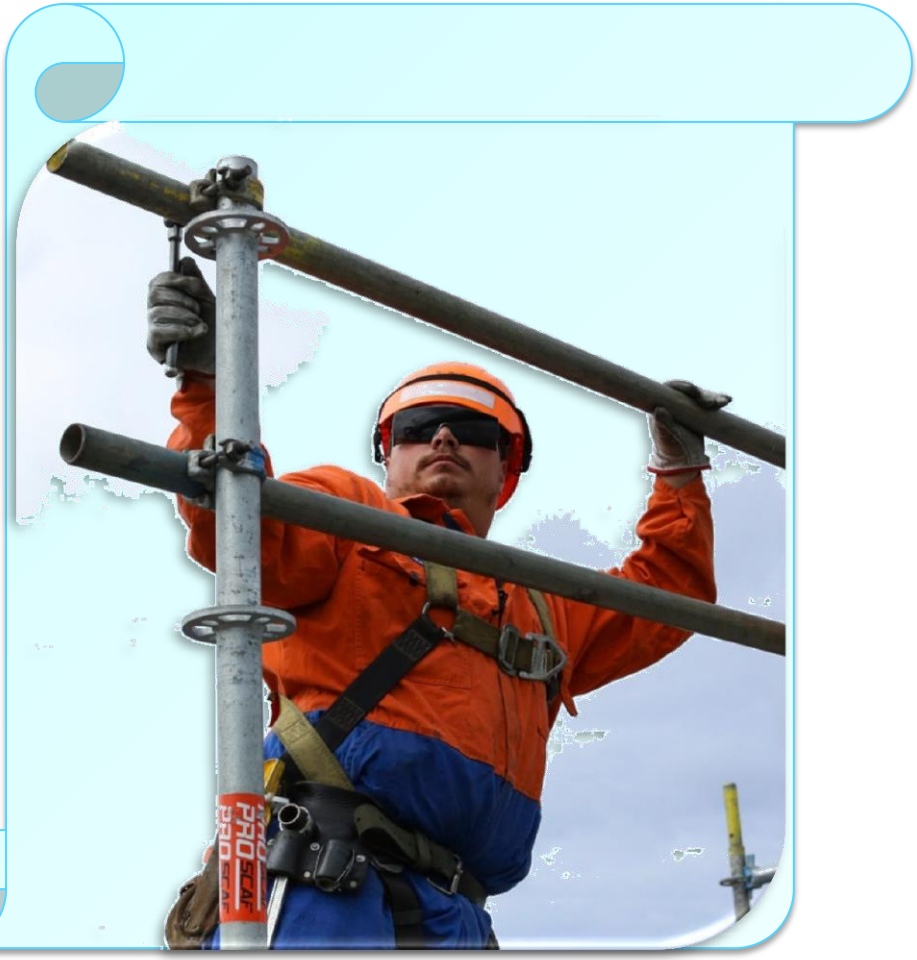
Scaffolding Training

Please
Turn off
your cell
phone
Thank You!



NCC HSE Department Riyadh

Worldwide Safety Awareness

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Chaudhry Zulfiqar Haider Warraich

Advance Scaffolding

- Objective
- Regulations
- PPE
- Accident Prevention
- General Scaf Safety
- Manual Handling
- Recovery Time
- Scaf. Hazards
- Workers Protection
- Scaffold Introduction
- Definitions
- Inspection
- Modern Alternatives
- Scaffolds Components
- Materials loading
- Common Faults in Tubes
- Scaf Boards
- Foundations
- PFAS
- Q & A

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What is Scaffolding ?

An Elevated
Temporary
Working Platform

Applied Standards

- Knowledge about Rules and Regulations
- International Regulations
- Country Rules and Regs
- Company Rules and Regs / Procedures

Applied Standards

- British Standard (BSI)
- BS 5973 : 1993
- December : 2010
- January 2011 : BS EN 12811

- OSHA Standard : USA
- www.osha.gov

Who is a Scaffold Operator ?

A Competent worker who perform scaffolding erection and dismantling job.

- **Erection**
- **Dismantling**
- **Storage etc,**

Note: Only a Competent Scaffolding operator can perform the scaffolding job

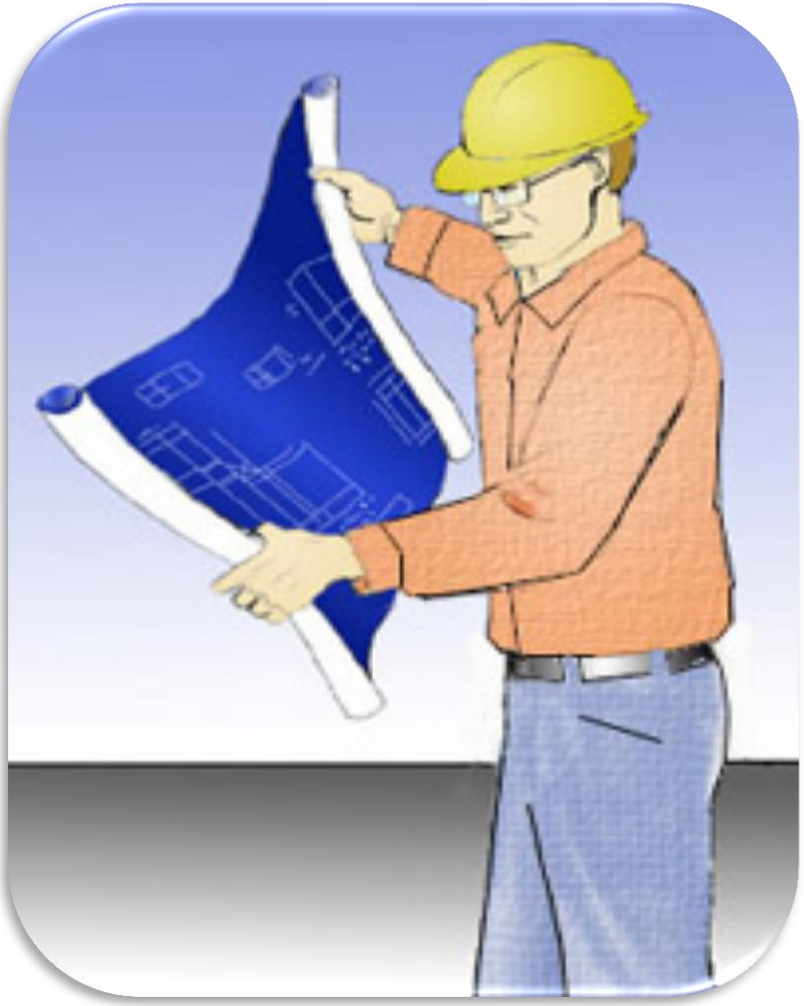
Competent Person ?

Qualified

(Trained & Experienced)

Authorised

(A Person having relative authority to perform the job)



Qualities of a Good Scaffolding Operator ?

- Qualified and Authorised
- Knowledge about Rules and Regulations
- Erection and Dismantling
- Scaffolding Components
- Use of Scaffolds
- Types of Scaffolds
- Standard Materials
- Risk Assessment

Qualities of a Good Scaffolding Operator ?

- TBT / Job Brief
- Planning
- General Safety Rules
- House Keeping
- Manual and Mechanical Handling
- Materials Estimation
- Scaffolding Inspection
- Reporting of Incidents
- PTW

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USES OF SCAFFOLDS

- **Use of Scaffolding**
- Working Platform
- Loading Platform
- Lifting Frames (Material)
- Lifting Frames (Persons)
- Supporting Structures
- Access Tower
- Storage Purpose
- Bridges
- Cable Crossing over (Roads etc)

Types of Scaffold

❖By Material

(Steel, Aluminium, Wood)

❖By Weight

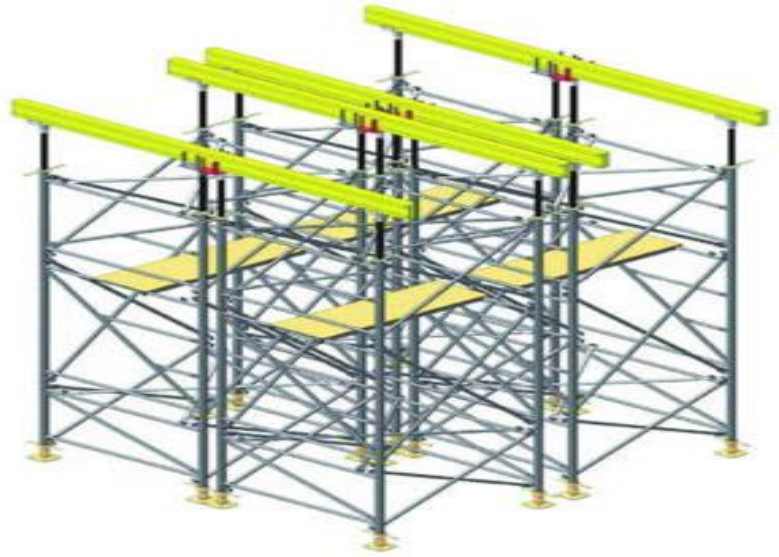
(Light, Medium, Heavy, Special)

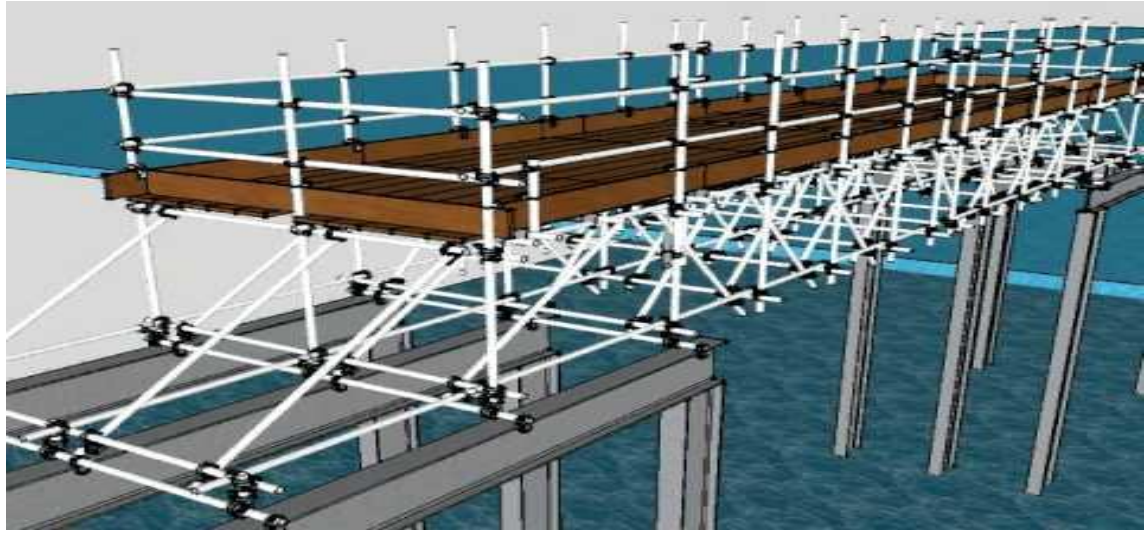
❖Basic Erection Design

(Supported, Independent,

Suspended / Hanging)

