmation that you've got all the information you need.
- ✓ **Sequence the instructions.** Putting instructions and/or steps into the order you'll be completing them makes them much easier to follow.

Here are some examples of documented work instructions which may be found on a typical construction site:

- ✓ Working Drawings issued for construction such as Plans , elevations, sections etc
- ✓ Specifications/Contract specifications
- ✓ Construction method statements
- ✓ Quality requirements
- ✓ Operational details
- ✓ Maintenance manuals

- **Sources of information**

- ✓ diagrams or sketches

A diagram is a symbolic representation of information using visualization techniques. Diagrams have been used since ancient times, but became more prevalent during the Enlightenment. Sometimes, the technique uses a three-dimensional visualization which is then projected onto a two-dimensional surface. The word graph is sometimes used as a synonym for diagram.

The term "diagram" in its commonly used sense can have a general or specific meaning:

1. Visual information device: Like the term "illustration", "diagram" is used as a collective term standing for the whole class of technical genres, including graphs, technical drawings and tables.
2. Specific kind of visual display : This is the genre that shows qualitative data with shapes that are connected by lines, arrows, or other visual links.

The essence of a diagram can be seen as

- a form of visual formatting devices
- a display that does not show quantitative data (numerical data), but rather relationships and abstract information
- with building blocks such as geometrical shapes connected by lines, arrows, or other visual links

Refer:- <https://en.wikipedia.org/wiki/Diagram>

- **manufacturer specifications and instructions**

Analysing technical information in an enterprise, including quality documentation, equipment manufacturer specifications, engineering data sheets and national standards. It also covers explaining and using the information, and identifying implications of changes to technical information.

Manufacturer specifications are an important element of cost and quality control for testing, calibration and other measurement processes. They are used for MTE (materials, tools and equipment) selection or establishing equipment substitutions for a given measurement application.

MTE specifications should provide adequate details about the expected performance characteristics of a representative group of identical devices or items (i.e., a specific

manufacturer and model). This information should be reported in a logical format, using consistent terms, abbreviations and units that clearly convey pertinent performance characteristics.

✓ **maps**

Is the source of information to know the place where the task is being performed. A simple guide to creating a site plan that will meet your council planning department's requirements. Includes information on Scale, Format, Size and Examples.

✓ **material safety data sheets (MSDS)**

A Material Safety Data Sheet (MSDS) is a document that contains information on the potential hazards (health, fire, reactivity and environmental) and how to work safely with the chemical product. It is an essential starting point for the development of a complete health and safety program

✓ **memos**

A memo is a type of document used to communicate with others in the same organization. Memos (or memoranda) are typically used for fairly short messages of one page or less, but informal reports of several pages may also employ memo format.

- **Organization work specifications and requirements.**

It includes functional requirements, performance requirements, interface requirements, design requirements, and development standards. So the requirements specification is simply the requirements written down on paper

- **plans and specifications**

Plans and specifications as described in the Building

The drawings, specification and other documents (see 3.0.2 below) from which the building is to be constructed, altered, demolished or removed the proposed procedures for inspection during construction the definition of the intended building use details of specified systems and procedures for their inspection and maintenance.

Refer to:- <https://www.collate.co.nz › BU622-Good-plans-and-specifications>

- **Relevant Ethiopian standards**

Standardisation in building is a process of creating various elements in building to a certain specification size and quality. Standardisation is an important principle of rationalisation and requires that buildings be built of standardised components. The other benefits of standardisation include reduced Construction time, improved quality and reduced costs.

In Ethiopia there has been standardisation programs in the industry, and also major manufacturers have been offering standardised product range. Standardised materials available to the industry include roofing materials, pre-cast concrete materials, steel windows, doors and electrical fittings.

As with all construction tasks there are quality requirements related to carrying out levelling operations. If you're unsure about quality requirements – whether in relation to the work you're doing, the materials you're using, or some other area – always check with your supervisor. Although there is no specific Standard for levelling, information related to carrying out levelling operations can be found in some of the Standards for construction elements that rely on correct establishment of ground level, such as:

- ✓ Residential slabs and footings
- ✓ Residential timber-framed construction – Non-cyclonic areas

- **Signage**



Figure1 examples of signage

Signage is the design or use of signs and symbols to communicate a message to a specific group, usually for the purpose of marketing or a kind of advocacy.

Signs are any kind of visual graphics created to display information to a particular audience.

This is typically manifested in the form of wayfinding information in places such as streets or on the inside and outside buildings. Signs vary in form and size based on location and intent, from more expansive banners, billboards, and murals, to smaller street signs, street name signs, sandwich boards and lawn signs. Newer signs may also use digital or electronic displays.

<https://en.wikipedia.org/wiki/Signage>

- **Verbal or written and graphical instructions**

verbal instruction = instructions given verbally, or spoken words , can be heard

written instruction = instructions which can be read words and pictures need the ability to interpret

1. When you're giving instructions

- ✓ **Think before you speak** - work out what you want to say before you say it, and make sure you cover all of the points that are relevant.
- ✓ **Avoid jargon** - don't use words that the listener won't understand.
- ✓ **Watch for body language signals** - see if the listener looks like they understand what you're saying.
- ✓ **Ask for feedback** - check that the listener has understood the message the way you intended it.

2. When you're receiving instructions

- ✓ **Listen to the whole message** - don't assume you know what the speaker is going to say before they say it.
- ✓ **Use positive body language** - show that you're taking in what they're saying.
- ✓ **Ask questions** - clarify any points you don't understand.
- ✓ **Give feedback** - restate in your own words what you think the speaker is saying, and check that they agree with you.

- **Work schedules**

A work schedule generally refers to the days per week and the hours per day that an employee is expected to be at their job. There are several different types of work schedules, which vary based on the organization and the position. Your schedule can also vary based on the time of year. For example, some jobs have work schedules that change, depending on the season.

Make sure you know the work schedule for any job before accepting a position. This will help you avoid any surprises when you start work.



It's important to know if the work schedule will fit with your lifestyle and other responsibilities, like family or school.

## **Types of Work Schedules**

### ✓ **Full-Time Work Schedule:**

A full-time work schedule often requires a commitment of 37-40 hours per week. Because of the long hours, most jobs with full-time schedules are eligible for employee benefits. These benefits can include vacation and sick days, health insurance, and different retirement plan options.

Full-time schedules vary from company to company, but most of the time, employees will work the same shift every week. The most common full-time work schedule is a variant of 9:00 AM to 5:00 PM, Monday through Friday, adding up to 40 hours per week.

While most full-time work schedules are normally the same shift each day, in some cases (like retail), shifts can vary, but the number of hours will still add up to 35-40 per week.

Full-time non-exempt workers generally receive overtime pay. This happens when the hours worked exceed the established 40-hour maximum. Overtime is paid at a minimum of base hourly pay plus a half of that base pay, also known as "time and a half." This is typical for people who get paid hourly.

Exempt employees are not generally eligible for overtime. Most exempt employees receive a salary instead of an hourly rate.

### ✓ **Part-Time Work Schedule:**

A part-time work schedule is any schedule less than full-time employment. The benefit of this type of schedule is that it allows for greater flexibility to maintain other responsibilities outside of work.

Part-time work often does not include benefits offered to full-time employees, and hours can be erratic and inconsistent from week to week. An example of a part-time work schedule could be Monday through Wednesday from 7:00 AM to 11:00 AM and Saturday and Sunday 11:00 AM to 7:00 PM.

✓ **Fixed Work Schedule:**

A fixed work schedule is a timetable that generally consists of the same number of hours and days worked per week. Fixed work schedules tend to stay consistent once the number of hours and the days have been agreed upon by both the employer and the worker. An example of a fixed schedule would be Monday through Friday from 8:30 AM to 5:00 PM or Thursday through Sunday from 3:00 PM to 11:00 PM.

