

TVET CERTIFICATE IV in CARPENTRY

SCAFFOLDING

CAPSC401

Build scaffolding

Competence



Credits: 10

Learning hours: 100

Sector: Construction and Building Services

Sub-sector: CARPENTRY

Module Note Issue date: June, 2020

Purpose statement

This module describes knowledge, skills and attitude required to make wooden and metal scaffolding.

Table of Contents

Elements of competence and performance criteria		Page No.
Learning Unit	Performance Criteria	
1. Learning Unit 1 Prepare tools, workplace, equipment and materials	1.1 Proper selection of materials and tools	3
	1.2. Appropriate preparation of the workplace (clearing, footing, levelling ground)	
	1.3 Proper preparation of materials	
	1.4 Appropriate setting out of scaffolding	
	1.5 Proper setting of the sole plate	
2. Learning Unit 2 Assemble scaffolding	2.1 Correct fixing of scaffolding elements (standard, ledger, putlogs and cross braces) 2.2 2.3 2.4	21
	2.2 Proper laying of platforms	
	2.3 Proper attachment of guardrails	
	2.4 Convenient application of safety precautions on scaffolding	

LU & PC is linked in LO inside the content

Total Number of Pages: 32

LO 1.1 – Select tools and equipment

- Importance of scaffolding

A. GENERAL INTRODUCTION TO SCAFFOLDINGS

A Suitable and sufficient scaffolding must be provided where the construction work cannot be carried out safely by other means. Variety of types of scaffolds shall be discussed on in this document and specifically the safety practices to all persons engaged in scaffolding work are required to comply with these provisions.

A scaffold is a structure that will be constructed as the frame work either

- ❖ In steel;
- ❖ In timber; or
- ❖ In the combination of both timber and steel.

B. Definition of key terms in scaffolding process:

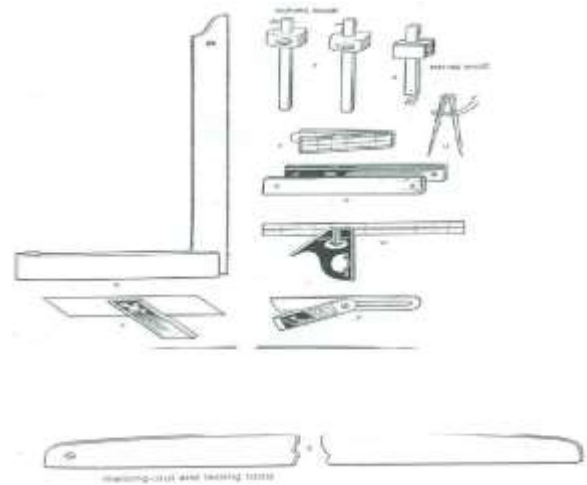
- ❖ **Scaffolding** is defined as any structure, framework, swinging stage, suspended scaffolding, of a temporary nature, used or intended to be used for the support or protection of workers engaged in or in connection with construction work. Or;
Scaffold is a temporary structure designed to be constructed near the wall, pier, column, etc. for providing an elevated working surface to the workmen while elevating the structure.
- ❖ **Scaffolding process** is defined as the planning for, the design of, the erection of, the inspection of, the use of, and the dismantling of any scaffolding. The scaffolding process does not include the erection of structures constructed using scaffolding components, such as falsework, temporary grandstands, lighting towers, etc.
- ❖ **Castor:** A swiveling wheel secured to the base of a vertical member of the scaffold for the purpose of mobilizing it.
- ❖ **Ladder bracket:** A bracket designed to be attached to at least two rungs of a ladder for the purpose of supporting a plank for a person to work on.
- ❖ **Lift:** The assembly of ledgers and putlogs forming each horizontal level of a scaffold. The lift height is the vertical distance between two lifts, measured center to center.
- ❖ **Outriggers (needles):** Cantilevered beams from which a swinging stage is suspended.
- ❖ **Raker:** An inclined load-bearing member.
- ❖ **Right-angle coupler:** A coupler used to join tubes at right angles.
- ❖ **Scaffolder:** A scaffolder is a person skilled and experienced in the erection, altering and dismantling of scaffolding.
- ❖ **Span:** Means the distance measured along the member between the center lines of adjacent supports of the member.
- ❖ **Tie:** The attachment by which scaffolding is attached to a structure; it also means “tie and spreader” and includes the attachments used in conjunction with the spreader or putlog extension to secure a scaffold to a building or structure to prevent movement.
- ❖ **Working platform:** That part of a scaffolding on which workers and/or materials are supported for the purpose of carrying out construction work.

- Types of tools

Scaffolding, especially those made of timbers are made using a variety of tools and/or equipment which are normally used in carpentry workshop. The following listed below are the mostly used, but there can be others which may be needed but not listed here below:

A. Setting out tools : these are measuring, marking and testing tools

- Tape measure
- Folding rule
- Marking gauge
- Pencil
- Spirit level
- Try square

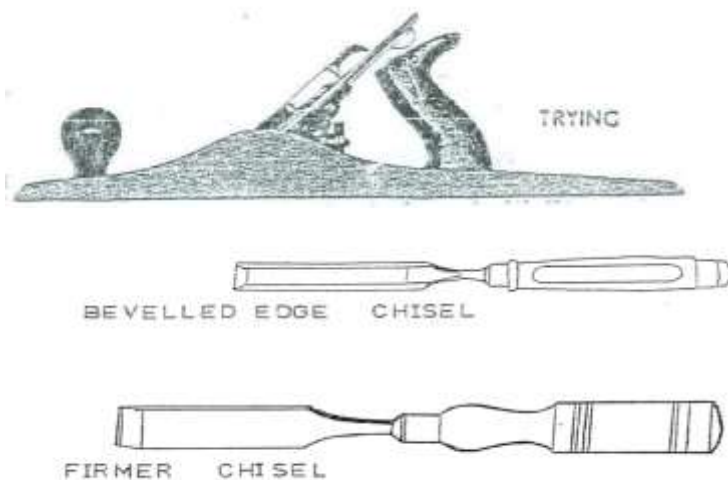


B. Shaving and cutting tools

They are divided into two groups:

B.1. Slicing and smoothing tools: planes, chisels and gauges

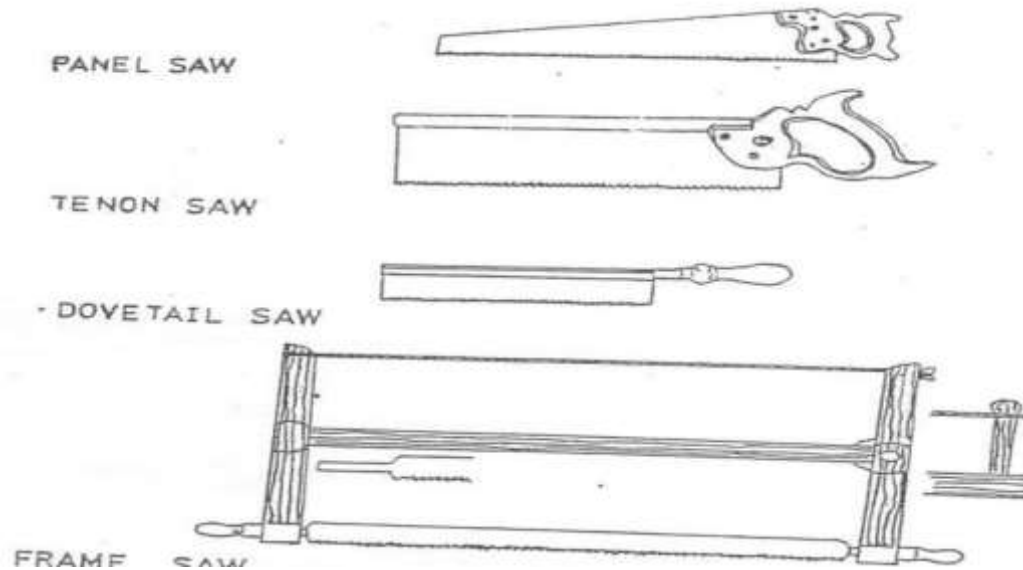
- Steel or wooden jointing plane No6 for jointing
- Wood or steel planes used for:
 - Smoothing
 - rebating
 - Grooving
 - Planing hollow or rounds
- Chisels for chopping or paring
- Gauges for turning in wood lathe are thick and heavier



B.2. Parting and shaving tools:

– **Saws:**

- Ripping saws
- Cross cut saws
- Tenon saws
- dovetail saw



C. Boring tools

- Single brace
 - Ratchet brace
 - Hand drill or Wheel drill
- Types of bits used in above tools:
 - Drill bits
 - Twist bits
 - Auger bits

D. Fixing tools

- (The tools which gives force to others)
 - Wood or plastic mallet
 - hammer s
 - Pincers
 - Pliers
 - Screw drivers (ordinary or flat screw driver)
 - Claw bars

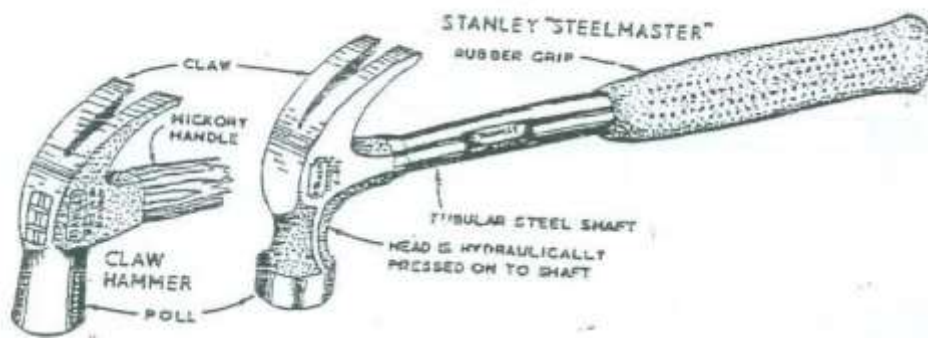


Fig. Claw hammer or Carpenter hammer

- **Types of equipment**

The three major processes involved in manufacturing of wood working machine are:

- ❖ Cutting and planning
- ❖ Shaving and Thicknessing
- ❖ Jointing and finishing.