❖Manufacturer Design





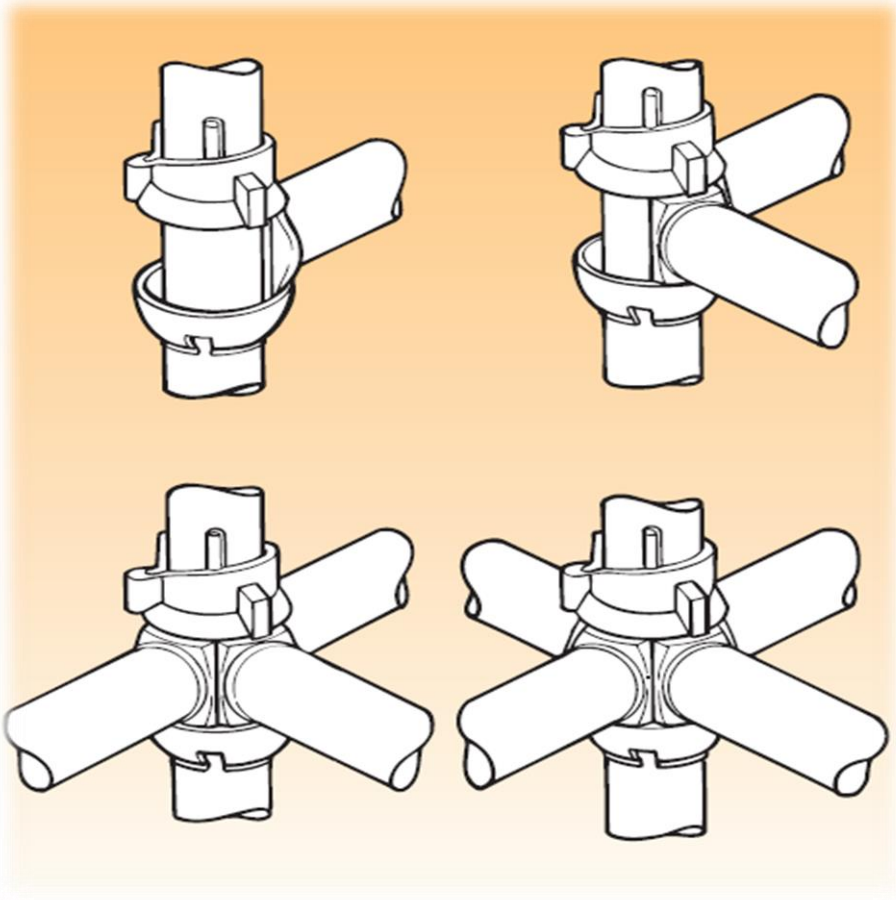
Types of Scaffold

Types of Scaffolding (Manufacturer Design Name)

There are many types but some of them mostly in common use are;

- Tube and Coupler System Scaffold
- Tube and Cup lock System Scaffold
- H Type Frame (Readymade Scaffold)
- Kwick Type System Scaffold

Tube and Cup lock System Scaffold



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Tube and Cup lock System Scaffold

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Tube and Coupler System Scaffold

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Kwick Stage System Scaffold

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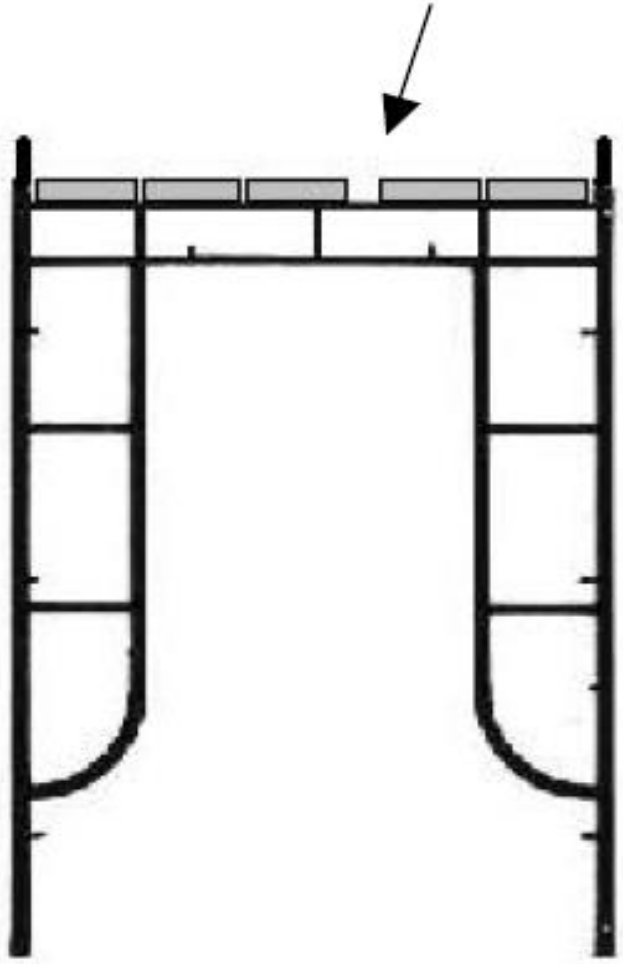
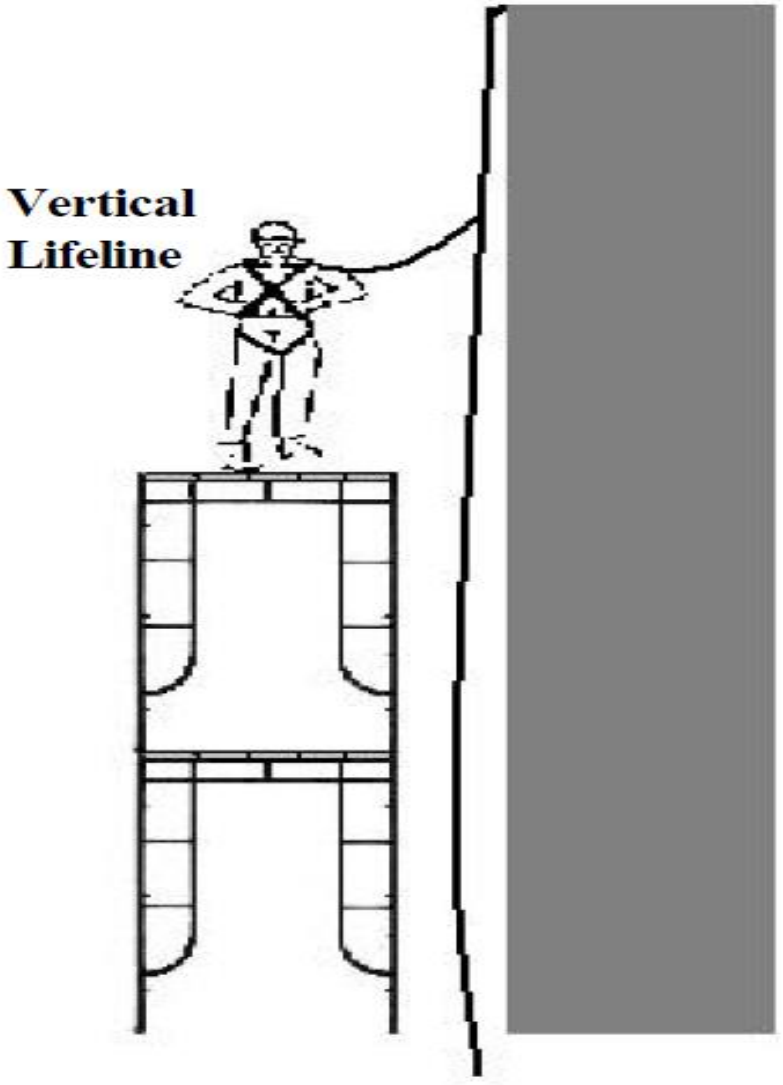
H Type of Readymade System Scaffold





H Type Frame System Scaffold (Readymade Scaffold)

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Types of Scaffolding

Types of Scaffold by Weight as per BSI 5973

- Light duty - 150kg/m²
- Medium duty - 200kg/m²
- Heavy duty - 250kg/m²
- Special purpose - ____kg/m²

Scaffolding Tag

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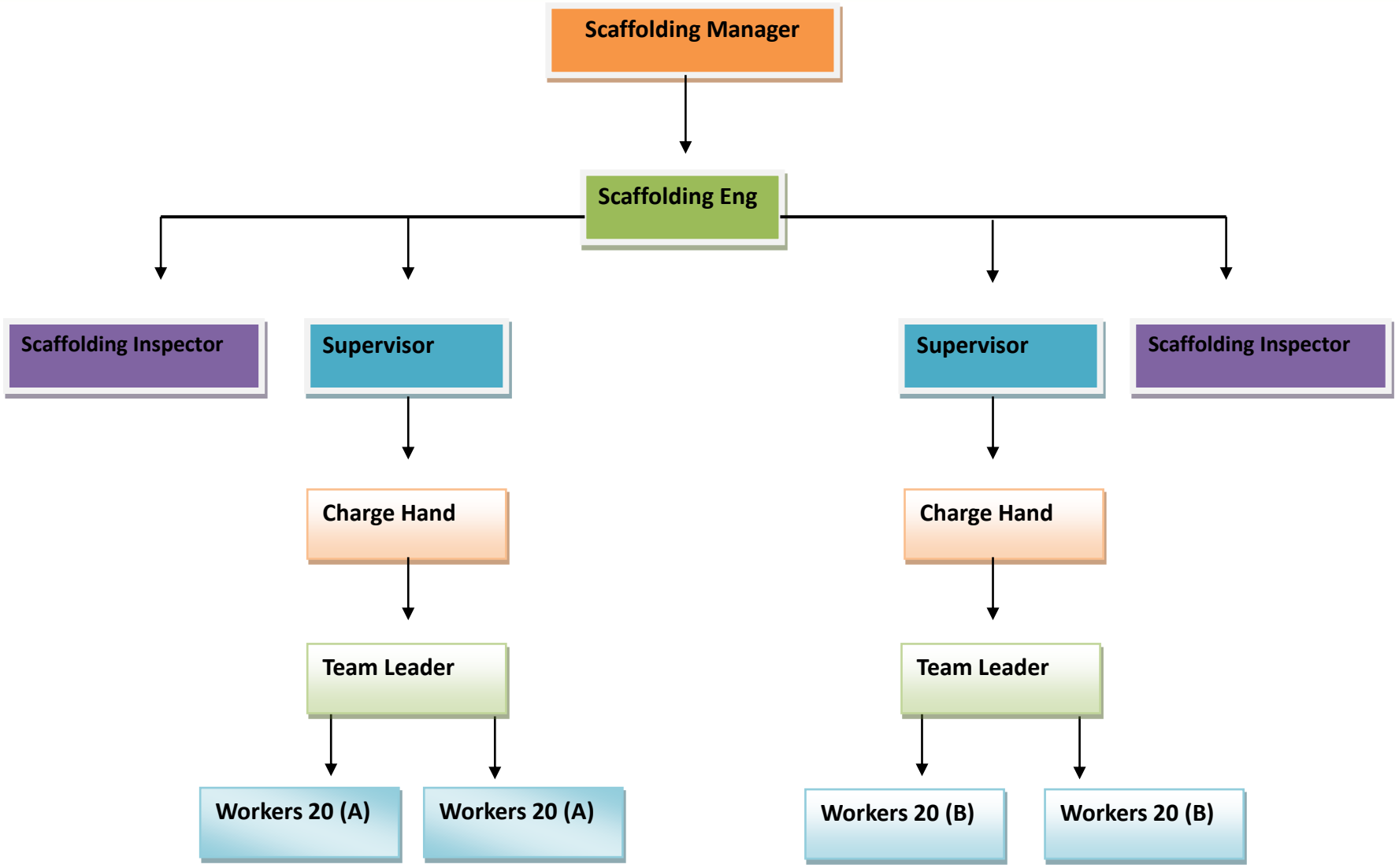

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Personal Protective Equipment Cont.