✓ **Flexible Work Schedule:**

A flexible work schedule is less rigid than a fixed schedule. Employees and employers work together to determine the number of hours and days of the week the employee will work. Depending on the employer's policy, employees may be expected to work a minimum number of hours or be at work at a certain daily block of time, but shifts can often be switched with other coworkers in order to satisfy the needs of the employer and the busy life of the employee.

Flexible work schedules can vary infinitely, but an example might look like: Monday - 9:00 AM to 12:30 PM, Tuesday - 11:00 AM to 4:00 PM, Saturday and Sunday - 2:00 PM to close.

✓ **Rotating Shift Work Schedule:**

Rotating work schedules cycle employees through day, swing, and night shifts. This cycle helps to distribute different shifts between all employees so that no one is stuck with the less desirable hours every shift.

This work schedule is not as common but can be seen in many careers like the military, construction work, roadwork jobs, power plants, and health care. These shifts can cycle weekly or quarterly, depending on the type of work required.

For many employees, the transition between the different schedules can be tricky. Sleep and eating patterns change and the employee may see their family and friends less because of their rotating schedule.

This type of timetable does have some benefits. Employees are able to spend more time with family and friends during their normal work hours, and may be able to run errands they normally would not be able to complete. Hours can cycle between day shifts (7:00 AM to 3:00 PM), swing shifts (1:00 PM to 9:00 PM), and weekend, night, or overnight shifts.

Refer to = <https://www.thebalancecareers.com/types-of-work-schedules-2064278>

- **Basic levelling activities**
  - ✓ setting up of devices

### **Setting up the tripod**

A tripod is used as a stable platform to hold the levelling device. To correctly set up and stabilise a tripod, consider the following tips.

- Do not position the tripod legs too far apart or too close together.
- On sloping ground, set the tripod so that one leg is uphill and the other two are downhill on the slope.
- Set up on firm, dry ground that doesn't shift as you walk around.
- Push the tripod's pins into the ground as far as they will go.
- Extend the legs on the tripod so that the tripod is just above chest height (the levelling instrument should be at eye height) as bending down or standing on tiptoe can be tiring.
- Set the top of the tripod as level as possible with the leg adjustment. This will minimise the adjusting that needs to be done with the base plate, adjusting screws or compensating devices and the amount that an automatic or laser level will need to correct itself.

## Using an optical level

As an optical level is a very simple instrument, there is little difference in the way the various types are used to take a measurement. However, there are variations in the process of setting up and adjusting the instrument for accuracy. The following information relates to the simple, automatic levels commonly used in building and construction.

### Setting up

1. Mount the levelling instrument on the tripod and, if necessary, make manual adjustments to ensure that it's level.
  - a) Use the base plate adjustment screws to bring the bubble in the attached spirit level into the centre.
  - b) Swing the optical level around 180° and centre the bubble again.
  - c) Return the optical level to the starting position and recheck the bubble. Adjust as necessary until the optical level is accurate in all directions.

As long as the bubble in the circular level is central, the automatic compensators will make the necessary fine adjustments.

1. Look through the eyepiece of the optical level towards the levelling staff. Turn the focusing knob (clockwise or anticlockwise) until the details of the staff are clear.

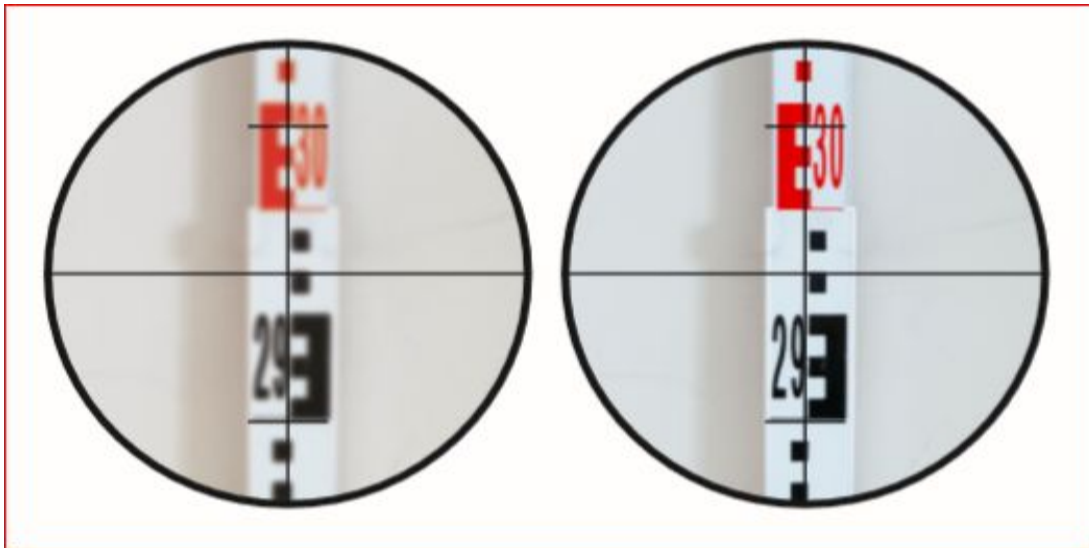
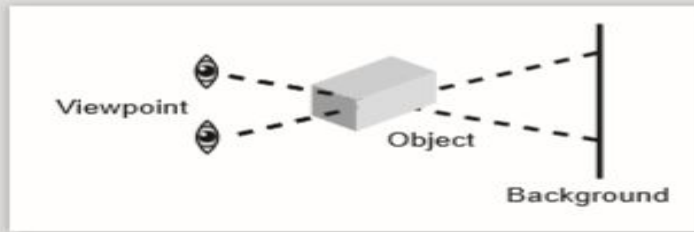


Figure 2 levelling staff when looking through the eye piece of optical level

2. Adjust the eyepiece (by turning clockwise or anticlockwise) to eliminate parallax error.

## Parallax error



Parallax is the difference in the perceived position of an object viewed along different lines of sight; that is, as you can see above, the background behind the object will seem to be in a different position.

Hold an object in front of your face at eye level. Look at it with one eye closed then the other eye closed. What do you notice?

When you look through an optical levelling instrument, parallax error will distort your view of the markings on the staff.

You can check for this error in an optical level by moving your eye up and down in front of the eyepiece. If the crosshairs (the marks on the telescope glass) appear to move in relation to the view in the telescope, parallax error is present.

Figure 3 parallax error

## Taking a reading

When you look through an optical level, you'll see a horizontal line and a vertical line creating a crosshair. When you look at the staff, the level reading is the measurement at the exact centre of the cross, as pictured here.

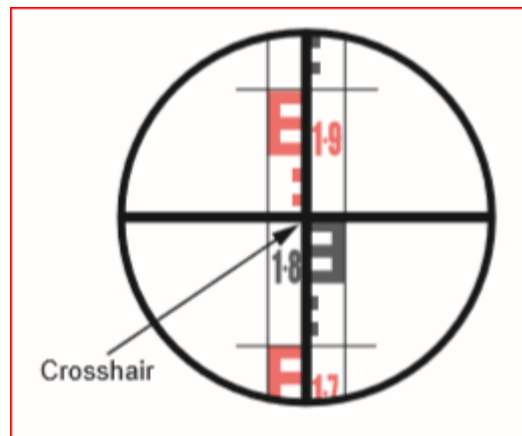


Figure 4 reading a staff level



There are two short, parallel lines at the top and bottom of the view. These are called **stadia lines**. These lines are used to measure distance. You will look at that process in Section 6.