Wood working machines are generally classified into two groups, which are the following:

A. Portable machines

Portable power machines are those which can be held easily and displaced for outdoor works.

There are several machines classified into this category, but some are listed below:

- Circular Saw
- Power Drill
- Jig saw
- Random Orbital Sander
- Miter Saw
- Router



B. Heavy machines

Heavy duty machines are heavier and stationary machines. There are several machines classified into this category, but some are listed in table below:

- Circular Saw
- Surface planer machine
- Thickness planer machine
- Band saw
- Etc.?

- **PPE (Personal Protective Equipment)**

A. GENERALITES

It is perhaps a mistake to use the term “Accidents” to describe the undesirable events which occur almost daily in our workplace and which usually bring with them undesirable consequences such as injuries to workers(sometimes fatal)damages to equipment and properties and disrupt the production schedule.

It is important that the correct personal protective clothing is worn for each workshop task that is performed, so that in the event of an accident personal injury may be minimized.

B. Personal Protective Equipment:

✓ Overall

Although coveralls are provided in the list above, lab coats or other clothing may be worn. However, it should be noted that whatever the technician wears, it should be well fitting and of hard-wearing material.

✓ safety boots

Like all other safety equipment, safety boots with a steel toe are very important in preventing falling objects which may harm your foot.

✓ hard hat

It protects worker’s head from falling objects. At all working sites every person should wear a hard hat for accident prevention and this should be regularly monitored by supervisors.

✓ safety glasses

If hazardous liquid (battery acid, fuel, oil, etc.) should enter the eyes, it must be immediately washed out with clean water or specially designed eye wash from the first aid station.

✓ safety gloves

Hands are used to perform tasks all around the workshop, handling all types of substances and materials. It is therefore important that the correct types of gloves

✓ ear plugs /Protection

Ears may be damaged by loud noises that occur over long periods of time. This can be due to grinding, drilling or running vehicles in an enclosed area. It is therefore important that should these situations arise, correct ear protection is used. Typical ear protection equipment are earmuffs (ear defenders) and earplugs.

✓ dust mask

When working with chemicals, solvents and high dust levels, or when welding, it is important that respiratory equipment is used. If respiratory equipment is not used, then breathing difficulties, headaches, dizziness or sickness may occur. Typical respiratory equipment includes dust masks (used in low risk situations) and respirators (used when risk to respiration is much greater).

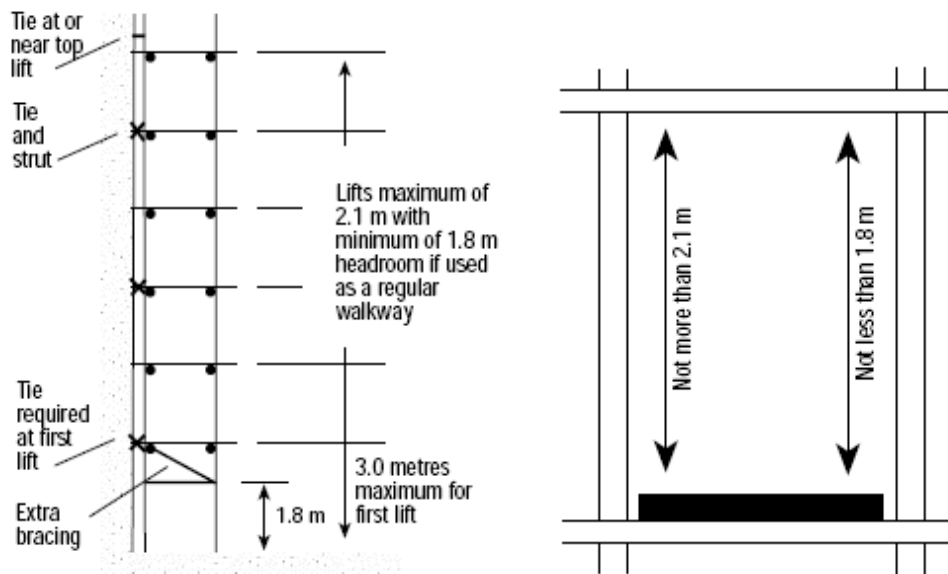
LO 1.2 – Perform setting out of scaffolding

- **Criteria of standard measurements of scaffolding and the building structure**

- The maximum distance between standards is 1.8m-2.4m.
- The maximum distance between wall and the standards is 1.25m
- The maximum distance between putlogs is 1.35m
- The minimum width of scaffold planks shall be 225 mm.
- For timber scaffold planks, the moisture content appropriate to the minimum width dimension shall be 16 + 2%.

✓ Height of the building

Height: In relation to scaffolding or part of scaffolding, means the greatest vertical distance from which any article may fall from the highest working platform of the scaffolding to the ground or structure on which the scaffolding is supported or above which the scaffolding is suspended or fixed, as the case may be. In determining the distance which an article may fall, no account shall be taken of any obstruction which may delay or stop the fall unless there is no possibility of the fall continuing after the obstruction is reached.



✓ Materials used

Regulations and various standards prescribe scaffolding made of timber, steel tubes, aluminium tubes or prefabricated frames. Other materials, provided they are suitable and adequate in strength, may be used subject to the approval of the Secretary of Labor. All scaffold materials must be in sound condition and be examined by a competent person before use.

✓ Holding capacity of the scaffolding

The design and construction of timber scaffolding for the support of both light duty and heavy-duty working platforms must be carried out in accordance with sound engineering and trade practices and conforms to appropriate Standards.

- ❖ Each scaffold and scaffold component must support without failure its own weight and at least four times the maximum intended load applied or transmitted to it.
- ❖ A qualified person must design the scaffolds, which are loaded in accordance with that design.
- ❖ Scaffolds and scaffold components must not be loaded in excess of their maximum intended loads or rated capacities, whichever is less.

- **Levelling methods**

- ✓ **Direct**

Direct levelling is the simplest method of determining the level of scaffolds, determination of horizontal as well as vertical levels.

- ❖ **Instruments to be used while direct levelling method**

- Measuring tape
 - spirit level
 - Set square
 - Pegs
 - Building lines
 - Etc.

- ✓ **Indirect**

Differential levelling or spirit levelling is the most accurate method of determining the difference of level between two points using surveying instruments

An instrument like theodolite, total station or a digital level may be used in determining horizontal and vertical levels.

- ❖ **Instruments to be used while Indirect levelling method**

- Total station
 - Theodolite
 - Digital Level
 - Surveying Tripods
 - Precision reflector
 - Reflector poles
 - Measure tape

- **Process involved in preparing the workplace**

- ✓ **Clearance of the workplace for scaffold**

Each scaffold platform and walkway must be at least **46 centimeters** wide. When the work area is less than 46 centimeters wide, guardrails and/or personal fall arrest systems must be used.

- ✓ **Compacting the surface for the scaffold.**

An adequate foundation is one that, like base plates on mud sills, will prevent the scaffold from settling into the ground. The purpose of the mud sill under the scaffold base plate is to uniformly distribute the scaffold load over a larger area than that distributed by the base plate alone, thereby reducing the loading on the ground beneath the base plates. The scaffold baseplates and mudsills increase the area where the downward forces of the scaffold are transmitted. The scaffold load is transferred from the uprights to the base plates and then to the mud sills or other adequate foundation from the scaffold legs, which must show minimal or negligible settlement under a full scaffold loading to be adequate.