- Safety gloves, leather
- Safety climbing helmet
- Safety boots/shoes with steel toe-cap
- Coveralls, 100% cotton, long sleeve

Personal Protective Equipment Cont.

- **Ear protection, when required**
- **Safety spectacles (clear/shaded)**
- **Tool pouch with appropriate tools**
- **Fall protection, safety harness or/and fall arrestor**

Tools

- Spanner
- Leveller
- Hammer
- Saw (Wood Cutter)
- Rope
- Measuring Tape
- Nails
- Wire Cutter

Tools

- Spanner
- Normally 21 mm and 22 mm spanner is used.

Tools

- Leveller

- **Wire Cutter**

Tower scaffolds

- **Uses of Scaffolding Towers**

- Electric Wiring
- AC Ducting
- Interior Decoration
- Painting
- Ceiling works
- Storage Purpose
- Supporting Structure

Tower scaffolds

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ERECTION AND DISMANTLING

- User manuals
- Which include
- Sequence of erection and dismantling
- Bracing
- Stabilizing requirements
- Ratio 1:4
- PFAS (Life Line, Fall arrestor)
- Raker System

ERECTION AND DISMANTLING

- User manuals
- Which include
- Sequence of erection and dismantling
- Bracing
- Stabilizing requirements
- Ratio 1:4
- PFAS (Life Line, Fall arrestor)
- Raker System

HAZARDS IN SCAFFOLDING TOWERS

- Overturn
- Material Fall
- Planks breakage
- Personal Fall
- Electrocution
- Incompatible Components

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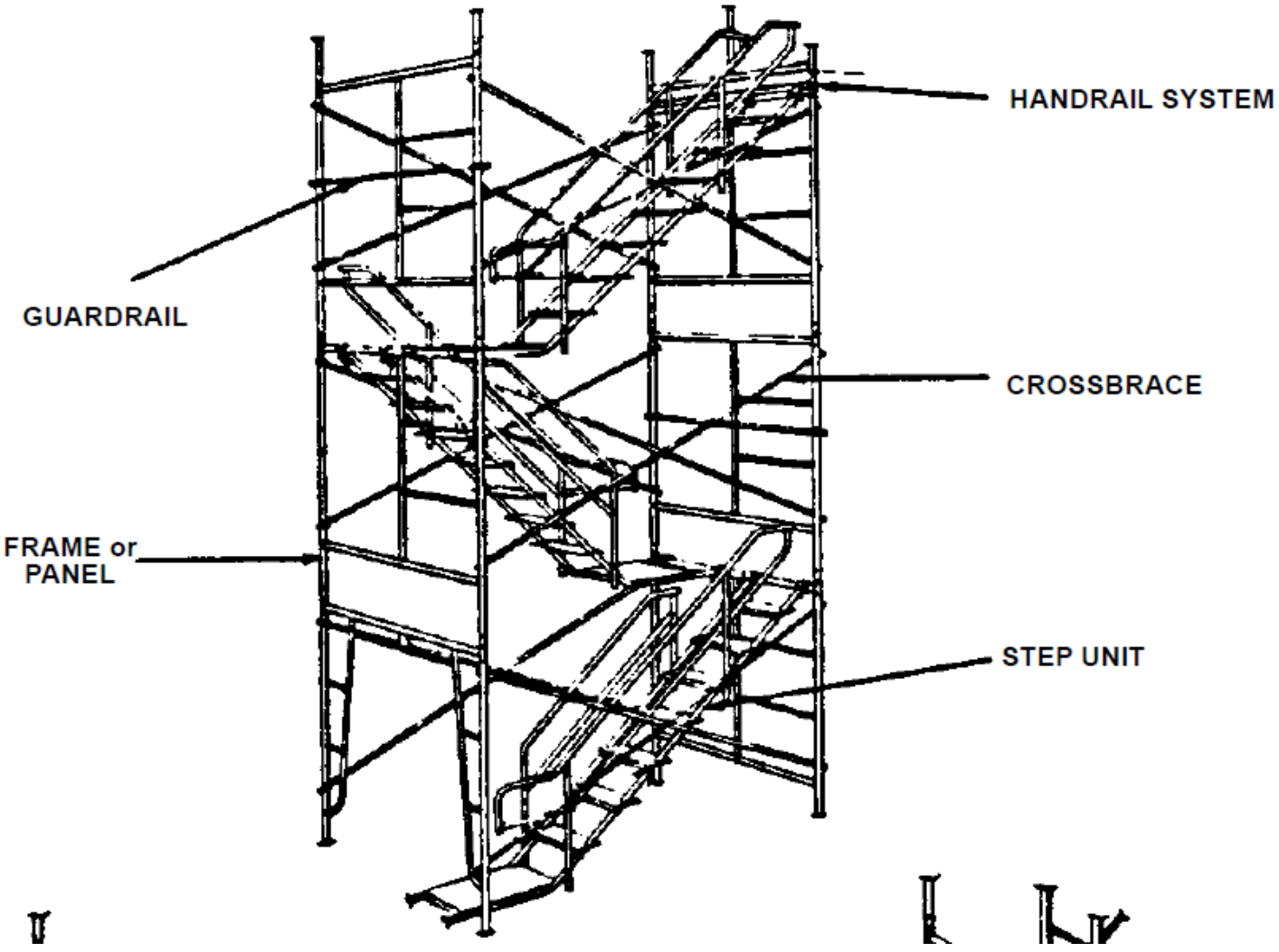
Fabricated Frame Scaffold



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Fabricated Frame Scaffold

- Rakers 4 sides
- ladder to be opposite sides

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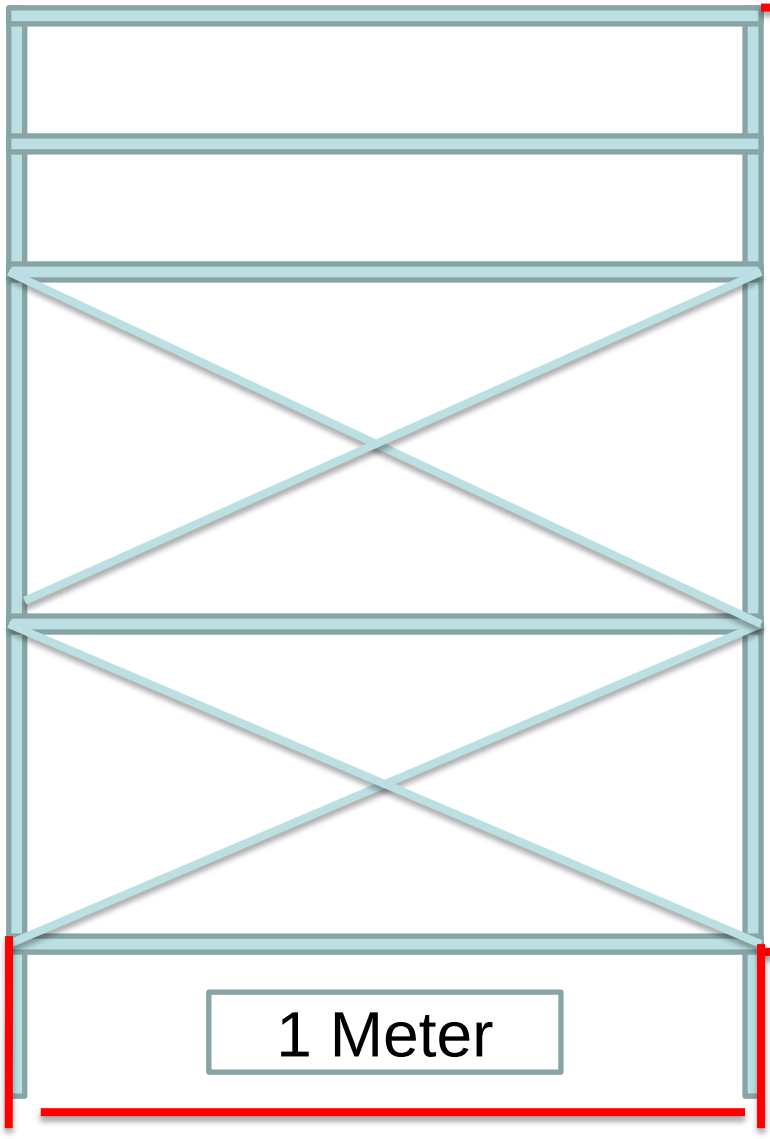

Inside Building

Stationary Internal independent Tower 10.8 Meter

Ratio : 1: 4

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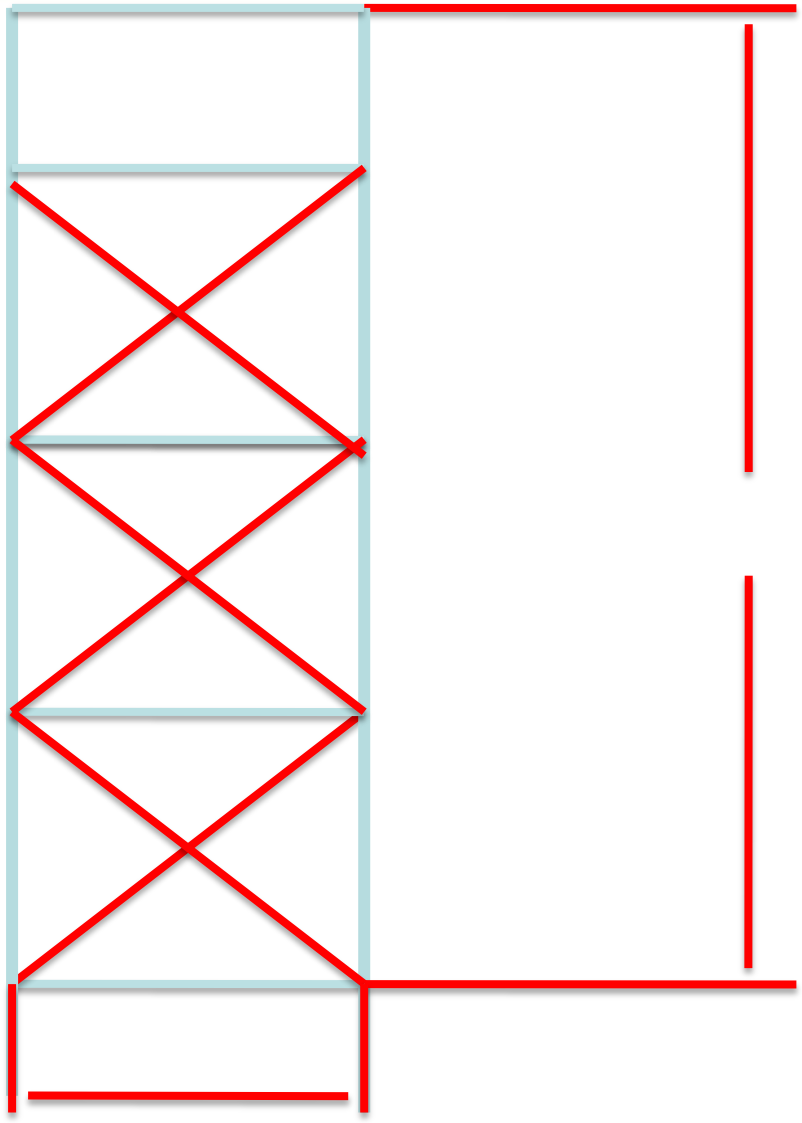