- **Using a laser level**

Laser levels vary from make to make and model to model. Before you use a laser level, read the manufacturer's instructions to familiarise yourself with that particular instrument. The following information is a basic guide to setting up and taking level readings with a rotating laser level as these are the most commonly used on Australian building sites.

**Setting up**

1. Securely mount the laser level on a tripod or suitable surface.
2. Press the power button on the instrument, allowing enough time (approximately 60 seconds) for the laser to self-level. The laser head may begin to rotate before the self-levelling is complete.
3. Select the required rotation speed.

**Taking a reading**

1. Mount the laser receiver on the staff at the measurement position, turn it to face the laser beam then press the receiver's power button.
2. Slowly move the receiver in an upwards and downwards direction until the laser beam indicator arrows appear and you hear an audible signal.
3. Using the indicator as a guide, move the receiver up or down until the centre line lights up and you hear a continuous sound. This shows you that the laser beam is precisely level with the receiver.

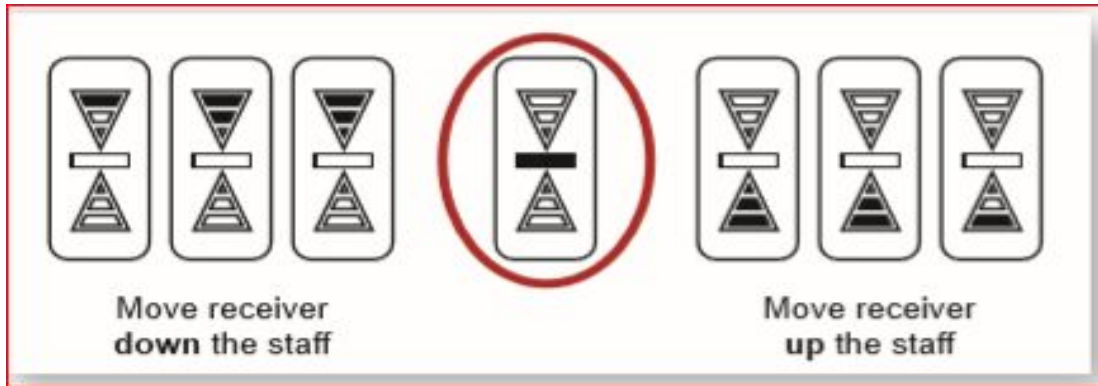


Figure 5 adjusting receiver

4. Lock the receiver into place on the staff and read the measurement at the indicator line.



Figure 6 locking receiver on the staff

- **Using a staff**

To take a precise level reading, you use a staff to measure elevation in metres to three decimal places, eg 1.255; that is, the metres and tenths, and hundredths and thousandths of a metre. While there is a variety of staffs available, the E-staff is the most commonly used on construction sites in Australia.

- **Reading an E-staff**

An E-staff has a series of 'E' shapes printed at set intervals along its length, with two small squares between each. These shapes are used like the lines on a ruler or tape measure but are easier to see at a distance.

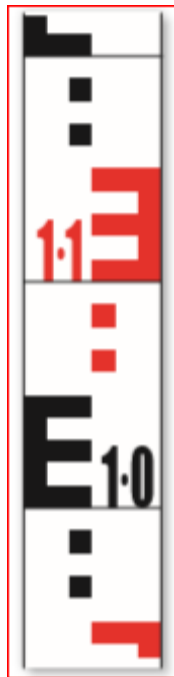


Figure 7 surface of staff to be red

The staff is initially divided into metres and tenths of metres (100 mm). These are labelled with a number with a decimal point. The measurement line always lines up with either the bottom or top of each E-shape

Each vertical block of colour (and space between) in the shapes is one hundredth of a metre (10 mm) high. There are 10 separate blocks of colour (and space) between each numerical label (10 × 10 mm = 100 mm).



Note: You will notice that each E-shape is 50 mm (5 × 10 mm).

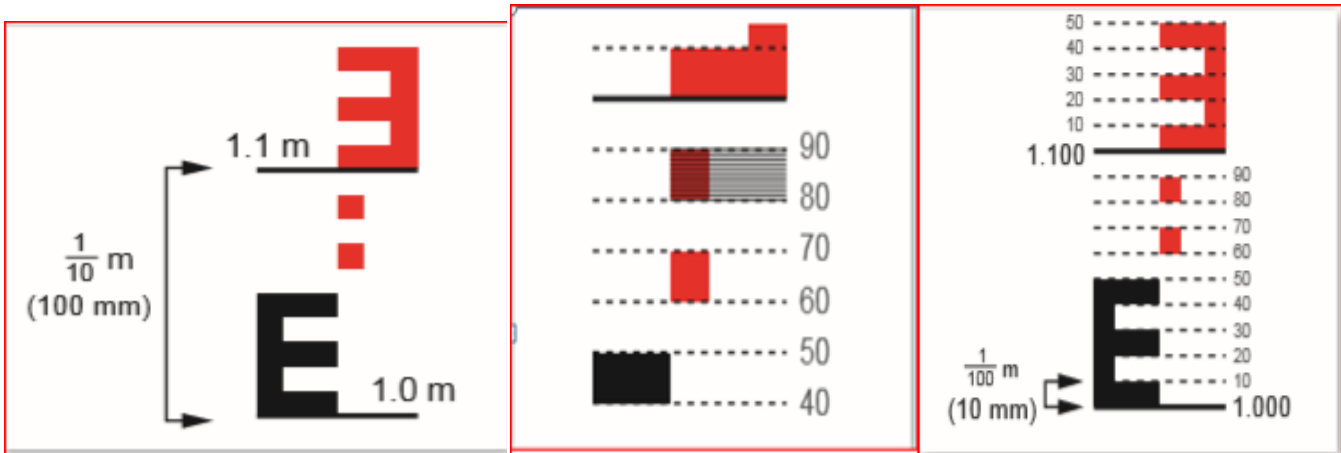


Figure 8 dimension on staff

As each block is 10 mm high, the thousandths of metres (1 mm) can be estimated by dividing each colour block (or space) into 10

The process for taking a level reading on an E-staff is completed in three steps.