- ✓ **Footing the scaffolding**

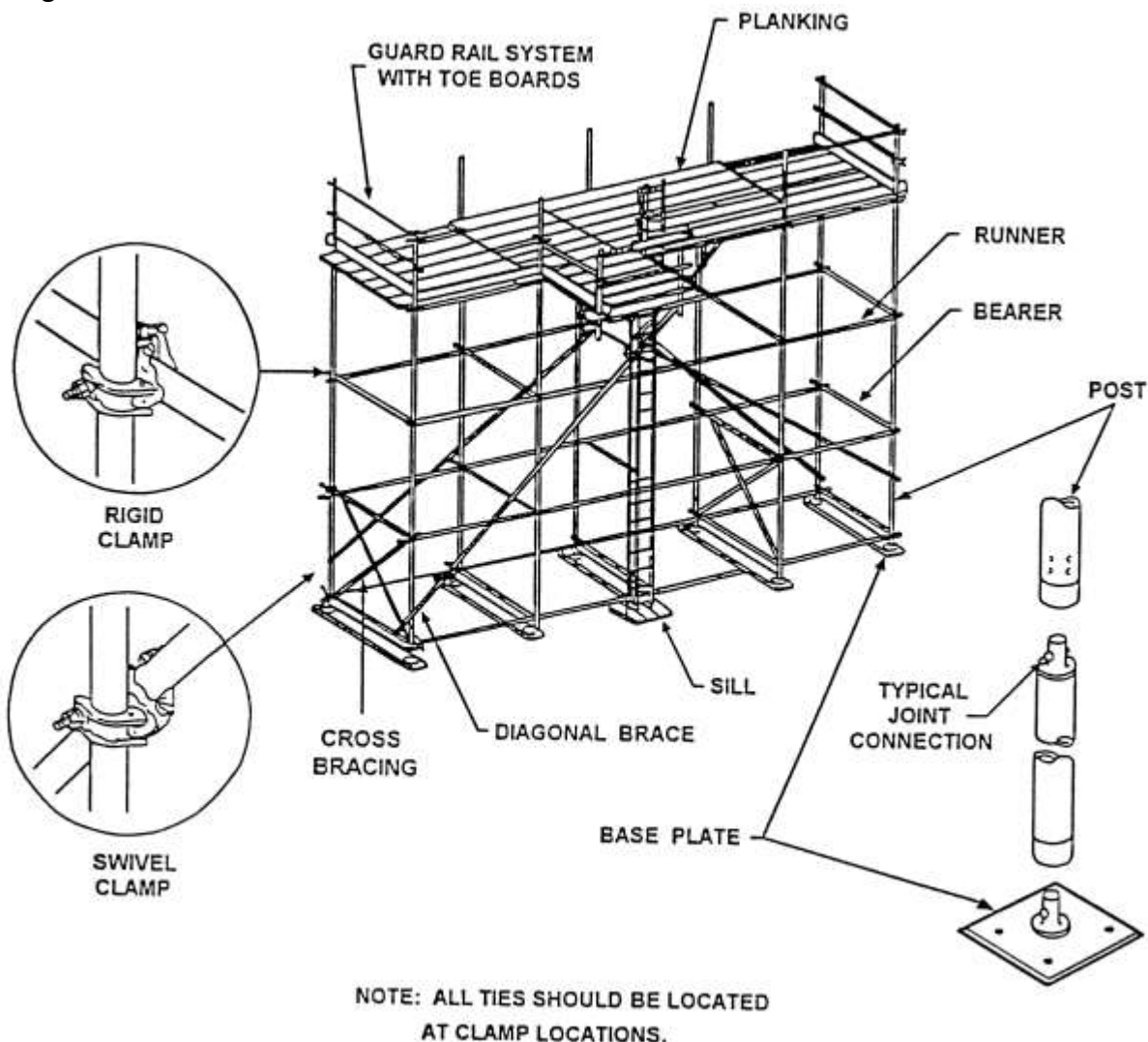
The **footing** of a **scaffold** typically consists of a wooden pad (known as a mud sill) that goes directly on top of the floor material – usually dirt or concrete. On top of the mud sill is a base plate, which is a 6-inch square steel **footing** component that goes under the **scaffold** post.

Footings -- Support **scaffold footings** shall be level and capable of supporting the loaded **scaffold**. The legs, poles, frames, and uprights shall bear on base plates and mud sills. (2) Platforms -- Supported **scaffold** platforms shall be fully planked or decked.

✓ **Laying of sole and base plates of the scaffold.**

All supported scaffolds will ultimately transmit their live and dead loads to the surface upon which the scaffold rests. For this reason, the foundation of a scaffold is arguably the most important part of a safe scaffold.

Sole plate: A timber, concrete or metal bearer used to distribute the load from a standard or base plate to the ground.



LO 1.3 – Prepare materials

- **Type of materials**

The Regulations and various standards prescribe scaffolding made of timber, steel tubes, aluminium tubes or prefabricated frames. Other materials provided they are suitable and adequate in strength. ***All scaffold materials must be in sound condition and be examined by a competent person before use.***

A. Timber

This part refers to standing scaffolds which comprise standards, ledgers, guardrails and putlogs made of timber. The species, grade, size and finish, preservative treatment, moisture content, methods of

manufacture, and other relevant characteristics of timber shall be suitable for their end use. Both faces of a timber scaffold plank shall be sawn finished or roughened to a similar finish.

A.1. Quality of Timber

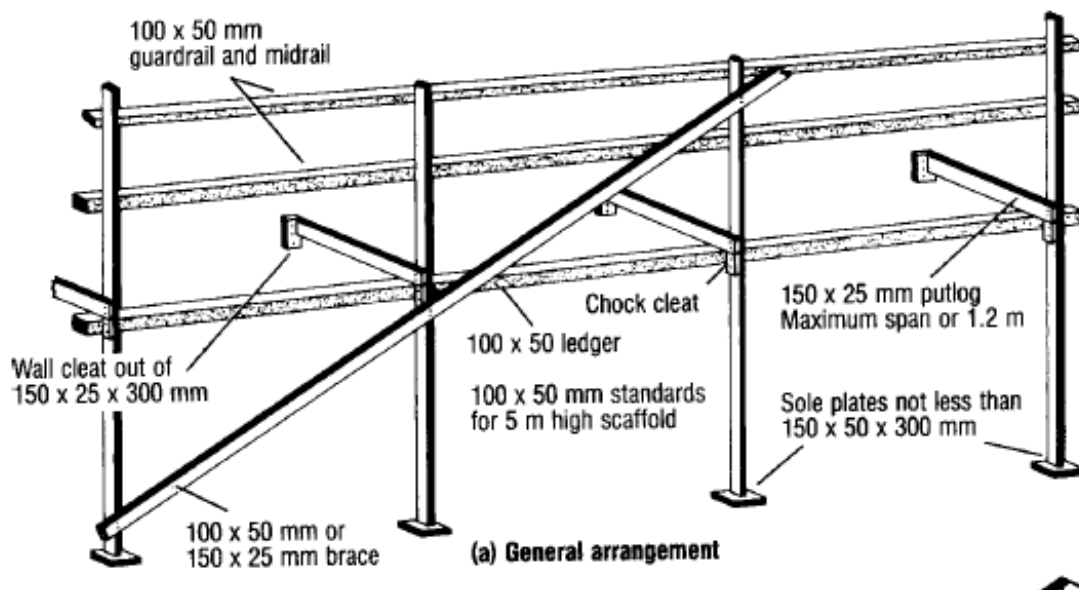
All timber used in scaffolding should be preservative treated. Untreated timber may be acceptable if the timber is sound and unlikely to deteriorate during the life of the scaffold. Fittings used for connecting joints between standards ledgers and braces must be of adequate strength and be maintained in good condition.

A.2. Requirements for Timber Scaffolds

The design and construction of timber scaffolding for the support of both light-duty and heavy-duty working platforms must be carried out in accordance with sound engineering and trade practices.

The requirements for single-standard (pole) light-duty scaffolds with putlogs cleated to wall or frame and for use up to 5 m high are summarized below:

- ✓ STANDARDS: 100 mm x 50 with a maximum spacing of 2.4 m.
- ✓ PUTLOGS: 150 mm x 25 mm or 100 mm x 50 mm for a maximum span of 1.2 m or 2/150 mm x 25 mm for a maximum span of 1.5 m.
- ✓ BRACING: Each standard must be tied to the wall by a putlog and braced longitudinally by a ledger and at least two diagonal braces in the length of the scaffold. An additional diagonal brace at 40% to 50% slope must also be provided for every 20 m length of scaffold. Minimum size of brace to be 100 mm x 50 mm or 150 mm x 25 mm.
- ✓ GUARDRAIL AND MIDRAIL: Minimum size 100 mm x 50 mm.



B. Metal

This part deals with standing scaffolds where the standards, ledgers guardrails, mid rails and putlogs are made of steel or aluminium tubes. The general rules may be applied to hanging scaffolds made of metal tubing.

B.1. Requirements for metal scaffolds

The general requirements for metal tubes and fittings of steel or aluminium are:

- ✓ Metal tubes must be purpose made with outside diameters accurately gauged to fit properly into the metal couplings and to allow complete interchangeability.
- ✓ Tubes in use on a scaffold must be in good condition, free from bends and defects that might affect strength, reasonably free from corrosion and cut square at the ends. Tubes which are 3 m and over in length should be reamed, if cut, to ensure safety when using internal joiners.
- ✓ Steel tubes must be hot-dipped galvanized or painted when used in scaffolds which are exposed for prolonged periods to marine or corrosive atmospheres.
- ✓ Fittings and couplings must be specially made for the tubes in use and must be of a satisfactory quality as to strength and performance.
- ✓ Fittings must be carefully maintained in good order and condition. They must not be left lying around but stored in bags, boxes or bins, and kept well-oiled and protected from rusting.