Outside Building

Stationary External independent Tower 9.45 Meter

Ratio : 1: 3.5

Tube and Fitting Scaffolding

- **Consists of 6 Parts:**

1. **Tubes:**
   - To make the framework of the scaffolding
2. **Couplings / Couplers**
   - To connect the tubes together
   - **Load bearing** and **non** load bearing
3. **Floor boards/ Scaffolding Boards**
   - Make the work-platform/sole-boards/toe board
4. **Foundation:**
   - A safe footing for the scaffolding
5. **Access** : Ladder / Staircase etc.
6. **Working Surface(s) / Working Platform**

- From which the workers will carry out their work

Fixed / Right Angle / Double Coupler

Component Weight : 1025 grams

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Scaffolding Components

- Swivel Couplers

Capacities of Components

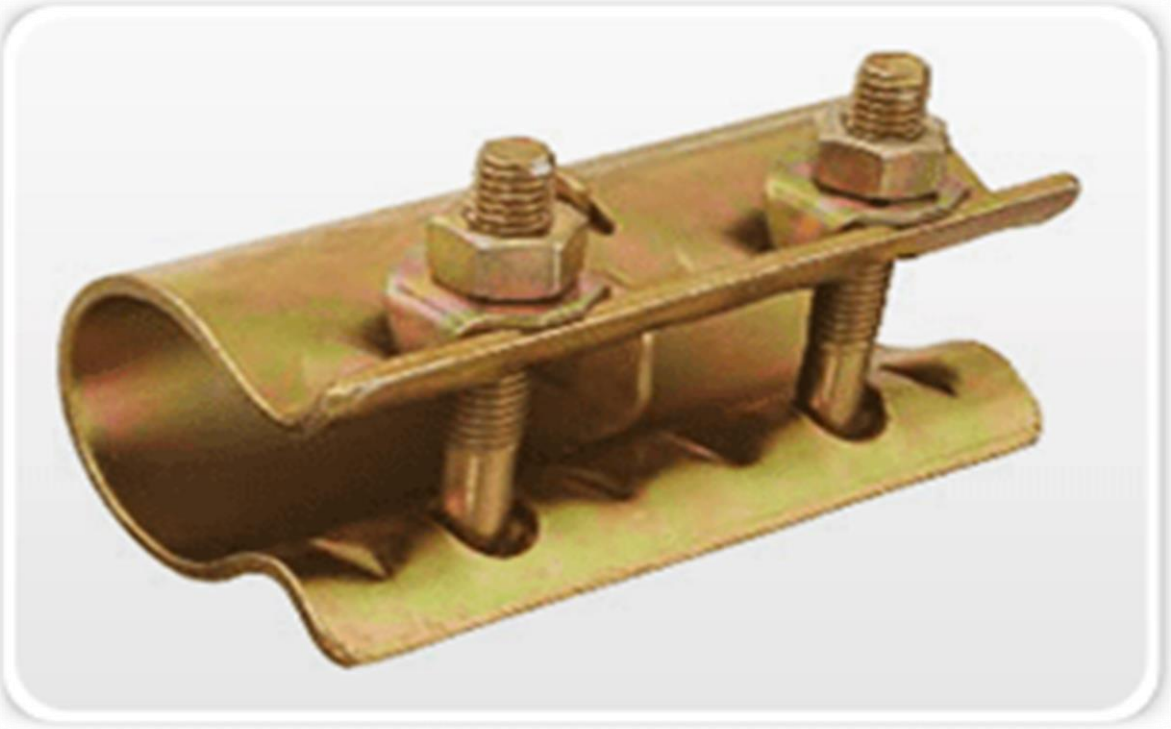
- MTDS
- MANUFACTURER TECHNICAL DATA SHEET
- MPDS
- Material Property Data Sheet
- References
- BS 1139 (Tubes)
- BS EN 74 (Couplers)
- BS 2482 (Scaffolding Boards)

BS 5973 1991

BS 1139	Type of fitting	Type of load	Class	Safe working load
Part 2:1982	Right angle coupler Double Coupler	Slip along a tube		6.3 kN or 630 Kg
Section 2.1:1991	Right angle coupler Double Coupler	Slip along a tube	B	9.4 kN or 940 Kg
Part 2:1982	Swivel coupler	Slip along a tube		6.3 kN or 630 Kg
Section 2.1:1991	Swivel coupler	Slip along a tube	A	5.3 kN or 530 Kg
Part 2:1982	Sleeve coupler	Tension		3.0 kN or 300 Kg
Section 2.1:1991	Sleeve coupler	Tension	A	1.5 kN or 150 Kg
Part 2:1982	Sleeve coupler	Bending		0.79 kN ma
Section 2.1:1991	Sleeve coupler	Bending	B	0.59 kN ma

Sleeve Coupler

- Used to connect two tubes in horizontal or vertical also making a fence or guardrails.
- Weight : 1150 Grams



Joint Pin Coupler

- Used to connect two tubes in horizontal or vertical also making a fence or guardrails.
- Weight : 900 Grams

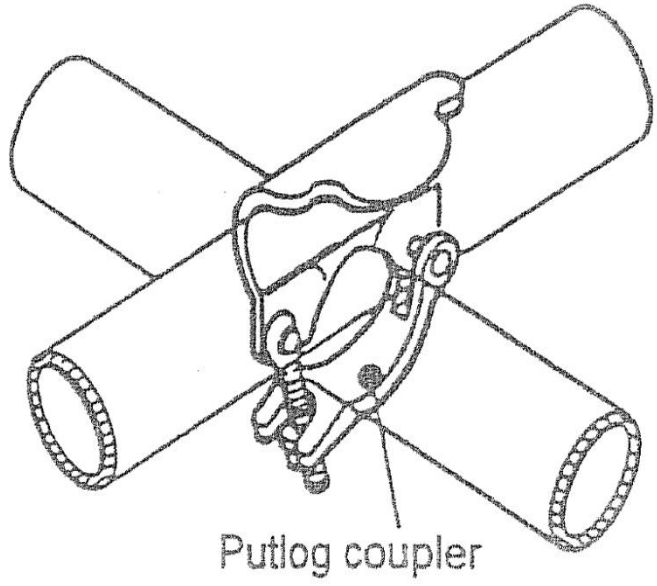
Putlog Coupler / Single

- Used to connect two Scaffold tubes at 90º
- Used to connect toe boards with standard (as shown in picture)
- Weight : 700 Grams

Toe boards Connected with standard

Putlog Coupler

- Used to connect intermediate transom to ledger at right angle



Ladder Clamp

- Used to connect ladder to the support tube in scaffolding

Scaffolding Couplings

- **Girder Coupler:**
- **For connecting scaffold tubes to “H” girders (RSJ’s)**
- **Units must fixed to girders in pairs**
- **Refer to manufacturers recommendations for loading**
- **SWL when used in pairs, is 1.25 tons**

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Gin Wheel

- Used to raise and lower components and materials to a scaffold structure
- SWL 100kg, or otherwise stamped on the frame,
- Secured in-place with two single couplers
- Use only approved ropes for hauling purposes

Board Retaining Coupler (BRC)

- Used to connect two Scaffold Boards with the Tubes
- Weight : 600 grams

Castor Wheel

- The diameter of the wheel of the castor shall be not less than 127 mm.
- The castor shall have a wheel brake.
- The Minimum resistance to vertical load of not less than 7.2 kN.

Scaffolding Tubes

Three main types of tubes are in common use.

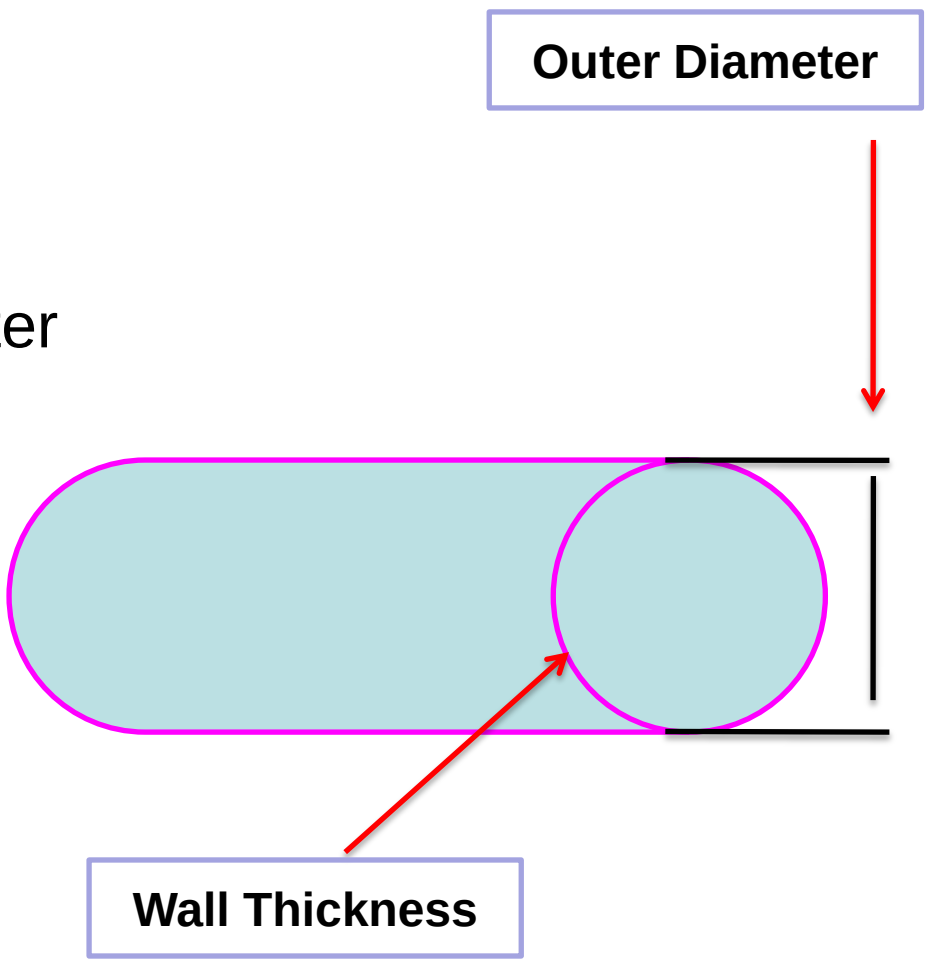
- Black steel tubes
- Galvanized steel tubes.
- Aluminum alloy tubes.