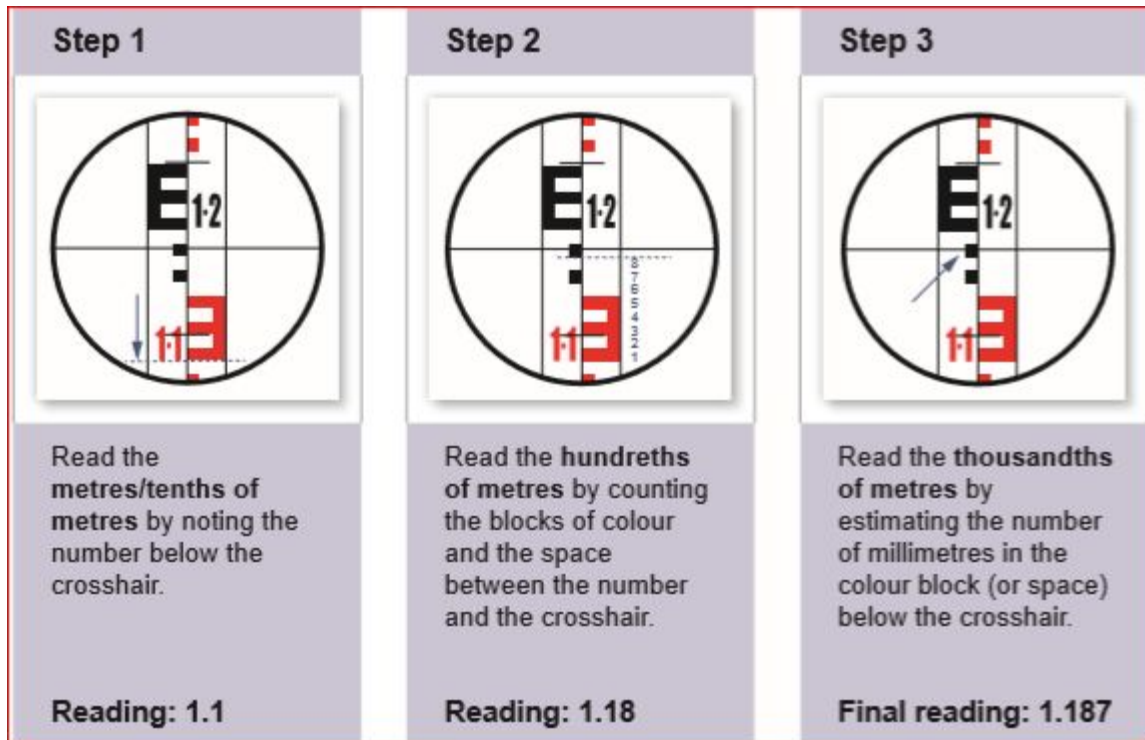


Figure 9 steps of reading an E- staff

- **Holding a staff**

Taking a level with an optical levelling instrument usually requires an operator to look through the telescope and take the reading, and an assistant to hold the staff at the measurement point.

A land surveyor's assistant is also known as a chain person because surveyors measure distances with a special type of chain rather than a tape.

The most important aspect of holding a staff is making sure it's plumb (vertical). If it's leaning in any direction, the crosshairs will appear to be further up the staff and the reading will be incorrect.

If the assistant stands behind the staff, neither the assistant nor the instrument operator can tell whether the staff is vertical from the side.

- Note: The movements of the staff in this direction are generally referred to as 'fore and aft'.
- If the assistant stands to the side of the staff, they can tell if it's vertical 'fore and aft', while the instrument operator can see if it's vertical the other way.

- ✓ recording of heights or level and the transfer of data points
- ✓ transferring levels/heights for formwork
- ✓ shooting levels for concrete slabs
- ✓ recording ground levels at respective critical set out points
- ✓ recording slab or pad levels for placement of steel columns or masonry piers
- ✓ recording or checking levels in drainage
- ✓ Positioning offsets and recovery pegs for construction projects.

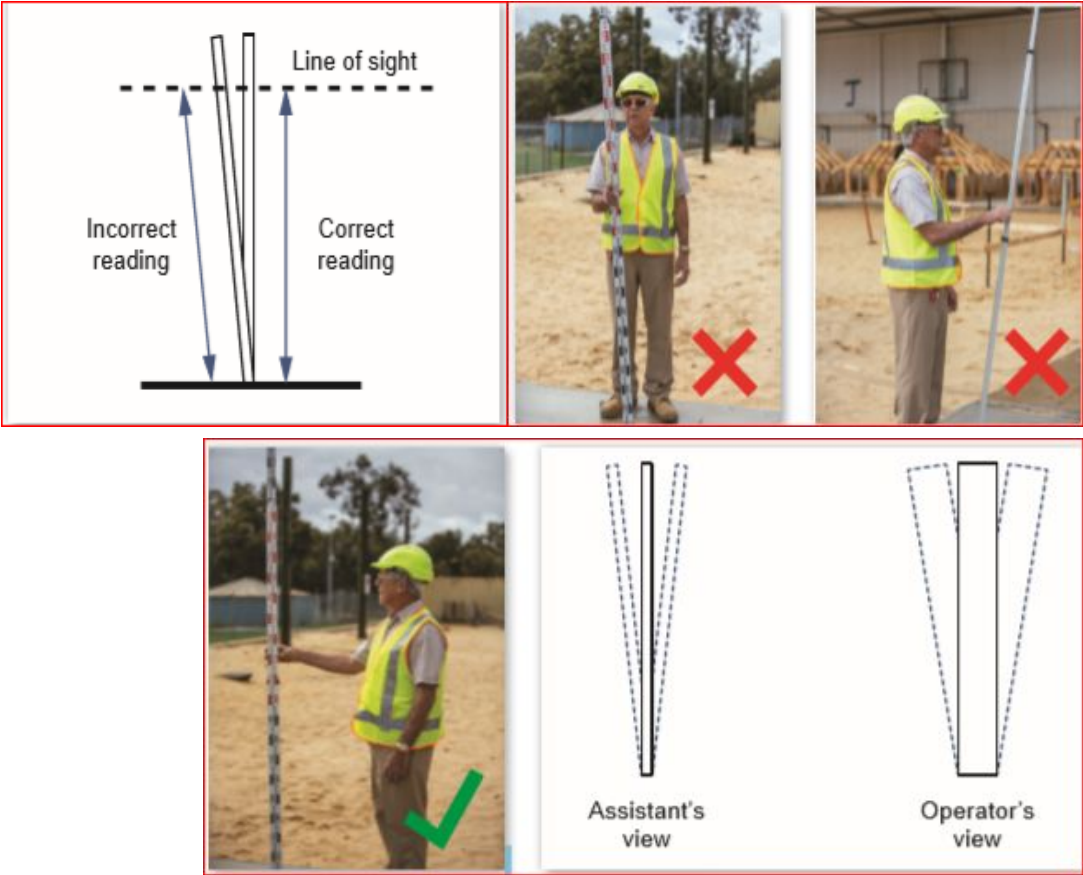


Figure 10 incorrect holding of staff results in error reading

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. \_\_\_\_\_ is a symbolic representation of information (2 points)
  - A. Diagrams
  - B. Specifications
  - C. work bulletins
  - D. sketches
2. Full work schedules often requires a commitment of \_\_\_\_\_ hours/week (2 points)
  - A. 35-40
  - B. 30-35
  - C. 40-45
  - D. 37-40
3. What is stadia lines?(5 points)

**Note: Satisfactory rating – 5 points**

**Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

## Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

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

Date: \_\_\_\_\_

Choice

1. \_\_\_\_\_

2. \_\_\_\_\_

**Short Answer Questions**

1. -

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## 2.1 Safety (OHS)

- **Safe work procedures related to performing levelling**

Safety on the worksite Safety is the most important issue in all construction tasks. All workers, no matter what task they're completing, must comply with all site safety Regulations and procedures. You may think that carrying out levelling operations is low risk; however, it has some specific safety issues that you need to be aware of.



- ✓ **Movement around the site** – Constant moving around the site presents safety risks such as trip hazards, uneven or unstable ground. You also run the risk of bumping into obstacles.
- ✓ **Manual handling** – Although the equipment you use for levelling tasks is small and easy to transport, you may need to interact with other equipment and materials on a building site which are large, heavy and awkward to move.
- ✓ **Focus and concentration** – Because levelling requires you to focus and pay close attention to what you're doing to ensure you're being precise, it can be easy to lose awareness of your surroundings and what's happening around you.
- ✓ **Environment** – Levelling operations take place outside, and often before any building structures are up to provide shade or shelter. You may be exposed to elements such as sun, wind and rain.
- ✓ **Dust** – The quality of the air on site may cause you respiratory problems and it can obstruct your vision while you're levelling.

- ✓ **Noise** – Building sites can be noisy at times, which may make it hard for you to concentrate. Noise is also a safety issue because you may not be able to hear what’s happening around you.
- ✓ **Human traffic** – Building sites are often busy with lots of workers moving around. It’s inevitable that people will get in each other’s way sometimes.
- ✓ **Mechanical traffic** – There will be times when you’ll be positioned in a place where you may not be seen easily seen by others – particularly if someone’s driving a large vehicle. You may also have to take a level from a point on the kerb or roadside of the site, which puts you at risk from moving vehicles.
- ✓ **High-risk situations** – There are always areas of high risk such as demolition, excavation, confined spaces and heights that you’ll need to be aware of. For example, you may be required to complete a levelling task for services and footings in an open trench.