- **Other materials**

Various ironmongeries are often used when assembling a scaffold, some serve in making up connections and others are used giving strength to the scaffold by enabling it to freely stand by its self. Those may include:

- ✓ Nails
- ✓ Bolts and nuts
- ✓ Pins
- ✓ Nets

- **Basic scaffolding elements**

- ✓ **Anchorage:** Component cast or fixed into the building or structure for the purpose of attaching a scaffold or tie; it also means the holding down system for cantilevered beams when referring to suspended scaffolding and cantilevered platforms.
- ✓ **Base plate:** A metal plate with a spigot for distributing the load from a standard or raker or other load-bearing tube. An adjustable base plate is a metal base plate embodying a screw jack
- ✓ **Bay:** The portion of a scaffold situated between two adjacent pairs of standards measured longitudinally and extending the full height of the scaffold. The bay length is the longitudinal distance between the two adjacent pairs of standards.
- ✓ **Brace:** A member placed diagonally with respect to the vertical or horizontal members of a scaffold and fixed to them to afford stability
- ✓ **Guardrail:** A rail or barrier secured to standards or upright members, and erected along the exposed sides and ends of working platforms to prevent persons from falling. A lower rail which is fixed to standards midway between the guardrail and platform is termed a midrail.

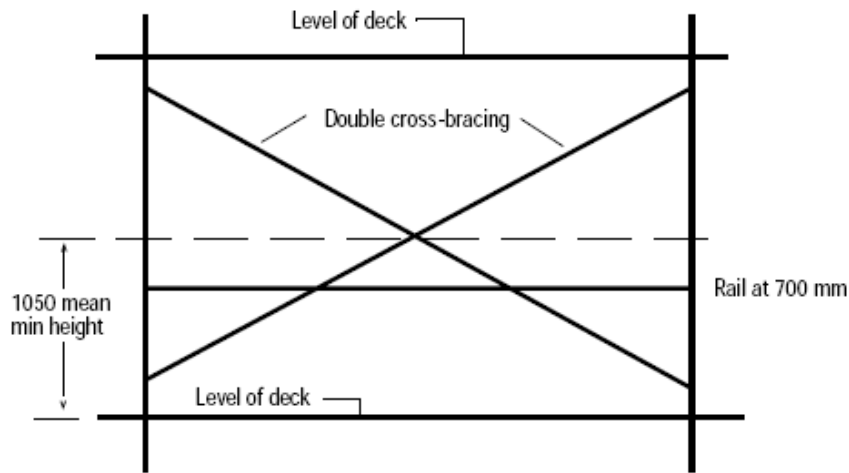


Fig. 7 (b) Guardrails.

- ✓ **Ladder:** Means a portable appliance consisting of two stiles joined by steps or rungs and designed for the purpose of climbing and descending.
- ✓ **Ledger:** A horizontal member placed in the longitudinal direction between standards for the purpose of supporting putlogs
- ✓ **Standard:** An upright member used for transmitting the weight of the load from the working platforms to the base of the scaffolding.
- ✓ **Toeboard:** An upstand or vertical barrier at the edge of a platform intended to prevent materials, or workers' from slipping off the platform.

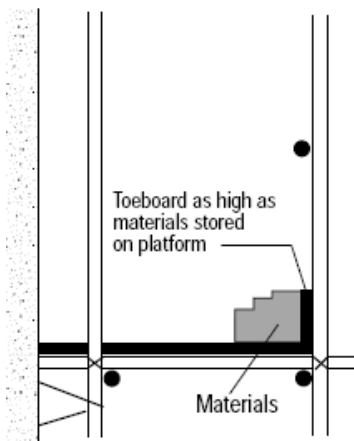
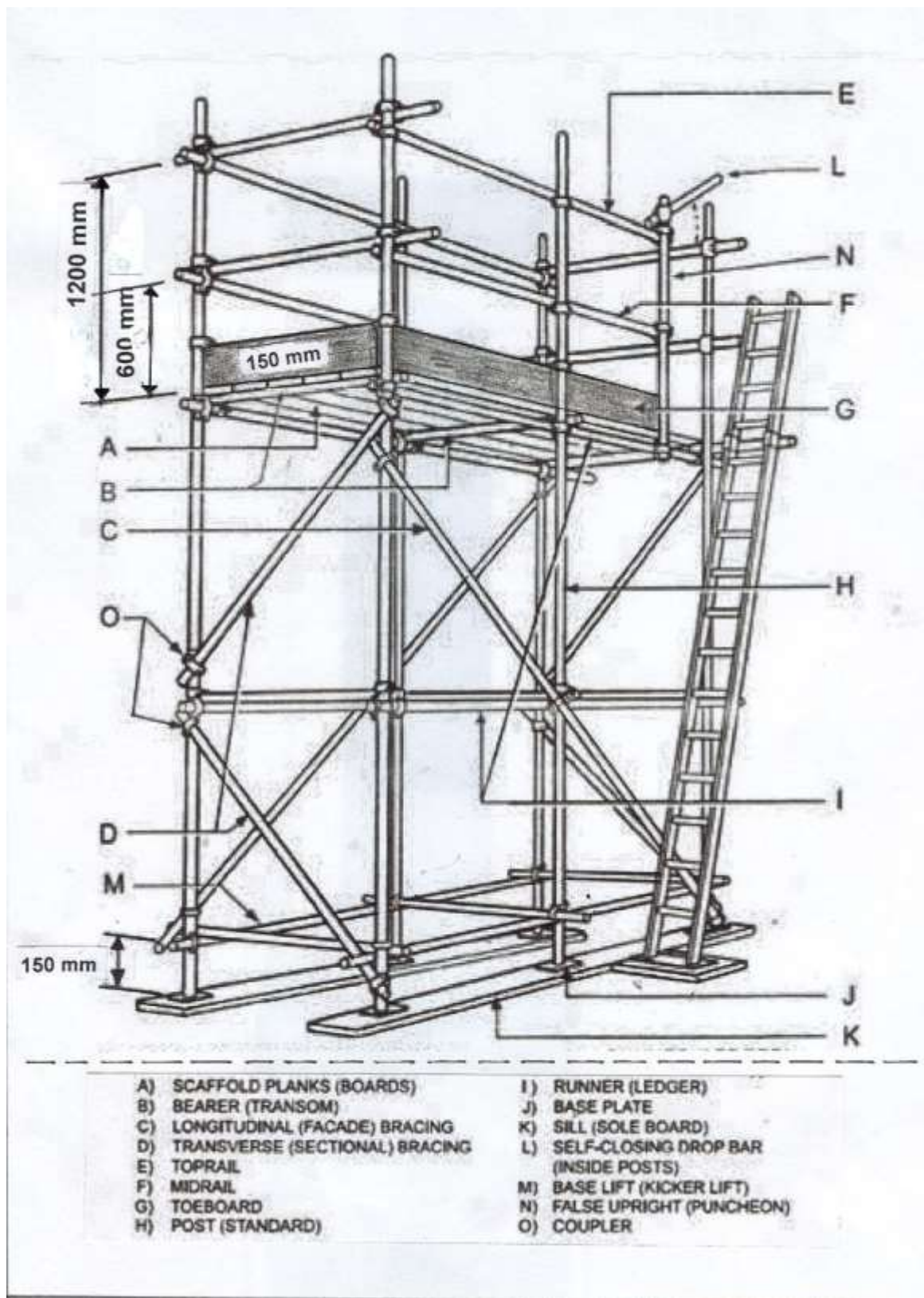


Fig. 8 Toeboard.

- ✓ **Planks:** All scaffold planks must meet the performance requirements. Planks must be frequently examined during use for splits, cracks, mechanical damage, excessive wear and decay. Planks which are defective must be rendered unfit for further use.



- ✓ **Transom:** A lube or beam spanning across ledgers to form the support for boards forming the working platform or to connect the outer standards to the inner standards
- ✓ **Putlog (or bearer or transom):** A horizontal member placed in the transverse direction between ledgers, standards, or other supports and used to support a working platform. transoms spanning across ledgers normally at right angles (90°) to the face of the building. They may also be used to support a working platform.

- Techniques of preparing wooden scaffolding elements:

STEPS OF MAKING A WOODEN SCAFFOLDING ELEMENT

STEP 1: Design

Before starting any large build, get at least a rough design put together so as to know whether you are heading in the right direction.

The drawings show enough detail to build the scaffold, they are what you should work from, but they do require you to think about what you are doing.