Note: All Tubes have same diameter

Outer diameter : 48.3 mm

Walls thickness : 4.0 mm

Weight : 4.4 kg / Meter.



Scaffolding Tubes

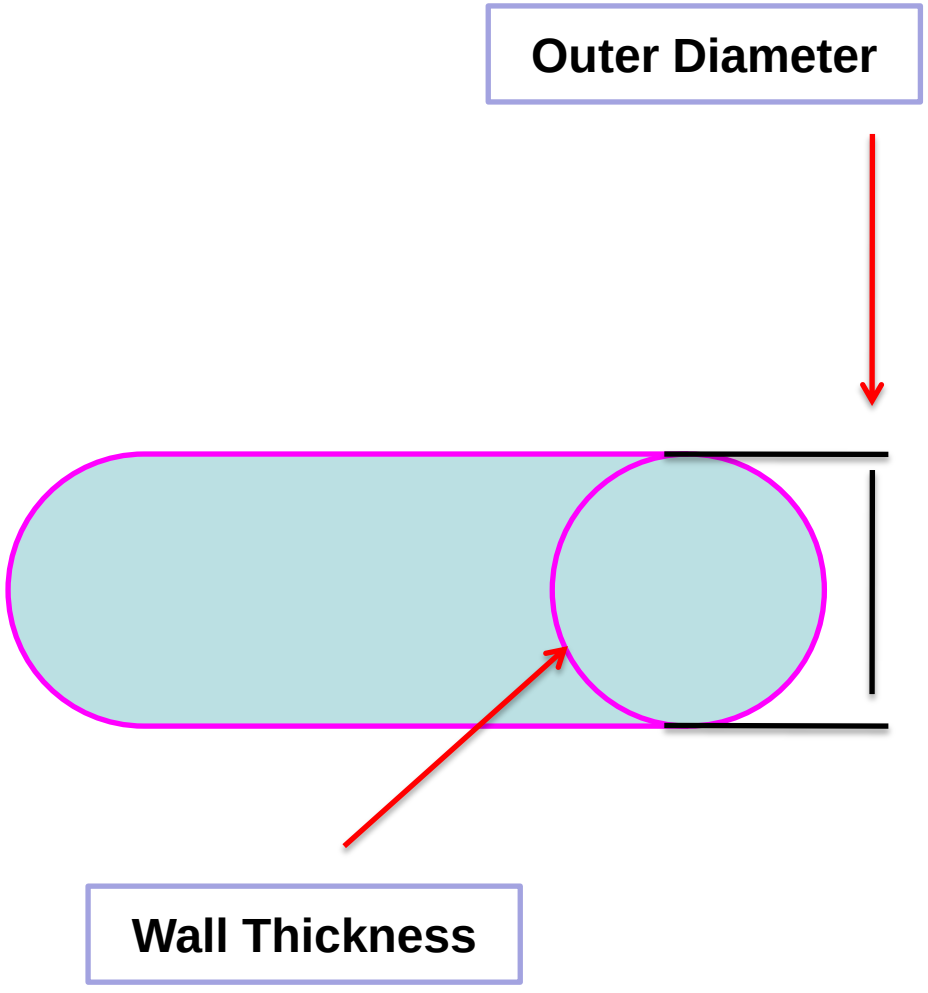
- Galvanized steel tubes.

Outer diameter : 48.3 mm

Walls thickness : 3.2 mm

Weight : 3.56 kg / Meter.

Reference : BS 6323



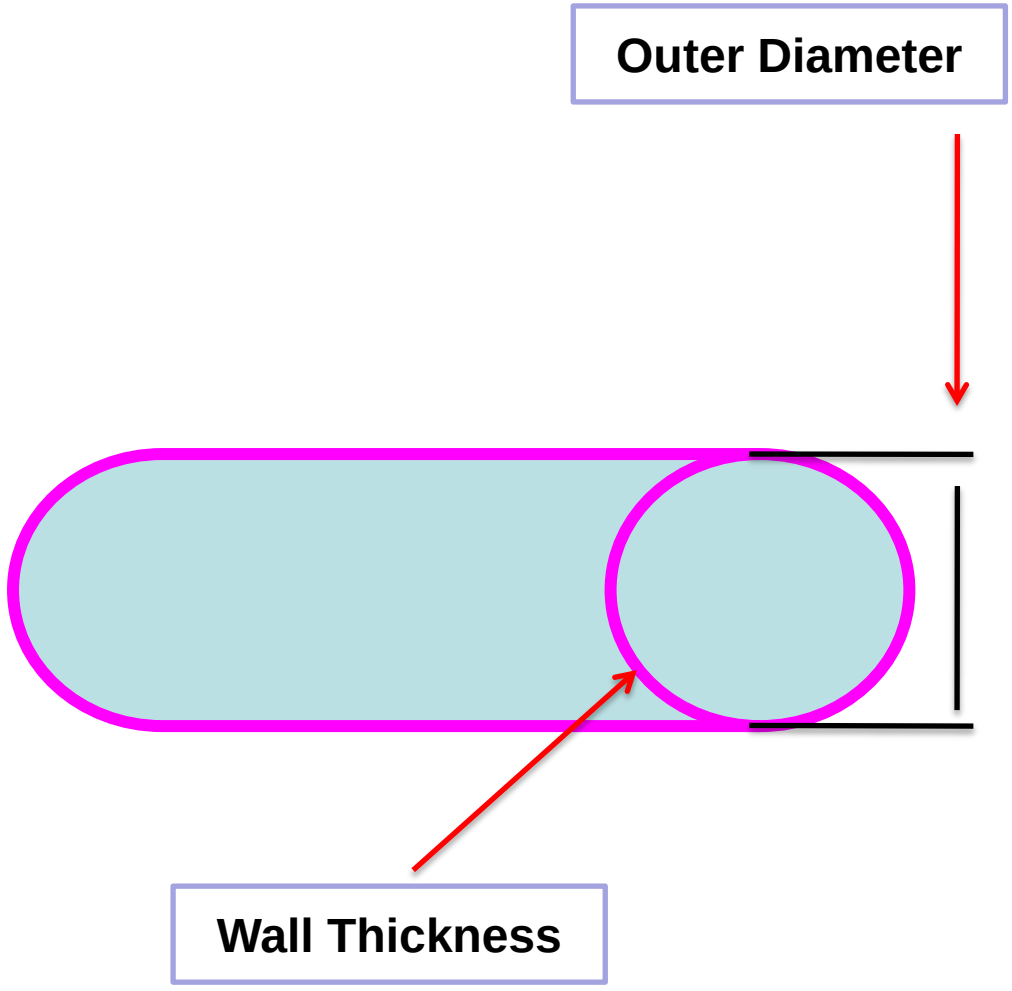
Scaffolding Tubes

- **Aluminum alloy tubes.**

Outer diameter : 48.3 mm

Walls thickness : 4.5 mm

Weight : 1.7 kg / Meter.



Scaffolding Components

Free from:

Splits

Scaffolding Components

Bad dents

Scaffolding Components

- Mushroomed head

Scaffolding Components

- Sharp Point/Edges

Scaffolding Components

- Excessive corrosion

Scaffolding Components (Boards)

- Usually the boards are made up of wood called “ TIMBER” that is why it is called “Timber Boards”