Figure 11 sign to show hazard areas

- emergency procedures,

An emergency procedure is a plan of actions to be conducted in a certain order or manner, in response to a specific class of reasonably foreseeable emergency, a situation that poses an immediate risk to health, life, property, or the environment including extinguishing fires, organisational first aid requirements and evacuation

- handling of materials
- hazard control
- hazardous materials and substances
- safe operating procedures, including the conduct of operational risk assessment and treatments associated with:
  - earth leakage boxes
  - lighting

- power cables, including overhead service trays, cables and conduits
- restricted access barriers
- surrounding structures
- traffic control
- trip hazards
- work site visitors and the public
- working at heights
- working in confined spaces
- working in proximity to others
- working with dangerous materials
- organisational first aid
- personal protective clothing and equipment prescribed under legislation, regulations and workplace policies and practices
- use of firefighting equipment
- use of tools and equipment
  - **General Safety Rule**

General safety rule is very important to reduce the accident while you working in workshop. Some of them are listed below,

- ☛ **Follow directions:**-understanding the procedures of using by hand tools & machines.
- ☛ **Stay alert.** Watch what you are doing, and use common sense when operating a power tool. Do not use a power tool while tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating power tools may result in serious personal injury.
- ☛ **Use safety equipment.** Always wear eye protection. Dust mask, non-skid safety shoes, hard hat, or hearing protection must be used for appropriate conditions.
- ☛ **Always dress properly:** - Dress properly for your work. While you must wear your aprons are provided so that you can work on the machines. Remove any jeweler, neckties, chains, bracelets, and rings. Roll up your sleeves and tie any hair back in a ponytail before beginning any work



- ☛ **Keep the shop clean:** - Put your tools back where they belong when you finished.
- ☛ **Keep the floor clear of debris and sawdust:-** the floor should be clear of scrap blocks, excessive material, and sawdust. Keep projects, sawhorses, and other equipment and materials you are using out of travel lanes. Wipe up any spilled liquids immediately.
- ☛ **Learn to use the tools correctly**
  - -Understanding using of hand tools in proper ways.
- ☛ **Avoid house play**
- ☛ **Report all accidents**
- ☛ **Practice lending a cheerful helping hand when requested by someone.**

Be thoughtful and helpful toward other students in the class. Caution them if they are violating a safety rule. This is one of the most important rules in that all of you have responsibility for each other's safety and well-being in the class.

- House Keeping/kaizen

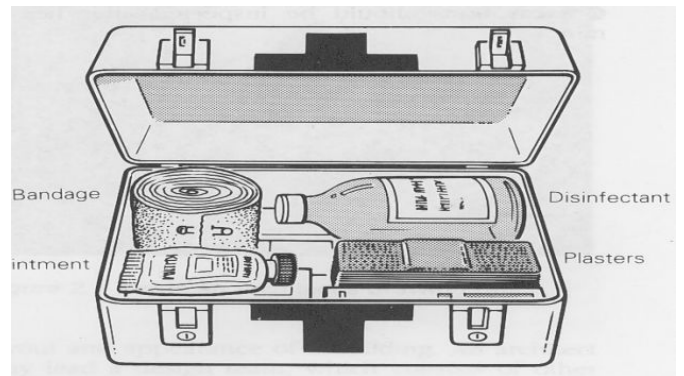
Keeping of work shop clean & store the tools in proper place is to ensure our body & tools from the accidents of machine while working & breakage of tools respectively. The workshop is kept in different ways .Some of themes are:

- Work benches should be free & clean of clutter.
- Tools & equipments should be safely stored.
- Keep the floor clean & clear.
- Immediately wipe of spilled liquids which can create a slippery surface.
- Apply 5's; sort, standardize, shine, stabilize & sustain.
- Make the environment very conducive.

### 2.1.1.1 First aid;

A building site should have a first aid box which as minimum contents: -

- Plasters;
- Bandages;
- Ointments;
- Disinfectant.



**Figure 12 first aid box**

### 1.3. Signage

A variety of situations exist at Council worksites where barricading and/or safety signage are required. Barricading and safety signage draw attention to hazardous objects and situations that may affect health and safety, reducing the potential of injury to personnel and damage to property. Examples include warning tape, mesh barrier, road barriers, traffic control signs, emergency signage, mandatory PPE signs and precautionary signage. Barricading and safety signage shall be used:

- when there are no other practical control measures available to control a hazard;
- as an interim measure until a more effective way of controlling the risk can be used or the hazard is no longer present; and
- as a secondary control measure to supplement higher level control measures. The type and number of barricading or safety signage erected must be assessed adequately and positioned to be suitable for the intended purpose. Barricading Requirements

Barricading is one of the risk control measures used to protect personnel from hazard such as:

- being struck by falling objects, material movements or plant;
- fall from height, including falling into open excavations or penetrations;
- fall from unprotected edges (e.g. removed flooring, walkways, stairs and handrails);
- exposure to hazardous substances, process or activities;
- unauthorized entry into a confined space or other restricted work areas; and
  - any potentially hazardous work processes, such as hot works, demolition work, scaffolding, radiation work and work involving asbestos. Barricading may also be used as part of incident management and emergency response procedures.

#### 1.3.1. Selection of Barricade

The following factors are to be considered as part of a risk assessment when selecting the type of barricade (soft or hard):

- risk associated with the hazard;
- required strength of the barrier (e.g. impact potential); and
- the amount of clearance provided from the hazard by the barricade.

Barricading shall be used to manage the risk of fall from height greater than two metres (refer to the Working at Height Procedure,) and excavations greater than 1.5 metres deep (refer to the Trenching and Excavation Procedure,).

All barricading shall be designed, installed and used in accordance with the relevant Standards and the recommendations of the manufacturer.

Where barricades are supported by star pickets, the star pickets shall be protected by using a suitable cap fitted to the star pickets.

### **1.3.2. Safety signage requirements**

Safety signs are erected to warn workers or the public of specific hazards and to communicate necessary precautionary measures and emergency actions. Safety signage, in accordance with Queensland Work Health and Safety Regulation 2011, is required for:

- Construction sites;
- confined spaces;
- asbestos;
- hazardous areas;
- hazardous chemicals;
- site specific personal protective equipment (ppe) requirements;
- fire protection equipment;
- emergency and first aid information;
- emergency eyewash shower; and
- traffic management and pedestrian control





### **1.3.3. Signage Classification and Use**

Safety signage are classified and shall be used according to their function as follows:

Type	Use	Example
<b>1. Regulatory Signs</b> – Signs containing instructions that if ignored could either be an offence at law, or a breach of site safety rules, safety procedures or other directions.		
<b>Principal contractor construction site signage</b>	<p>Any principal contractor for a construction project must be identified with signage. At a minimum, the sign must:</p> <ul style="list-style-type: none"> <li>Identify the principal contractor's name and telephone contact numbers (including an after hours telephone number);</li> <li>Identify the location of the site office for the project, if any; and</li> <li>Be clearly visible from outside the workplace, or the work area of the workplace, where the construction project is being undertaken.</li> </ul>	

<b>Mandatory Signs</b>	<p>Signs that specify that an instruction <b>MUST</b> be carried out. Symbols (or pictograms) are white on a blue circular background and indicate the minimum standard of compliance required for the workplace where it is displayed. The sign's wording is in black lettering on the white background. Multiple symbols may be on the sign.</p>	
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Type	Use	Example
<b>Prohibition Signs</b>	<p>Signs that specify behaviour or actions, which are not permitted. The round shape with a slash should be depicted in red over the action symbol in black. The sign's wording is in black lettering on the white background.</p>	
<b>Limitation or Restriction Signs</b>	<p>Signs that place a numerical or other defined limit on an activity. The most common signs are speed restriction signs. The signs have a symbolic Red circle shape with black writing or symbol on it and may also be on the roadway surface.</p>	