Fig. sample of a wooden scaffold sketch to be made

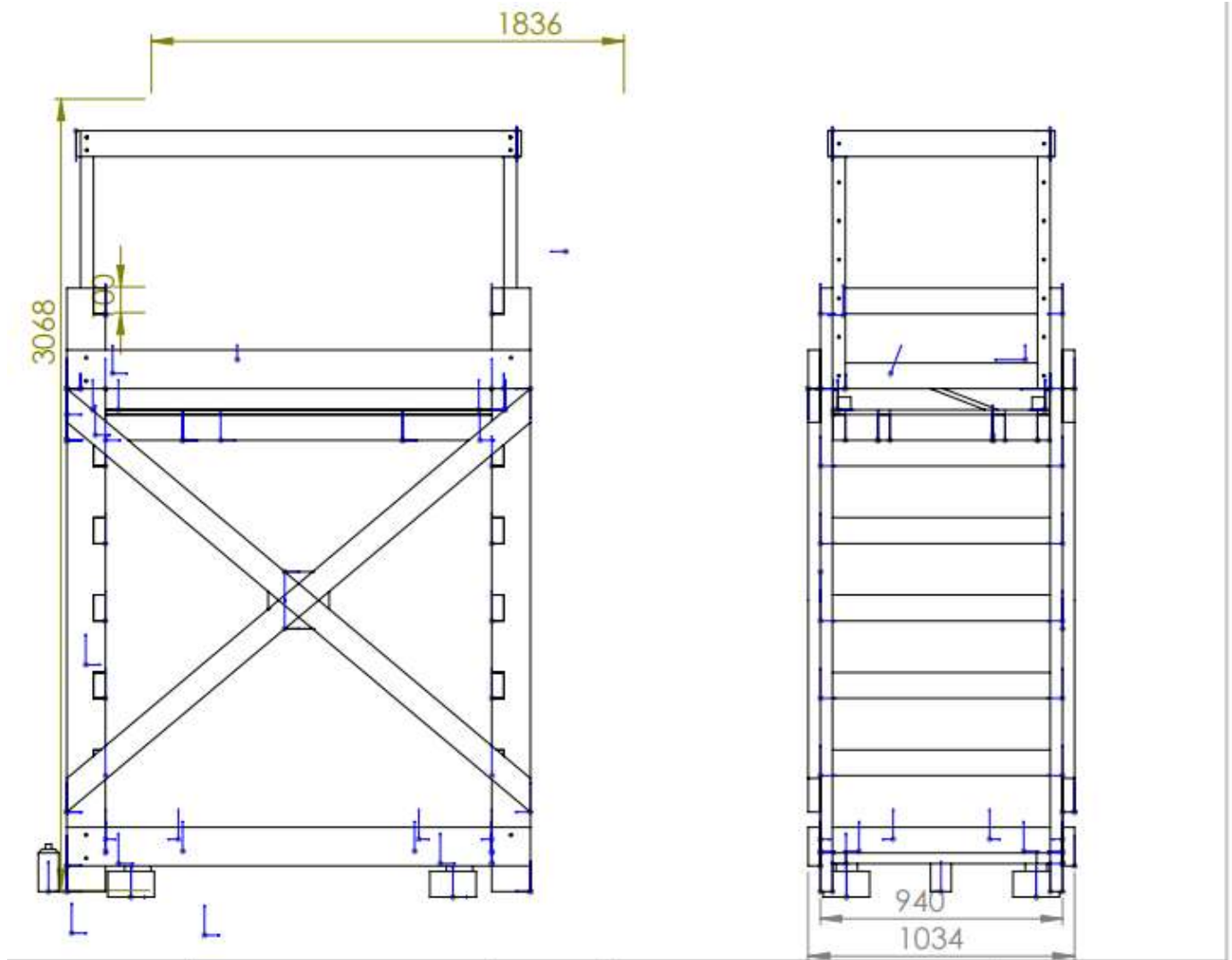


Fig: example of scaffold drawing

STEP 2: Calculations

Just looking at the design make sure that what you intended to build would be strong enough. The working platform is built like a floor in a house and so it seems reasonable that the calculations and tables used for floors would also work for the platform. The platform would be built from dry graded lumber with given dimension.

Step 3: Tools and Materials

Concerning tools and materials refer to TOPIC 1 of the entire LO.

Step 4: Completing the Long Sides

Attach the Stretchers

Lay two legs down, propping them up on some scraps to make clamping easier, and then lay the stretchers on top. Make sure that the rung sockets face in since this is the final arrangement of the scaffold.



Attach the Cross Bracing

The cross bracing that will be fitted next goes on the outside fact of the leg which means the frame needs to be carefully turned over. It's worth measuring it for square after it's been moved but it should be able to handle this level of movement.

Step 5: Assembling the Tower

Start by putting the two long sides up against each other orientated as they would be in the final product. Check to see how accurately they match each other.

Dry fit a couple of rungs so that the scaffold can stand on its own. Once the structure is safe and square, glue and screw one rung at a time into place

Step 6: Building the Platform

With the tower basically complete it's time to build the platform. Move the supports under the ply and cut the platform to length. At this point it will probably look a bit small but it's more than large enough.

Cut the four beams that will support the platform to length. Mark the locations of the noggins on the centre beams. Clamp everything together and drill and screw the noggins into place.

Step 7: Moving the Scaffold

Scaffolding tower was a bit too heavy to move by just dragging around so some sort of dolly system to move it may be needed.

Step 8: Securing the Platform

The test climb showed that I really needed to fit something to stop the platform from moving. While it probably wouldn't fall down in a hundred years the consequences of it happening were sufficiently bad that I wanted to do something about it.

I fitted two clips to each end of the platform.

Step 9: Guard Rail System

This way the guard rail can stay in place if and when I move the platform. The guard rail system is quite simple. While the guard rails might not comprise many parts they do have to be made accurately because they are designed to be interchangeable on each corner and adjustable vertically.

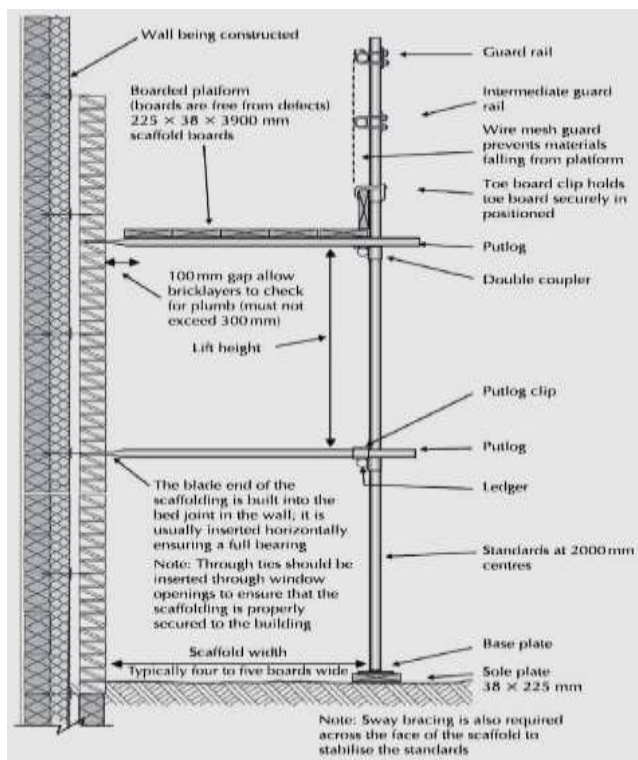
Learning Unit 2 – Assemble scaffolding

LO 2.1 – Construct scaffolding

• Types of Scaffoldings

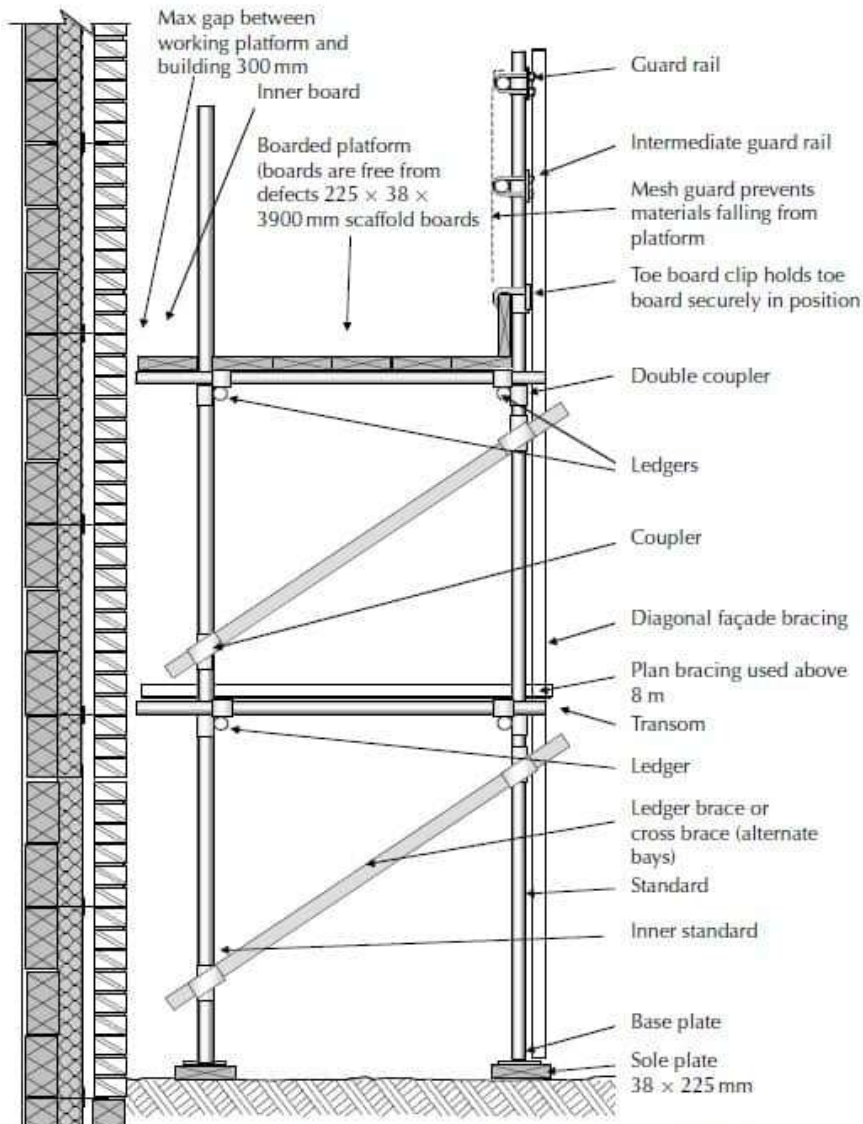
2.1.1. Putlog scaffolds

Putlog scaffolds are erected as the external wall is constructed. The scaffolding uses the external wall as part of the support system. Standards and ledgers are tied to the putlogs. Each putlog has one flat end that rests on the bed or perpendicular joints in the brick or blockwork.