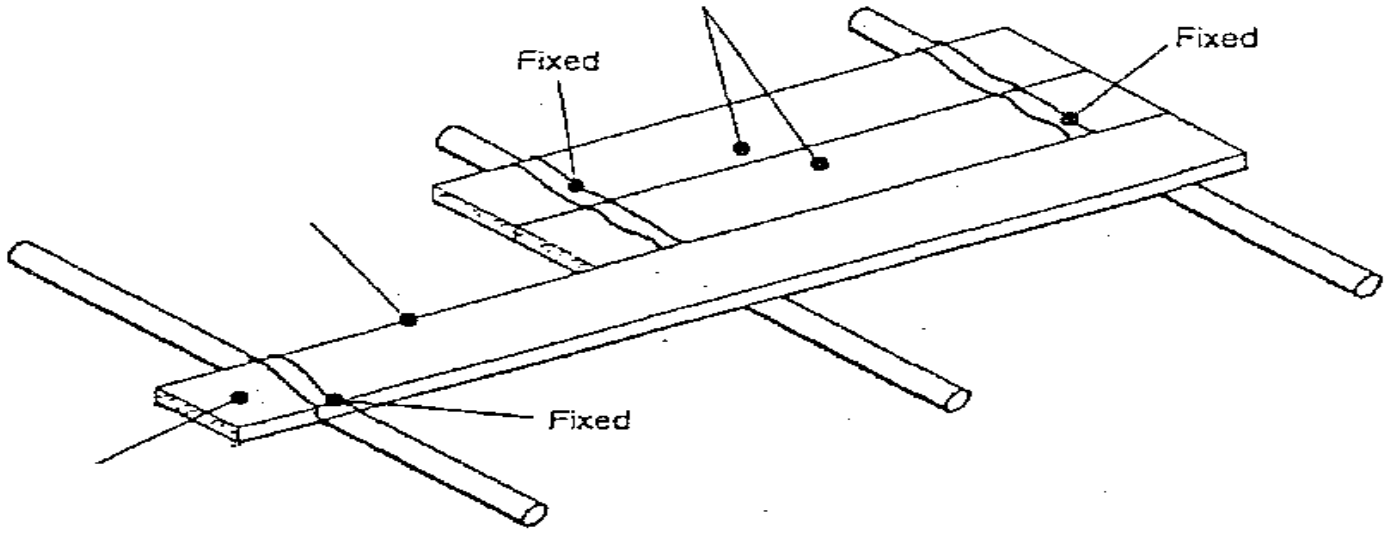
Length: 3.90 M

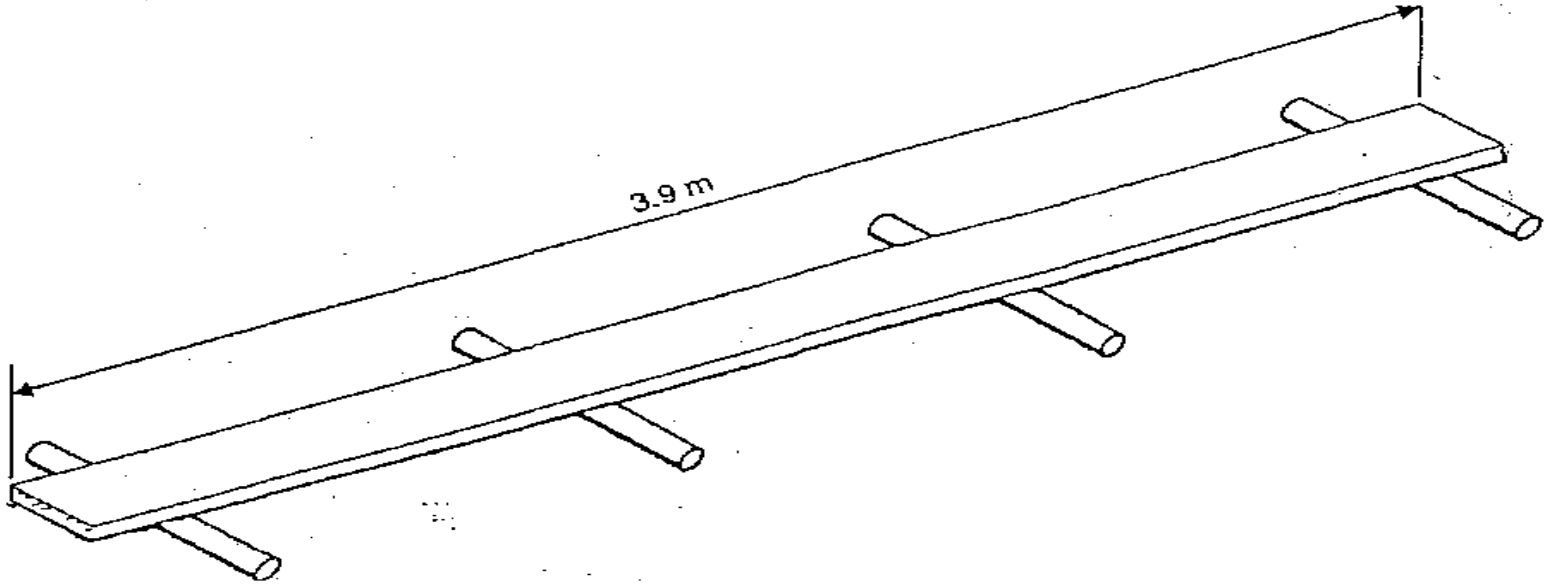
Width : 225 mm (22.5 Cm)

Thickness : 38 - 50 & 63mm

Note: Scaffolding Boards should Comply BS 2482 : 2009

Scaffolding Components (Boards)





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What is wrong here?

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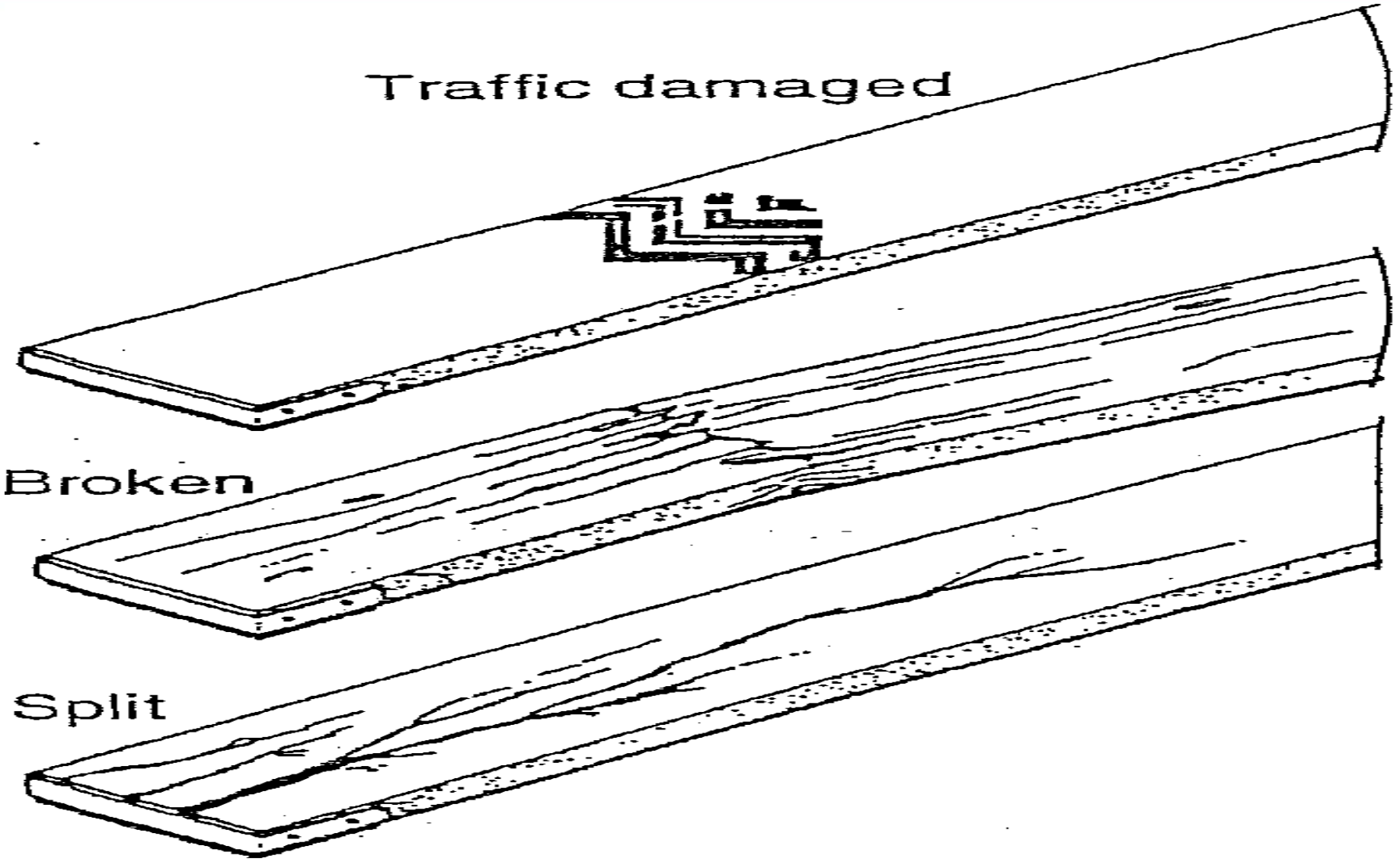
Common faults in Scaffolding boards



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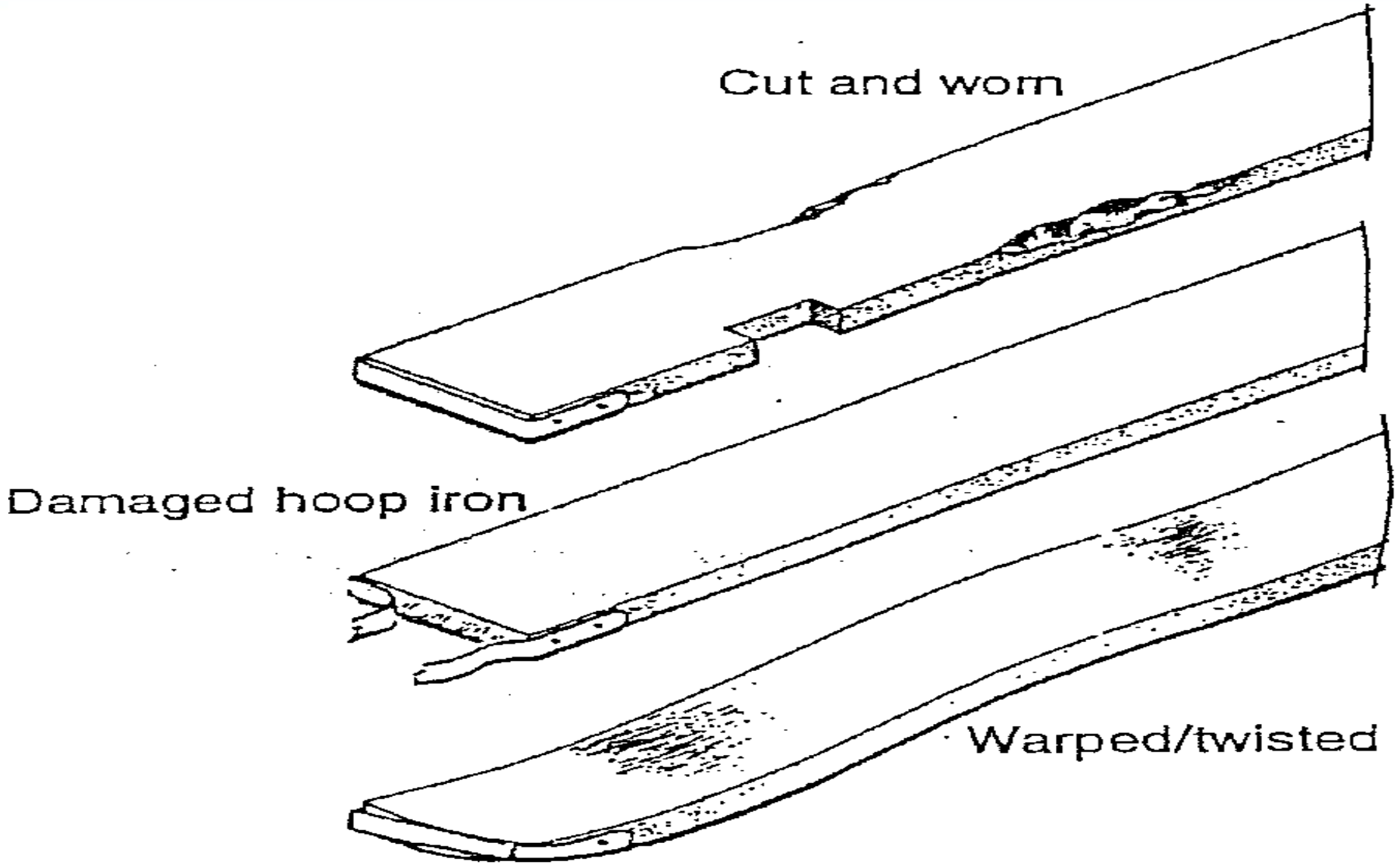
Common faults in Scaffolding boards