2. Hazard Signs – Signs advising of hazards.		
<b>Danger Signs</b>	Signs warning of a particular hazard or hazardous condition that is likely to be life-threatening. (The word 'DANGER' shall be in white featured inside a red ellipse inside black rectangle. The sign's wording shall be in black lettering on the white background.)	
<b>Warning Signs</b>	Signs warning of a hazard or hazardous condition that is <b>not</b> likely to be life-threatening. (The hazard symbol shall be black on a yellow background and a triangle should be depicted around the hazard symbol. The sign's wording shall be in black lettering on the yellow background.)	
3. Emergency Information Signs		
<b>Muster Point, First Aid Locations, etc</b>	Signs indicating the location of, or directions to, emergency related facilities such as exits, safety equipment or first aid facilities. (They feature a white symbol and/or wording on a green background.)	
4. Fire Signs		
<b>Fire-fighting Equipment Locations, etc</b>	Signs advising the location of the alarms and fire-fighting facilities. (Fire signs shall comprise a red rectangle with white symbol and/or wording.)	

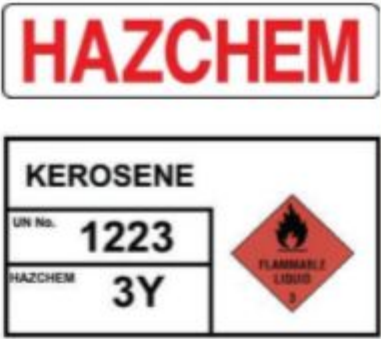

Type	Use	Example
<b>5. Hazardous Chemicals Placards</b>		
Placards	Placards alert the emergency services and other persons to the presence of hazardous chemicals and provide information about them.	 <p>The image shows a HAZCHEM placard for Kerosene. At the top, the word "HAZCHEM" is written in large red letters. Below this, the word "KEROSENE" is written in black. Underneath, there are two boxes: the left one contains "UN No. 1223" and "HAZCHEM 3Y", and the right one contains a red diamond-shaped hazard symbol with a flame and the text "FLAMMABLE LIQUID 3".</p>
<b>6. General Information Signs</b>		
Other signs not contained within the categories listed above	These signs are used to communicate information of a general nature (e.g. housekeeping)	 <p>The image shows a rectangular sign with a green header containing the text "THINK TIDY" in white. Below the header, the text "PLEASE KEEP THIS AREA CLEAN AND TIDY" is written in black on a white background.</p>

Table 1 types of hazards and the signs

<b>Self-Check -2</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are barricade and safety signage? (5 points)
2. List and explain OHS while applying basic leveling procedure (5 points)

**Note: Satisfactory rating - 5 points**

**Unsatisfactory - below 5 points**



You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = _____
Rating: _____

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

Date: \_\_\_\_\_

#### Short Answer Questions

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

#### 4.1. Tools, equipment and materials

A very important part of planning for a construction project is being able to identify the tools that are most appropriate for the task and making sure you have access to them where and when you need them. Here are some key points you need to remember when planning and preparing for a work task.

- Check the condition of all tools before you start any work, and rectify or report any faults.
- Always read the manufacturers' instructions for any tools, equipment and materials you're not familiar with.
- Be aware of materials that may be hazardous. Look for warning labels and, if there's a safety data sheet (SDS), read it carefully.
- Never use a tool or piece of equipment for any purpose other than what it's designed for.
- When you're calculating material quantities, always double-check the plan and/or instructions you're working from, and also your calculations. This will help you to avoid situations where you can't complete a task because you have either too much or not enough of a material you need.

#### 3. Levelling tools

Depending on the task, levelling operations on a construction site are carried out using a variety of tools. Some of these tools are very simple and quick to use while others are more complicated and require greater control for precision levelling.

#### 4. Spirit level

A spirit level consists of a body (generally made from aluminium) with an inset glass tube filled with a liquid that contains a bubble of air. The position of the bubble in relation to permanent markings on the glass indicates whether a surface is plumb (vertical) or level (horizontal).



Figure 13 spirit level

## 5. Line level

A line level is a miniature spirit level with a hook on each end to allow the instrument to be suspended on a taut stringline. It's used to transfer height levels from one point to another. Line levels are not very accurate and are used mostly used to, for example, check falls in concrete paths.



Figure 14 line level

## 6. Water level

Due to the effects of gravity, still water is level, so a clear plastic tube filled with water is a very simple tool that can be used to transfer heights on a construction site from one point to another. Water levels are particularly useful to quickly transfer height measurements from one room to another when there is no clear line of sight.



Figure 15 water level

## 7. String line

A stringline is one of the oldest and most basic hand tools used in building and construction. It's typically used in the setting out of buildings to create a straight line between two level points.



Figure 16 string line

## 8. Plumb-bob

Plumb-bobs (also known as plumb lines) are heavy metal objects with a pointed tip attached to the end of a stringline. Using gravity, they accurately transfer points vertically, eg from ceiling to floor, and can be used to check that a surface is plumb (vertically straight). Plumb-bobs can be awkward to use in windy conditions.



Figure 17 using plumb bob to check vertical alignment

## 9. Straight edge

Straight edges have a long, straight body made from wood or metal and can be used with spirit levels to transfer levels over short distances. They are generally available in lengths of 1.5–4 m.



Figure 18 using straight edge to check horizontal line

## 10. Boning rod

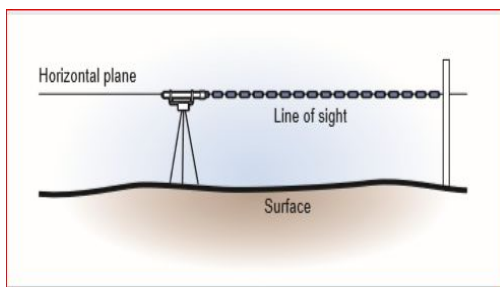
Boning rods are T-shaped devices used to check a straight line between two fixed points over long distances. They come in sets of three or four and are usually made from timber with their cross-rails painted in different colours – black, red and white – so that they can be seen easily. Boning rods are used to help in the setting out of horizontal surfaces or surfaces with a constant slope for excavation works, paths and drainage pipes.

## 11. Optical level

Optical levels are used to find precise height measurements and to check and transfer level information over longer distances than the simpler levelling tools described so far. An optical level is basically a telescope (usually with a magnification of around 20×) mounted on a swivelling base. It's adjusted with an attached spirit level so that the view through the telescope (the line of sight) is straight along the horizontal plane.



Figure 19 parts of modern optical level



By looking through the telescope toward a staff (a large rule), the operator can measure the distance between the surface and the line of sight. This measurement can then be compared to a measurement on a plan or at another location, or used to calculate the height of the surface at the position of the staff.

Figure 20 measuring the distance between the surface and the line of sight

Optical levels are often referred to mistakenly as 'dumpy levels' which are only one of many types of optical levels. They include the following.

### **Dumpy level**

A simple, compact device consisting of a telescope fixed to a levelling plate with three or four base plate adjustment screws that are used to level the instrument. When set up correctly, the dumpy level will remain level when rotated through 360°.

### **Tilting level**

A variation on the dumpy level that is very accurate and used for top quality work. The telescope is levelled by a screw which tilts the telescope. It needs to be reset for each reading taken.