2.1.2. Independent scaffolding

These scaffolds are erected 'independently' of the building structure, unlike putlog scaffolds, and are tied to the structure through window openings. Ties are required to ensure horizontal stability is maintained.



2.1.3. Free-standing scaffold:

A standing scaffold which is not attached to any other structure and is stable against overturning on its own account or, if necessary, assisted by rakers and anchors.

Free-standing scaffolds include:

- ✓ Tubular scaffolds (with or without rakers);
- ✓ Frame scaffolds (with or without rakers);
- ✓ Mobile scaffolds (without ties or rakers); and
- ✓ Trestle scaffolds (without ties or rakers)

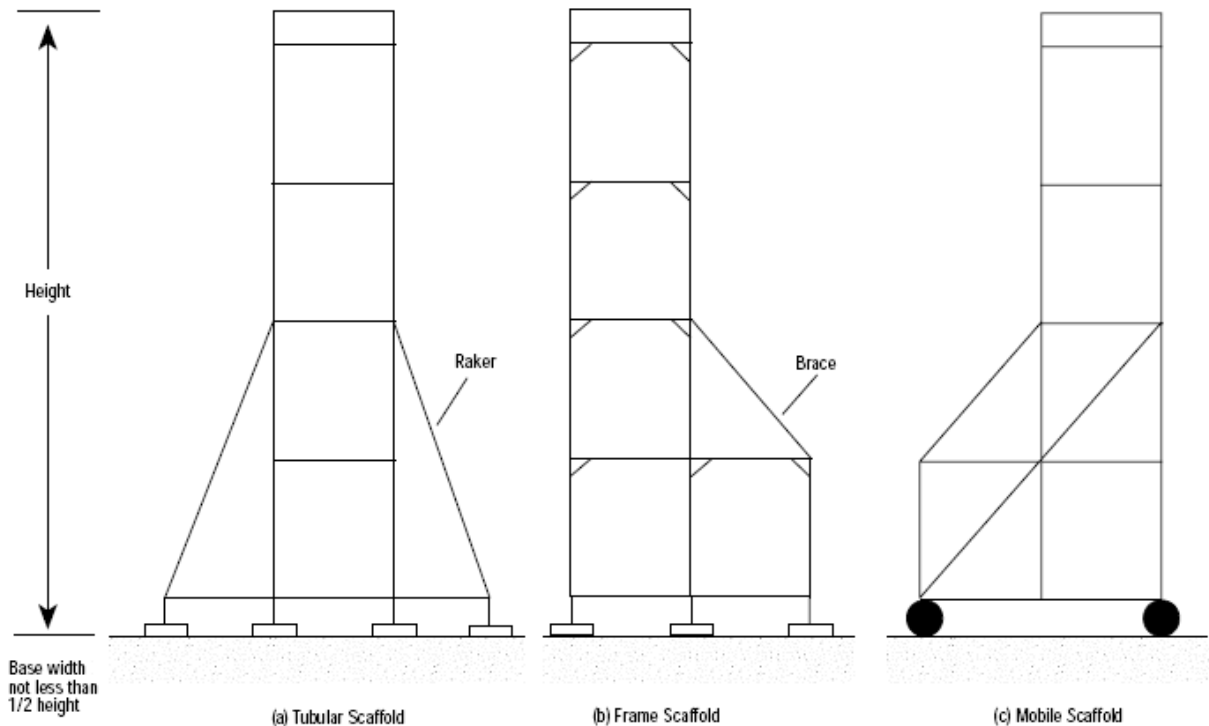


Fig. 17 Free-standing scaffolds.

All free-standing scaffolds must be stabilized against overturning forces. The factor of safety against overturning in any direction shall be not less than:

- a. 1.5 for scaffolds not exceeding 3 m in height; and
- b. 3 for scaffolds exceeding 3 m in height.

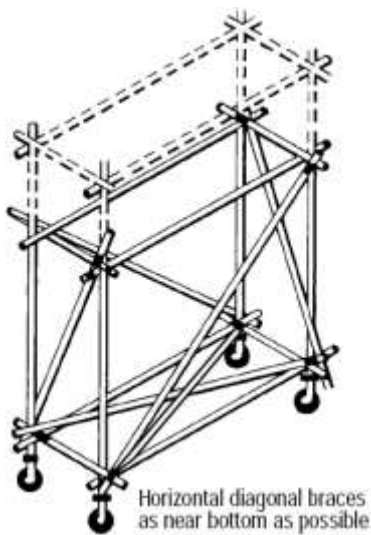
Note:

- a. The factor of safety against overturning is the ratio of the righting moment to the overturning moment from forces acting on the scaffold;
- b. The overturning moment may be due to eccentric dead and live loads on the scaffold, and/or wind;
- c. The righting moment is provided by the self-weight if suitably centred, added counterweight and the forces in the raker or anchor, if any.

✓ **Types of free – supported scaffolds:**

a. MOBILE SCAFFOLDS

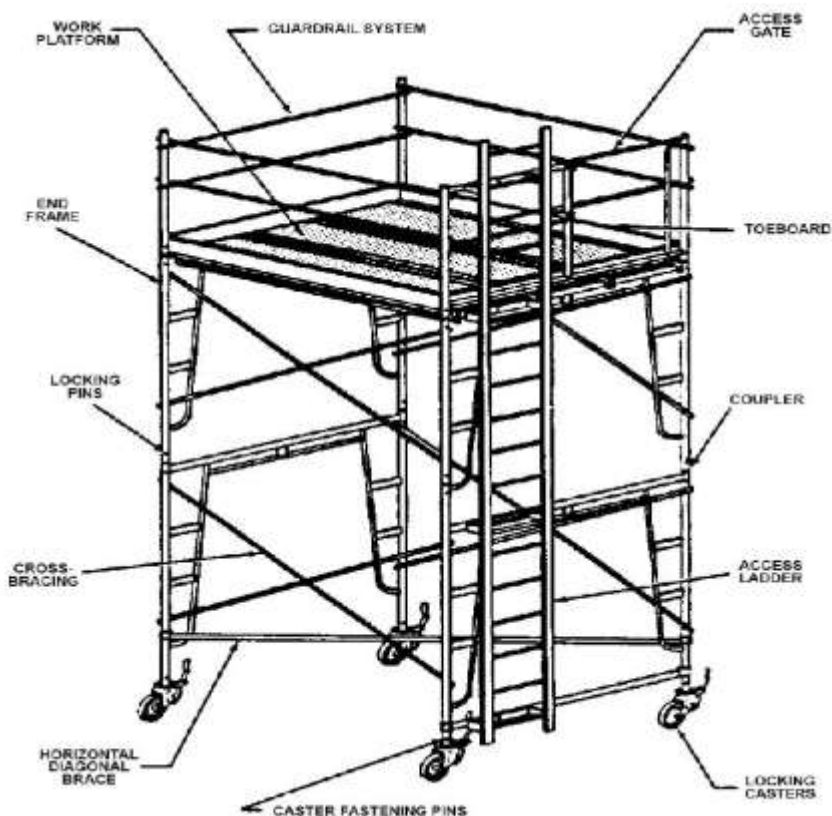
A mobile scaffold is a special type of free-standing scaffold supported on wheels, castors or other devices for ease of movement on a firm level surface.



b. TRESTLES AND TRIPODS

A **trestle** is a self-supporting metal or timber stand incorporating one or more horizontal members on which a working platform may be laid. Steel trestles are often telescopic, and of the folding type.

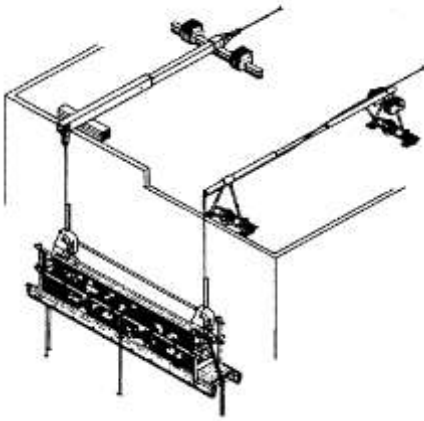
A **tripod** is a three-legged stand for supporting one end of a horizontal beam on which a working platform may be laid.



2.1.4. Suspended scaffold:

Are suspended by ropes from overhead outriggers, parapet hooks or brackets fixed to a building or structure; and (b) Are capable of being raised and lowered by hand haulage on fibre ropes, or by hoists that are either manually or mechanically operated.