Common faults in Scaffolding boards

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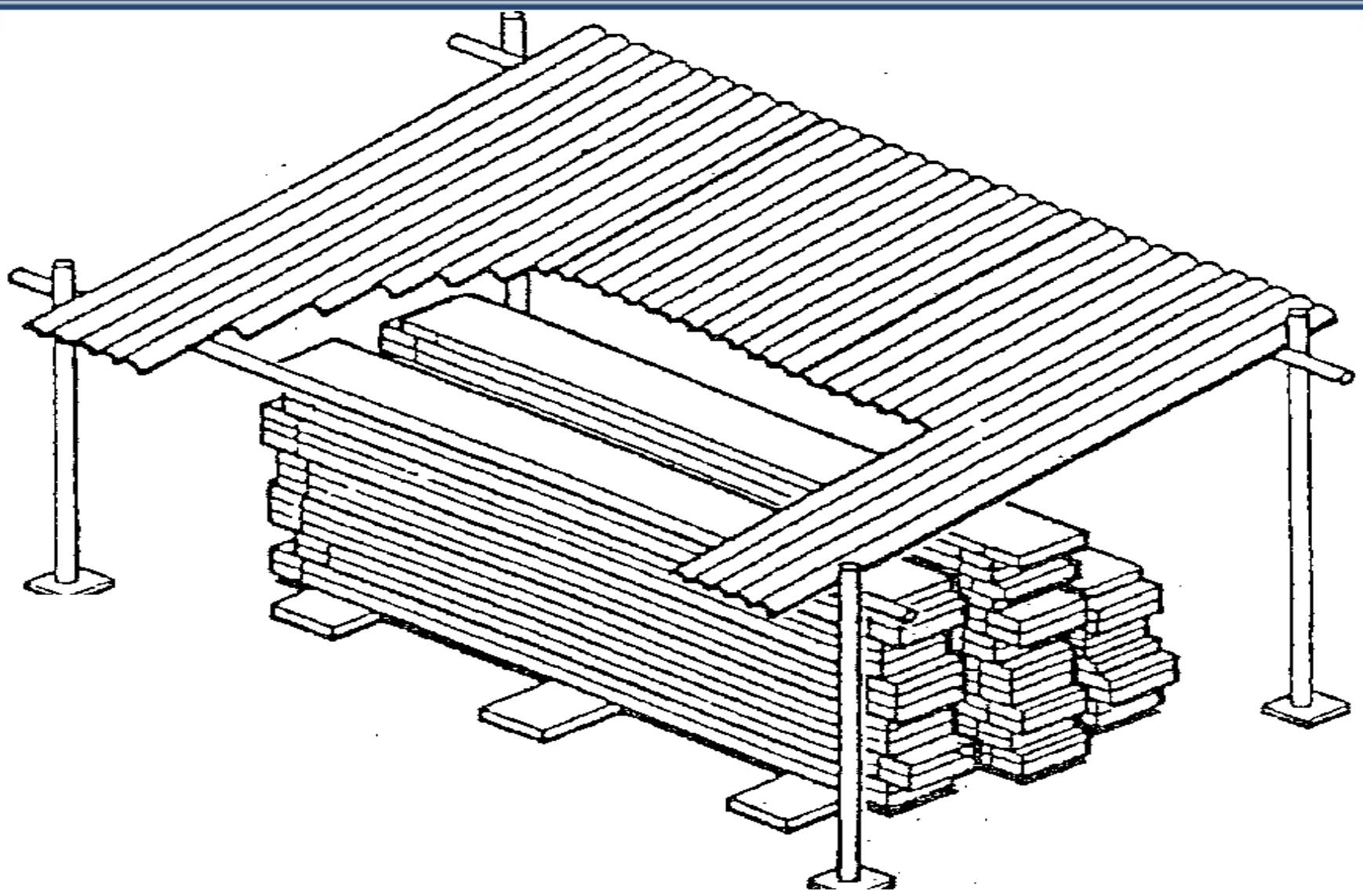
Storage of Scaffolding boards



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Scaffolding Sole Boards

What is Wrong here ?

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Sequence of Erection

Level the foundation

Sequence of Erection

Base Jack

Sole Board

Base Plate

Sequence of Erection

Shank

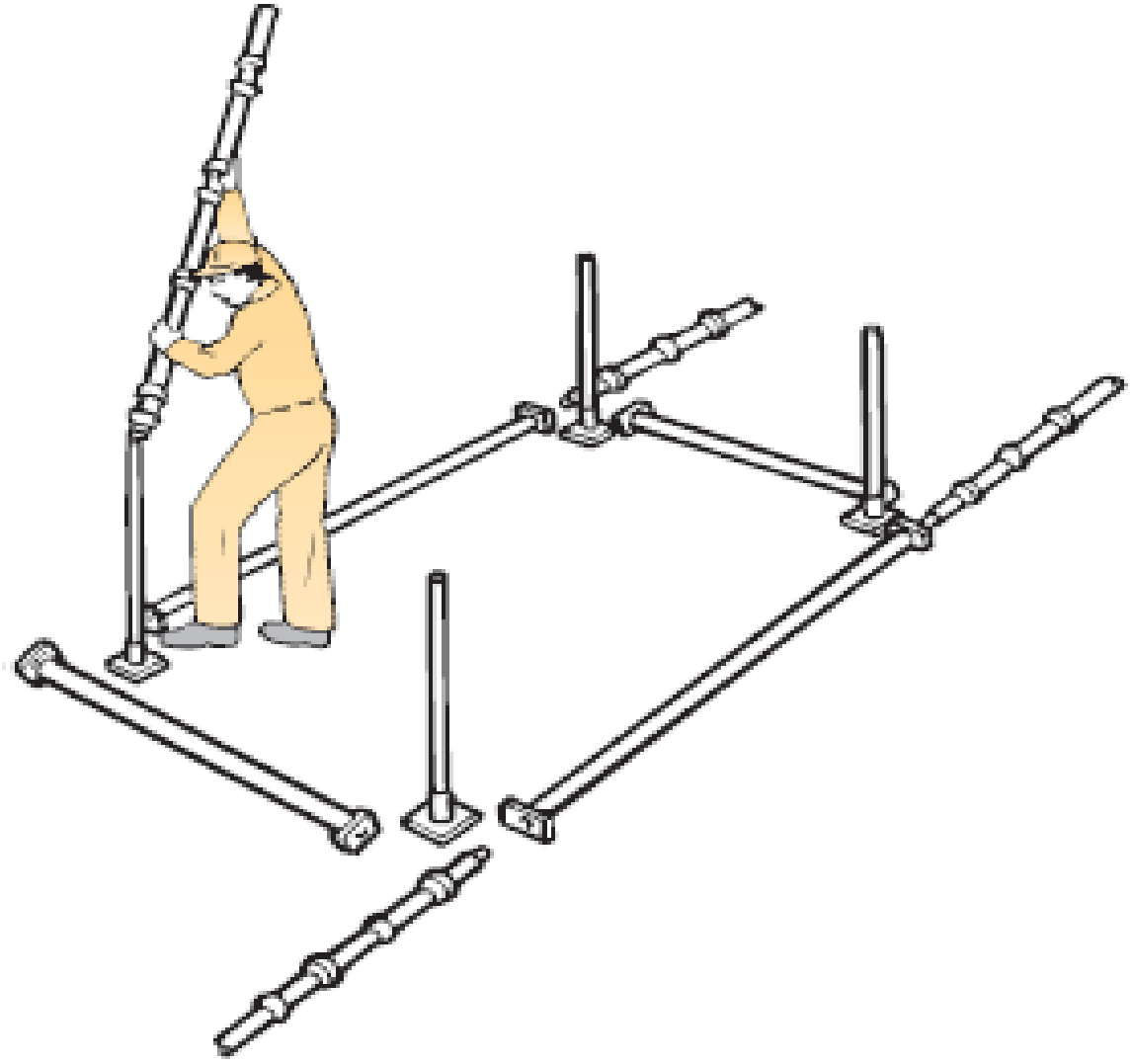
Base Jack

Sequence of Erection

Scaffolding Standards

- Carry the entire weight of the scaffold, and should be very carefully spaced
- This dimension should be measured and maintained, in accordance with the requirements of the design
- Subject to a maximum total deviation of 50mm

Sequence of Erection



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Sequence of Erection

Ledger

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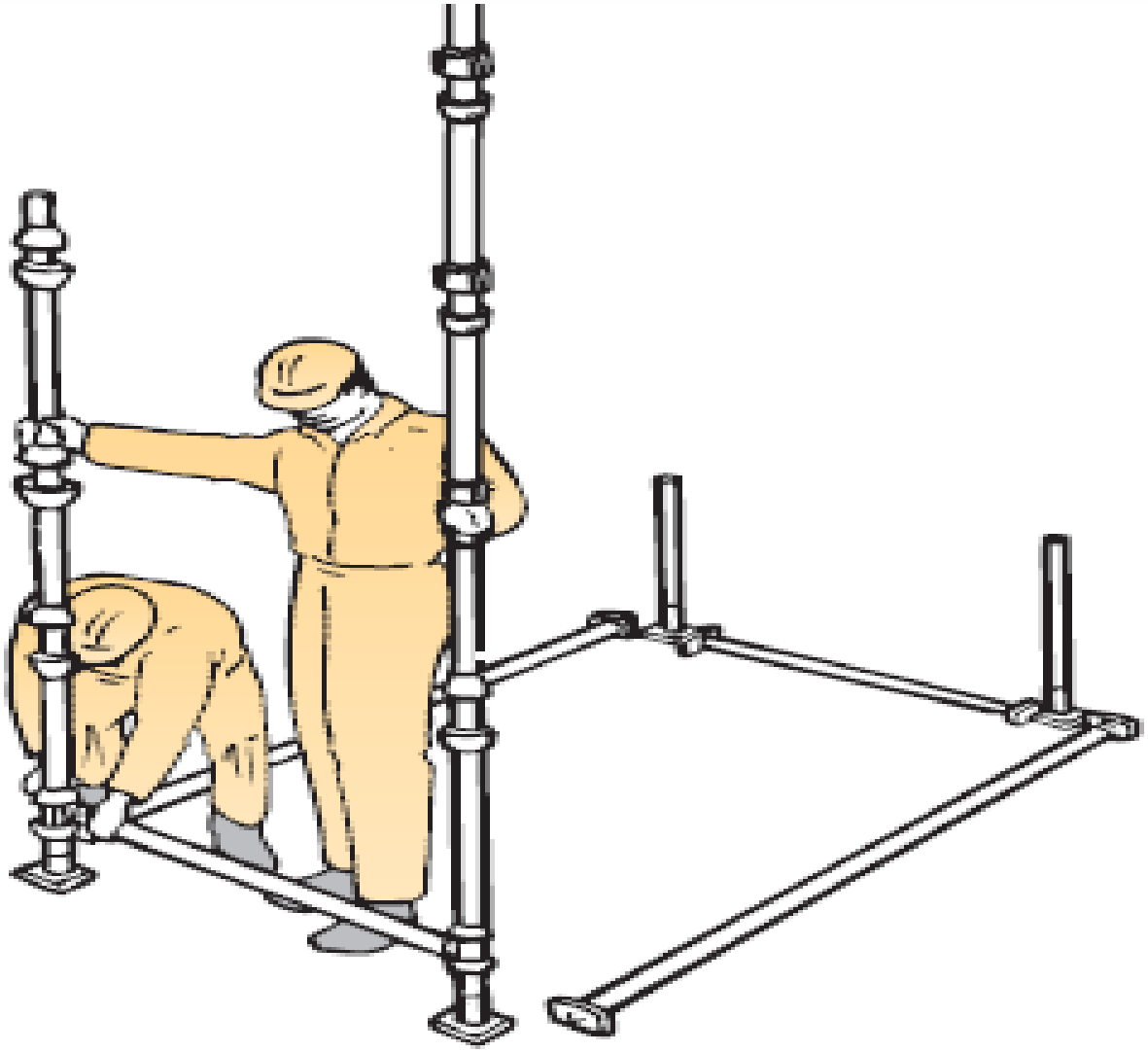
Sequence of Erection



Sequence of Erection

Main transom should be installed above the ledger.