### **Automatic level**

Also known as a 'self-levelling level', an automatic level requires only basic set-up as it has internal compensating mirrors that fine-tune the level of the instrument. Automatic levels are the most commonly used optical levels due to their speedy set-up time and ease of use.

### **Digital level**

Similar to an automatic level; however, the readings are taken automatically by the instrument using a barcode. The instrument displays the reading and records the level measurements.

The advantage of optical levels over other simpler levelling tools is that they're accurate and quick to use over long distances. Because there are no physical media involved, eg stringlines, straight edges, they're relatively free from error – as long as the operator can read a staff correctly! The main disadvantage is that they can't be used by a single operator as they require an assistant to position and hold the staff.

## **12. Laser level**

Laser levels are replacing optical levels on construction sites because they are more precise, easier to use and can be operated without an assistant.

A laser level is a laser beam projector mounted on a tripod. It projects a beam of light along a horizontal plane. The light falls on a surface, eg a wall or a staff, and a mark, comparison or staff reading can be made.

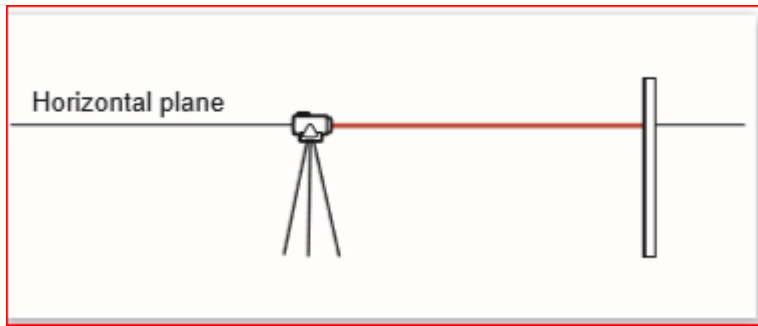
The laser levels most commonly used in the construction



Figure 21 parts of Laser level

industry include:

- **aimable** – a stationary laser beam aimed at a target with a remote control handset



**Figure 22 stationary laser beam tightened to tripod**

- **rotating** – a rotating prism that sweeps the laser beam 360° around the horizontal plane; the speed of rotation can be varied from zero to very fast

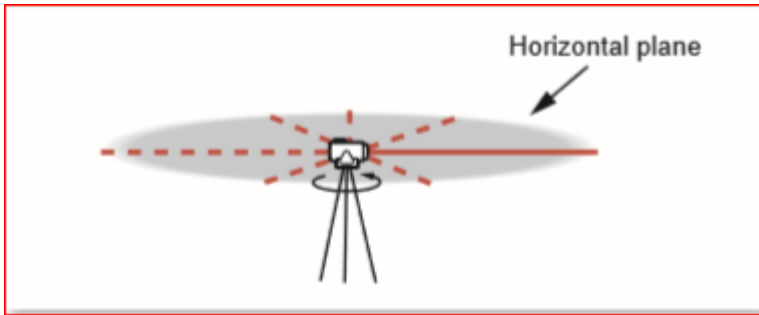
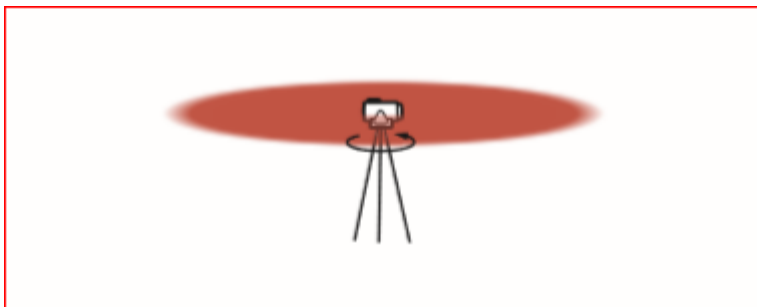


Figure 23 rotating prism

- **continuous plane** – the laser beam is reflected by an inverted cone and spreads a continuous plane of laser light through 360°



**Figure 24 continuous plane**

### 13. Laser receiver

As the laser beam can't always be seen in brightly lit areas, a receiver (also known as a detector or target) is usually used to locate the beam.



Figure 25 laser receiver

### Classification of lasers

Any equipment that generates a laser is classified by an Australian Standard®. Powerful lasers can cause injury (particularly eye damage) and can be used only by a licensed operator.

Most laser levels available for use in construction levelling, however, are very low-powered and classified as Class 1. These means that they're safe to use and an operating licence isn't required.

Some classifications of laser levels require the operator to display safety signs warning that laser levels are being used.



### 14. Levelling staff

Levelling staffs are long vertical rulers, usually made from wood or aluminium, which are marked with a graduated scale so that measurements can be at a distance. They're usually 3–5 m long and may have telescoping or hinged sections that expand or collapse as required. Levelling staffs are available in a variety of measuring units, scales, graduations and patterns, including barcoded staffs that are used with digital levelling equipment.



**Figure 26 holding and reading staff**

The most commonly seen levelling staff on construction sites is the E-staff which has distinctive E-shaped markings.



**Figure 27 miscellaneous equipments of leveling**



<b>Self-Check -4</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are key points to be remembered when planning and preparing for a work task? List and explain (4 points )
2. \_\_\_\_\_ is the oldest and most basic hand tools used in the setting out to create a straight line between two levels?
  - a. Plumb bob
  - b. Straight edge
  - c. Line level
  - d. String line
3. Boning rods are used to help in the setting out of horizontal and vertical surfaces (2 points)
  - a. True
  - b. False

**Note: Satisfactory rating – 4 points**

**Unsatisfactory - below 4 points**

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You can ask you teacher for the copy of the correct answers.

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

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

Date: \_\_\_\_\_

### Essay part

1. \_\_\_\_\_

### Choice

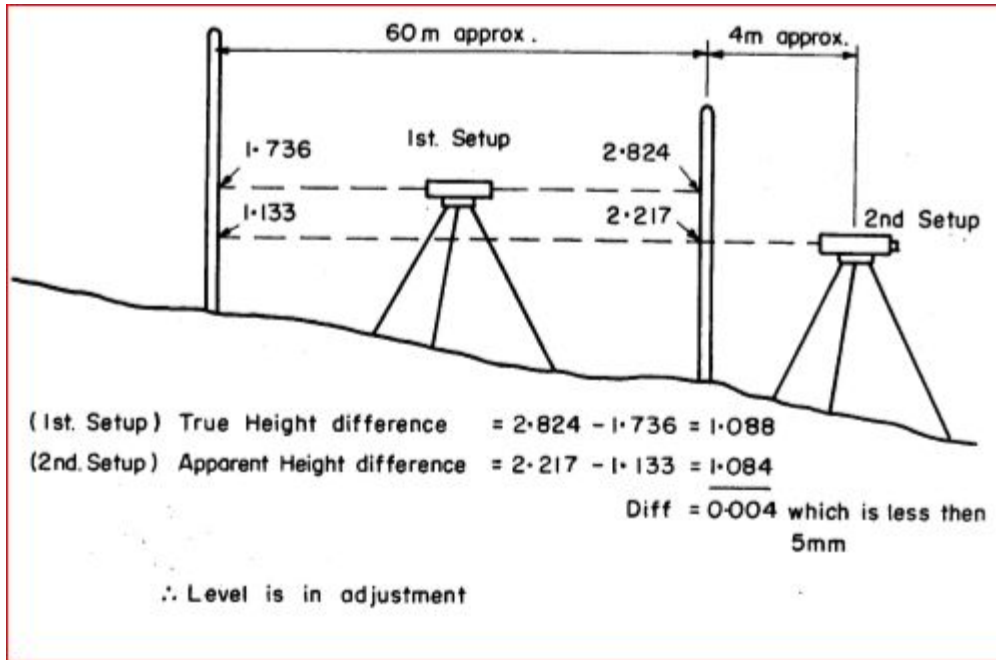
2. \_\_\_\_\_

3. \_\_\_\_\_

### 5.1. Checking the level's accuracy

Levels can move out of adjustment so that their line of sight (line of collimation) is not truly horizontal. This will cause errors in readings which become greater as the viewing distance increases. However if a backsight and a foresight are exactly equi-distant from the instrument, the error in each sighting will cancel each other out. This feature can be used to check the accuracy of a level by the following simple method.