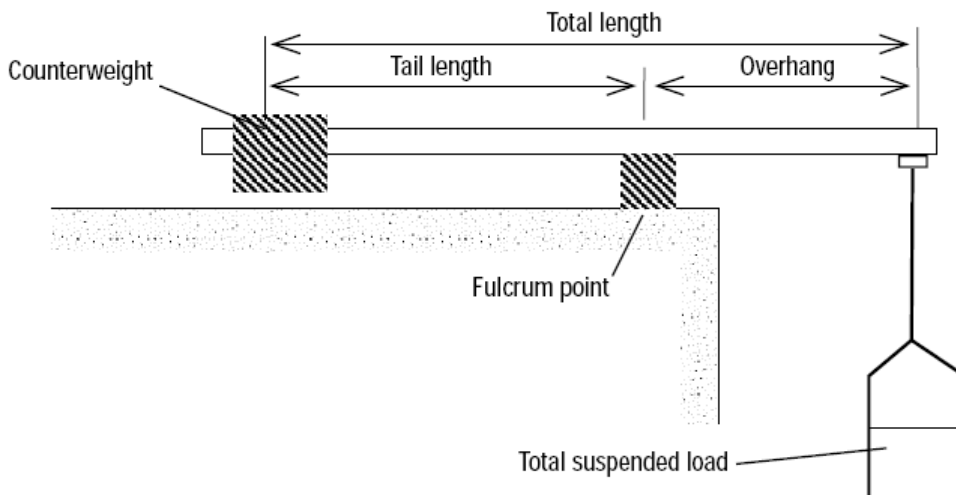
TWO POINT SUSPENDED SCAFFOLD



✓ Types Of Suspended Scaffolds

The more usual suspended scaffolds are:

- ✓ **Swinging stage (manual):** This has two points of overhead suspension and is raised or lowered by hand haulage on rope falls.
- ✓ **Swinging stage (mechanical):** This has two points of overhead suspension and is raised or lowered by power-operated hoists controlled on the stage.
- ✓ **Boatswain's chair (manual):** This has a single overhead suspension and is self-raised or lowered by hand haulage on rope falls.
- ✓ **Suspended safety chair (mechanical):** This has a single overhead suspension and is raised or lowered by a power-operated hoist controlled on the platform.
- ✓ **Multi-point suspended platforms:** These are platforms that have more than two points of overhead suspension, with power- or manually-operated hoists.



Counterweight Determined Using the Formula

Note: for a uniform two-outrigger suspended scaffold, the suspended load on one outrigger is assumed to be half the dead load plus the full live load.

$$\text{Counterweight} = \frac{\text{overhang (in m)} \times \text{the suspended load times three}}{\text{tail length (in m)}}$$

E.g. if the suspended load is 360kg, the overhang is 1.2m and the tail length is 4.1m, then the counterweight required is: $\frac{1.2\text{m} \times 360\text{ kg} \times 3}{4.1\text{ m}} = 316\text{kg}$

2.1.5. Special scaffold:

A scaffold which differs from the standard requirements for standing and suspended scaffolds. They include:

- ✓ **Non-standard standing scaffolds:** A standing scaffold becomes a special scaffold when it differs from the standard in respect of any of the following:
 - Height exceeds 33 meters;
 - Maximum bay length exceeds 2.4 meters;
 - Width exceeds 1.5 meters;
- ✓ **Standing scaffolds with attachments:**
Attachments include:
 - Cantilevered loading platforms, which are cantilevered structures erected from the main scaffold to serve as loading bays.
 - Protective screens which are fixed to the main scaffold to intercept anything which may fall from the structure.
- ✓ **Cantilever scaffolds:**

A cantilever scaffold is an independent tied standing scaffold constructed in accordance with this code but erected on beams cantilevering out from a building. It is used where it is impossible or undesirable to found the scaffold on the ground. **Generally cantilever scaffoldings are used under conditions such as:**

- When the ground does not having the capacity to support standards,
- When the Ground near the wall is to be free from traffic,
- When upper part of the wall is under construction.



✓ **Hanging scaffolds.**

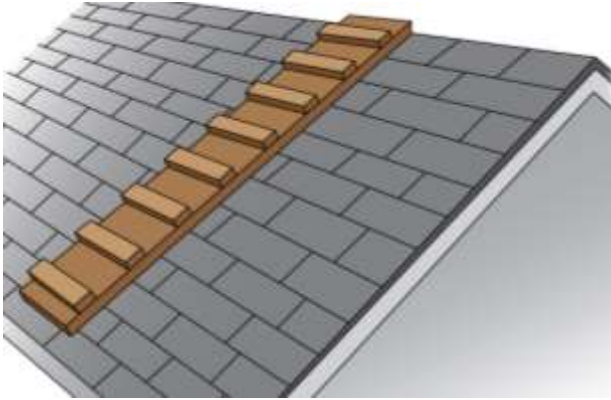
A working platform suspended by tubes, bolts, fixed rope slings or other methods and not intended for raising or lowering while in use.

2.1.6. Miscellaneous types of scaffolds:

✓ **Crawling board (chicken ladder)**

Crawling boards shall extend from the roof peak to the eaves when used in connection with roof construction, repair, or maintenance.

Crawling boards shall be secured to the roof by ridge hooks or by means that meet equivalent criteria (e.g., strength and durability).



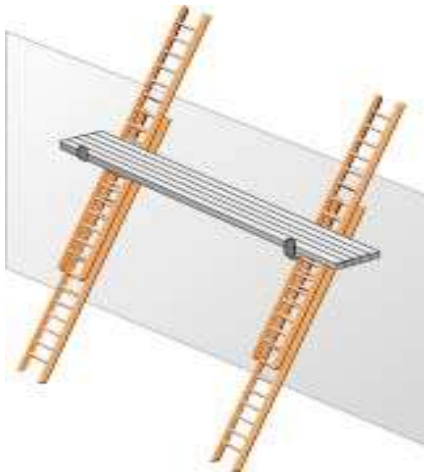
✓ **Float scaffold**

A **float**, or ship, **scaffold** is a suspension **scaffold** consisting of a braced platform resting on two parallel bearers and hung from overhead supports by ropes of fixed length. NOTE: The requirements on this page are specific to **float** (ship) **scaffolds** only.



✓ **Ladder jack scaffold**

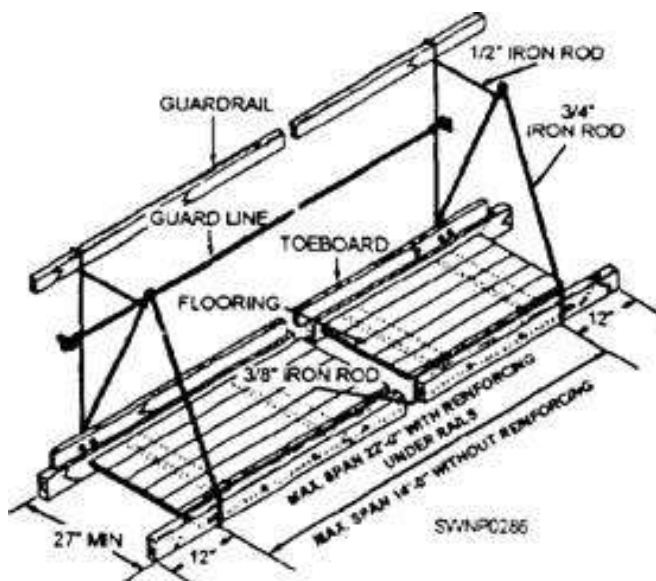
Triangle-shaped brackets called “ladder jacks” are attached to portable ladders, which are used on each side of a ladder jack scaffold to form a means of support for a platform.



✓ Needle beam scaffold

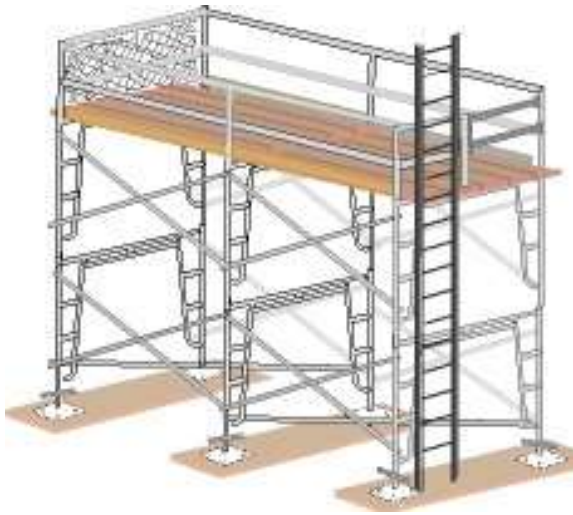
A needle-beam scaffold consists of a plank platform resting on two parallel horizontal beams, called needle beams, which are supported by lines from overhead.

Needle-beam scaffolds should be used only for the support of personnel doing light work. They are suitable for use by riveting gangs working on steel structures because of the frequent changes of location necessary and the adaptability of this type of scaffold to different situations.



✓ Self-contained scaffold

“Self-contained adjustable scaffold” means a combination supported and suspension scaffold consisting of an adjustable platform(s) mounted on an independent supporting frame(s) not a part of the object being worked on, and which is equipped with a means to permit the raising and lowering of the platform(s).



✓ Single-point and two point suspension scaffolds

A **single-point** adjustable **scaffold** consists of a platform **suspended** by one rope from an overhead support and equipped with means to permit the movement of the platform to desired work levels. ... For requirements that apply to all types of **suspended scaffolds**, please refer to the **Two-point** (swing stage) module.



✓ Supported scaffold

Supported scaffolds consist of one or more platforms supported by outrigger beams, brackets, poles, legs, uprights, posts, frames, or similar rigid support.

● Types of accessories

✓ Ladders

Access ladders, platforms, and scaffolding are used to reach high areas in a work site. Ladders allow workers to climb or cross over to a high place. Scaffolding and platforms provide a stable standing surface when working in high areas for extended periods of time. Ladders should be pitched at a slope of not less than 1 in 4 and not more than 1 in 6.

✓ Stair towers

A **staircase tower** or stair tower is a tower-like wing of a building with a circular or polygonal plan that contains a stairwell, usually a helical staircase.



✓ Ramps and walkways

Ramps and walkways have been designed to facilitate movement of people along long distances with maximum safety and comfort, either with or without shopping or luggage trolleys.



● Techniques of assembling scaffolding

All scaffolding, whether notifiable or not, must be erected, altered and dismantled by competent workers under proper supervision. Scaffolding must not be used unless the employer or employer's representative on the work is satisfied that it is safe for use and complies with the regulations.

Scaffold erection

An example of scaffold erection is shown in Figure below. In this example the scaffold is being erected against an existing building so guardrails are only needed on external faces. Access ladders and toe boards have been omitted for clarity.

After enough components of the scaffold have been erected to support it, immediately install:

1. a platform at least 450 mm wide along the full length of the section of scaffold edge protection across the space between the standards forming the outer frame of the scaffold at the level the scaffold has reached, and a way to access the scaffold e.g. temporary stairs or a ladder to the level the scaffold has reached.

2. Before the next level of the scaffold is erected, a platform should be installed not more than two meters below the position of the next level.
3. When erecting scaffolding:
 - ✓ A section of the platform may be left open to allow the passing of planks or other scaffolding between levels.
 - ✓ A platform may be removed after work has started two levels above the level from which the platform is to be removed.

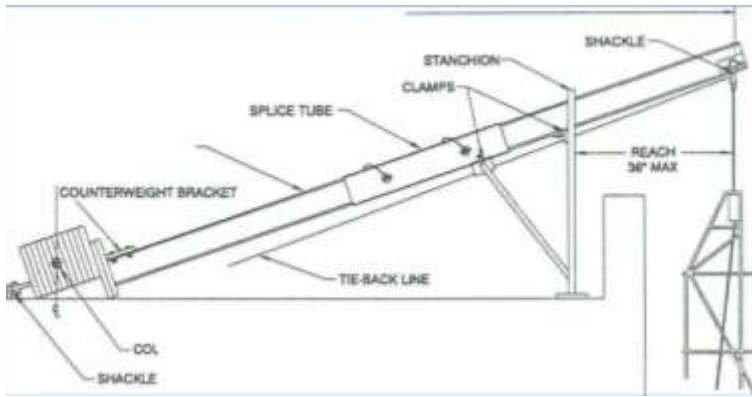


LO 2.2 – Apply safety precautions on scaffolding

- Materials used in safety precautions of scaffolding

- ✓ Tiebacks for outrigger beams

Tiebacks are used to secure the **outriggers** and counterweights of SAE. Wire ropes are recommended for **tiebacks** with all suspended access systems. The **tieback** holds the major components of the suspension system together. It keeps them from being loosened or dislodged and secures them back to an adequate anchor point.



✓ Cornice hooks

Cornice hooks support the vertically hung suspension wire rope of a staging from a **cornice** or parapet.



✓ Roof hooks

The roof hooks are used both for hanging a roofing ladder and for fastening personal fall protection equipment (PFPE).



✓ Roof irons

Roof irons for holding scaffold boards and working on roof as you slate up a roof



✓ Parapet clamps or similar devices need to be secured

Tiebacks for **parapet clamps** must be **secured** to a sound point of anchorage at or below the level of the **parapet clamp**. DO NOT **secure** a tieback to standpipes, vents, **other** piping systems, or electrical conduit. Two tiebacks are **required** when the point of anchorage is not directly behind the **parapet clamp**.



✓ **Suspension ropes**

These suspended scaffolds are normally supported on all four sides with ropes. However, other means can also be adopted, such as metal chains

✓ **Nets**

Nets are extremely lightweight and easy to install. They are highly tear-resistant, offering extremely efficient protection from falling debris, dust or objects on the construction site. Extreme weather conditions can also be effectively regulated by using the scaffolding protection nets.

• **Techniques of fastening the scaffolding for safety purpose**

The sequence of work should be planned and followed for each type of scaffold to be constructed. The sequence of work should include consideration of the following unless you have developed an alternative process that provides an equivalent or higher level of work health and safety.

✓ **Erecting A Scaffold Safely**

Erecting a scaffold safely will include preparing the foundations for the scaffold, installing sole boards and baseplates where required, and erecting the scaffold including for adequate access and work platforms that minimize the risk to those doing the scaffolding work and people who will use the scaffold.

The following safe work practices should be used when erecting a scaffold:

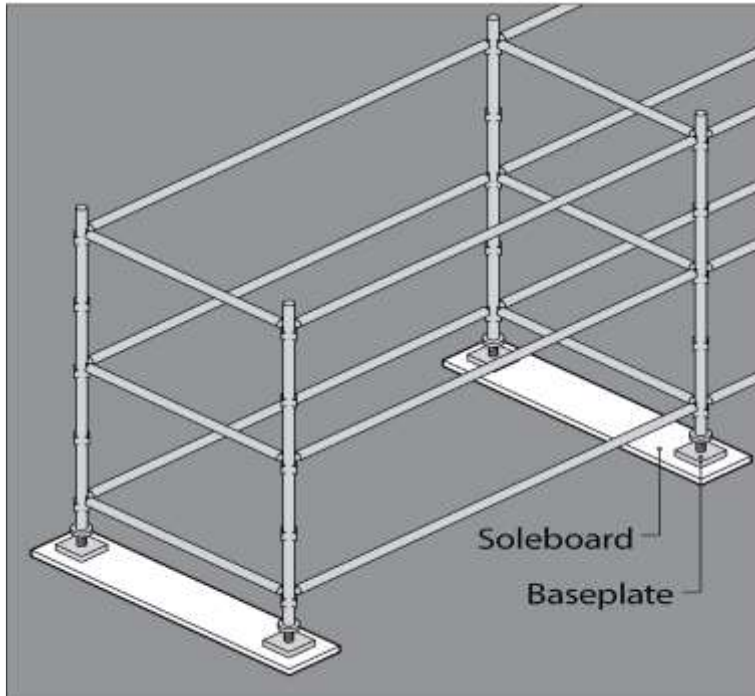
1. Develop and follow a methodical work sequence—e.g. scaffolding plan.
2. Scaffold fittings and other connections should be securely tightened where required.
3. Scaffolding including all bracing and ties, guy ropes or buttresses should be installed as the scaffold is erected.
4. The number of workers on the scaffold at any one time may need to be limited.
5. Work from a full deck of planks whenever possible
6. Do not overload scaffold bays with scaffolding awaiting installation.
7. Do not climb on guardrails to gain extra height
8. Do not climb on outside of scaffold.

✓ **Foundations**

Scaffold foundations should be designed and constructed to carry and distribute the full weight of the scaffold including both dead and live loads.

✓ Soleboards and baseplates

Soleboards and baseplates should evenly distribute the load from the scaffold to the supporting surface to provide scaffold stability (see Figure below). A soleboard distributes the load from a load-bearing member to a supporting surface and is intended for use underneath baseplates.



References:

Bibliography

- Department of Labour. (1995). *SAFE ERECTION AND USE OF SCAFFOLDING*. WELLINGTON, NEW ZEALAND: Occupational Safety and Health Service,.
- Health and Safety Authority,. (2019). *CODE OF PRACTICE FOR ACCESS AND WORKING scaffolding*. Dublin: The Metropolitan Building, James Joyce Street, Dublin 1.
- instructables. (2020, JULY MONDAY). *instructables*. Retrieved from <https://www.instructables.com:https://www.instructables.com/id/Wooden-Scaffolding-Tower/>
- OSHA. (2019, JUNE FRIDAY). Retrieved from <https://www.osha.gov:https://www.osha.gov/Publications/OSHA3150/osha3150.html>
- Researchgate. (2020, JUNE THURSDAY). *Researchgate*. Retrieved from https://www.researchgate.net:https://www.researchgate.net/publication/281493982_SCAFFOLDING_SAFETY_AND_ECONOMIC_AL_ASPECT_FOR_SCAFFOLDINGS_IN_CONSTRUCTION_INDUSTRY
- Safe work Australia. (2014). *GENERAL GUIDE FOR SCAFFOLDS AND SCAFFOLDING WORK*. Sydney: Safe work Australia.
- safeworkaustralia. (2020, JUNE THURSDAY). *safeworkaustralia*. Retrieved from <https://www.safeworkaustralia.gov.au:https://www.safeworkaustralia.gov.au/system/files/documents/1703/scaffolds-scaffolding-work-general-guide.pdf>
- WDA. (2013). *REQF Level 4 CURRICULUM IN CARPENTRY*. KIGALI: Workforce Development Authority (WDA).