- Install three pegs or marks firmly in the ground at distances of 30 m apart in a straight line; the centre peg is only to mark the distance, but the outside two shall be firm enough for reliable change points
- Set up the level over the centre peg and read the staff on each of the outside pegs in turn. Book these values and calculate the height difference. This will be a true height difference, as the distances are equal and any errors will be self-compensating
- Set up the level about 4 m to the far side of one of the outside pegs. Read the staff on the peg 4 m away and then on the one 64 m away. Book these values and calculate the apparent height difference
- Compare the two height differences; if the instrument is in adjustment (i.e. its collimation is true) they will be within 5 mm.



**Figure 28. A method for checking the level accuracy**

If the instrument's collimation appears to be out, recheck by repeating the process. Then, whilst setup at one of the outside locations, adjust the instrument (according to the manufacturer's instructions) so that it reads the correct value on the far staff, checking it against the near one. Two staves are useful for this. This type of level check shall be carried out at least once per year, preferably just prior to carrying out a round of station inspections. The details and results of the checks shall be recorded in a numbered level book and be readily retrievable as a quality record, and the date of this calibration check shall also be recorded in the instrument inventory.

## 5.2. Reporting problems and malfunctioning of tools

Broken or damaged tools can cause injury or accidents in the workplace. The quicker problems are reported, the quicker the tool can be fixed or replaced and the less the risk or injury. Broken or incomplete tools must not be used but placed in a special place for it to be repaired or adapted. This will prevent injury and will enhance the life of the tool. Persons with proper training and skill should repair tools. Preventative maintenance like fastening loose nuts or shafts will greatly reduce the need for large-scale repairs.

Every farm has its own set of procedures and systems to deal with the organizing, issuing and controlling tool stock. It is important that you find out who is responsible for different aspect regarding tools and equipment on the farm where you work. Also you should know who you have to report problems or defects to. Do not attempt to fix, maintain or use a tool if you have not been trained to do so. It is essential that problems and malfunctions be immediately reported to the correct person to prevent risk of injury through the use of the tools. It is important to respect the roles of the people placed in charge of organizing and maintaining tools because this also protects your safety. Supervisors need to be trained to check that labourers use tools in a proper way. Even when using a tool correctly a certain way of handling the tool will cause premature wear or damage to it. Master artisans always take extremely good care of their tools in using, storing and maintaining it. Tools should ideally be allocated to specific persons who then have the responsibility of looking after it. If tools are for 'general' use they are often left in the field or working place and a high percentage of replacement results from it. If tools are allocated to a specific person and marked as such control is very easier.

**My Notes ...**

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<b>Self-Check -5</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Which of the following is advisable about tools(3 points)
  - a. Use broken / malfunctioning tools until it totally fail
  - b. Place broken tools in special places for it to repaired
  - c. Maintain or use tools even if you have not trained
  - d. Immediately report problems and malfunctions to the correct persons
2. Explain steps to check the levels accuracy ( 5 points )

**Note: Satisfactory rating - 5 points**

**Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = _____
Rating: _____

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

Date: \_\_\_\_\_

**Short Answer Questions**

**6.1 Environmental requirements**

- clean-up management

Cleanup projects can generate different types of materials including industrial materials such as construction and demolition debris, organic matter such as wood and plants, and other types of solid wastes from project management oversight. When safely reused and recycled, industrial materials salvaged from demolition activities can be appropriately diverted from landfills for use in new building and transportation construction, water infrastructure, and agriculture. Organic materials can be reused for site design and remediation, and other solid wastes like paper, plastic, metals, and glass can be recycled by waste management and material recovery facilities into the same markets.

Materials have a large impact on the environment when a systems view of the life cycle of materials is taken. The life cycle typically comprises of resource extraction, material processing, product design and manufacturing, product use, collection, and disposal. Sustainable materials management is an important part of conserving natural resources, reducing waste, and minimizing our footprint on the environment. It describes a collection of integrated strategies that use resources most productively and sustainably throughout their life cycles. Reusing and recycling materials to more sustainably manage them can have significant environmental benefits.

- **Waste management.**

Waste reduction can also be promoted by recycling programmes, waste minimization and other measure. The EPR regulations extend producer responsibility to the postconsumer period, thus providing a strong incentive to redesign products using fewer materials as well as those with increased recycling potential.

After completion of your task, check that any left over materials that can pollute the soil, air and water is not left behind. Practice cleaning your environment until it becomes sustained.



<b>Self-Check -6</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What will happen to the environment if waste materials are not cleaned?( 5 points)
2. How you manage waste in your day-to-day activities? (3 points )
3. What is the difference between reuse and recycle? (2 points )

**Note: Satisfactory rating - 5 points**

**Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Score = _____
Rating: _____

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

Date: \_\_\_\_\_

**Short Answer Questions**

### 1.7. Statutory and regulatory authorities

This term expresses two types of requirements:

- (i) Statutory requirements
- (ii) Regulatory requirements

Both statutory requirements and regulatory requirements are those requirements that are required by law. These requirements are non-negotiable and must be complied with. Failure to comply a legal requirement may result in a fine or penalty and possibly a custodial sentence for the person or persons responsible or organization for such failure.

“Statutory refers to laws passed by a state and/or central government, while regulatory refers to a rule issued by a regulatory body appointed by a state and/or central government.”

Statutory requirements are those requirements which are applicable by virtue of law enacted by the government. These are enacted by passing the law in the legislative assembly or parliament. A regulatory requirement can be termed as administrative legislation that constitutes or constraints rights and allocates responsibilities. It is somewhat different from the statutory legislation and there can be following types of regulations applicable on an organization:

- Legal restrictions or responsibilities declared by a government authority
- Self regulation by an industry through trade association

✓ A simple example for Educational Institution:

- Educational System developed and passed in parliament of Ethiopia is a statutory requirement.
- Controls applied by Directorate of Controller of Examinations to institutions are regulatory requirement.

<b>Self-Check -7</b>	<b>Written Test</b>
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What you think about that, if you are not applying regulatory authority obligation? (6 points )

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

You can ask you teacher for the copy of the correct answers.

## Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

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

Date: \_\_\_\_\_

### Short Answer Questions

### List of Reference Materials

- a. <https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg3-chapter10-1.pdf>
- b. <https://www.linkedin.com/pulse/statutory-regulatory-requirements-quality-management-system-s>
- c. [http://www.whycos.org/fck\\_editor/upload/File/Pacific-HYCOS/Surface Waters/Levelling and surveying.pdf](http://www.whycos.org/fck_editor/upload/File/Pacific-HYCOS/Surface_Waters/Levelling_and_surveying.pdf)
- d. [https://logancitywhs.wiki/wp-content/uploads/2018/01/LCC DOCS-11314877-v1-HS-PRO-028 Barricading and Safety Signage Procedure.pdf](https://logancitywhs.wiki/wp-content/uploads/2018/01/LCC_DOCS-11314877-v1-HS-PRO-028_Barricading_and_Safety_Signage_Procedure.pdf)
- e. [http://www.isgmax.com/Articles Papers/Equipment%20Specs%20Paper.pdf](http://www.isgmax.com/Articles_Papers/Equipment%20Specs%20Paper.pdf)