Sequence of Erection

Putting the main transom on fixed one, for correct matching

Sequence of Erection

- Foot Tie
- Kicker Lift
- Height:
- 15 to 20 Cm
- Nod Point

Sequence of Erection

Fix the ledger over earlier fixed to match the correct position

Making Square

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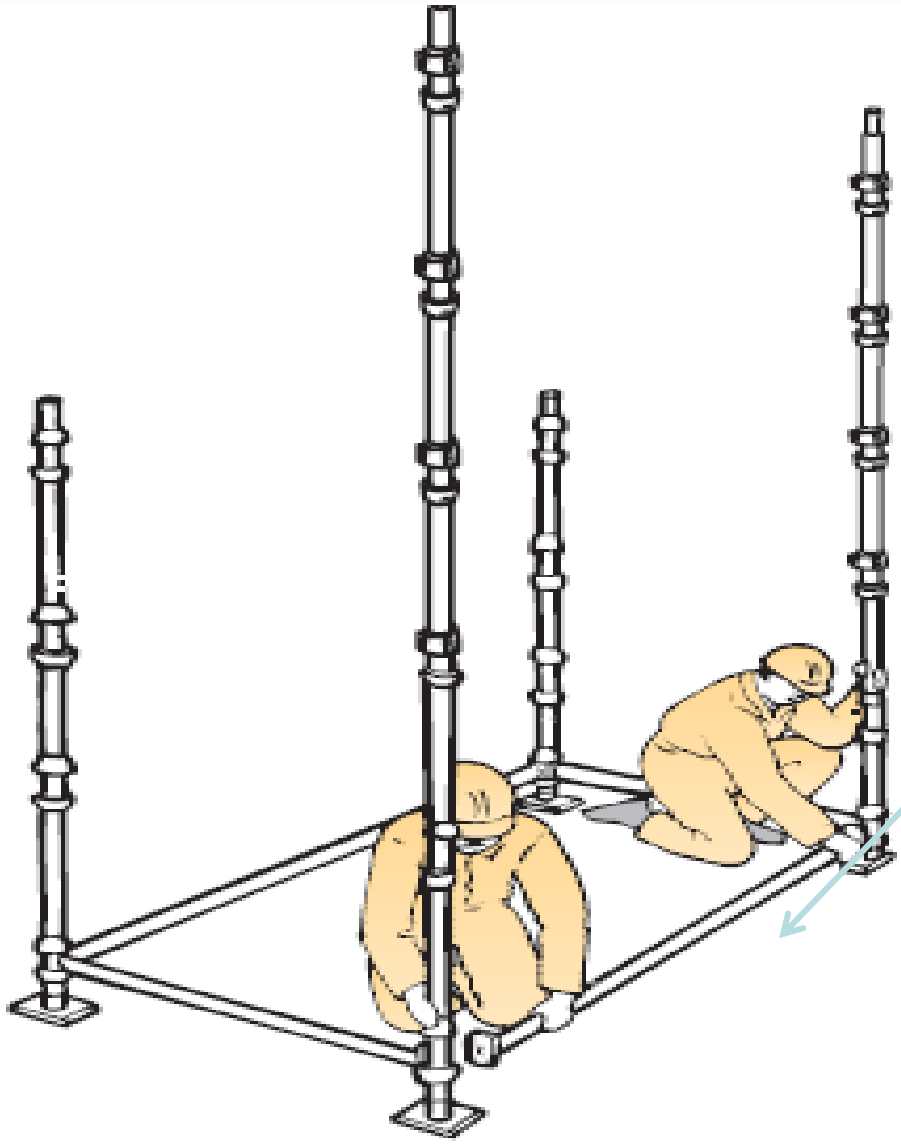
Sequence of Erection



Kicker Lift

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Sequence of Erection

Maintain the foot tie height

Sequence of Erection

- Check the level at foot tie

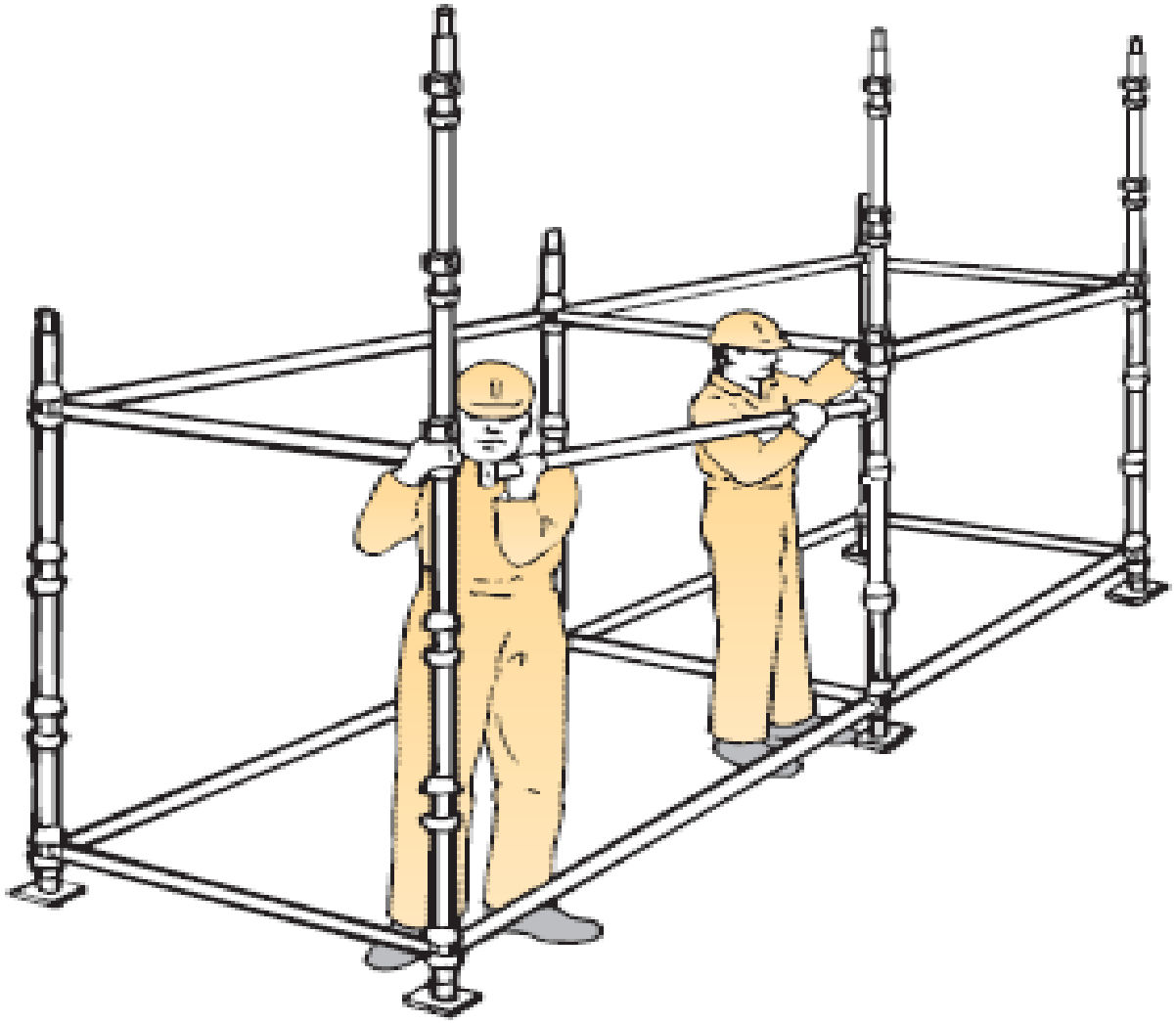
Sequence of Erection

Check the level at corners (Tube & Cup lock System)

Sequence of Erection

Check if the standard if it is straight at 90 Degree angle

Sequence of Erection



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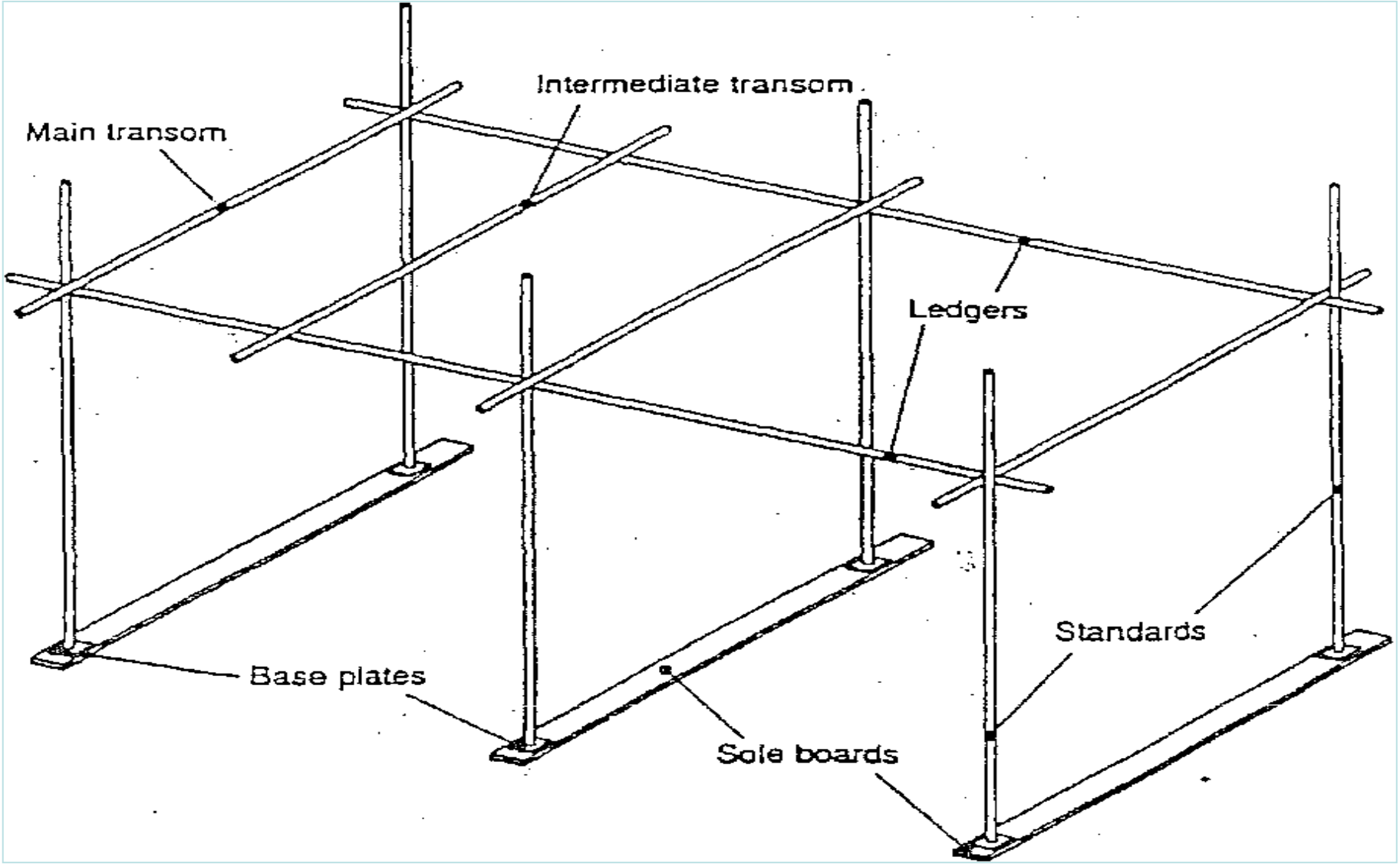
Sequence of Erection

Alignment of Standards

Basic Definitions of Scaffold Components



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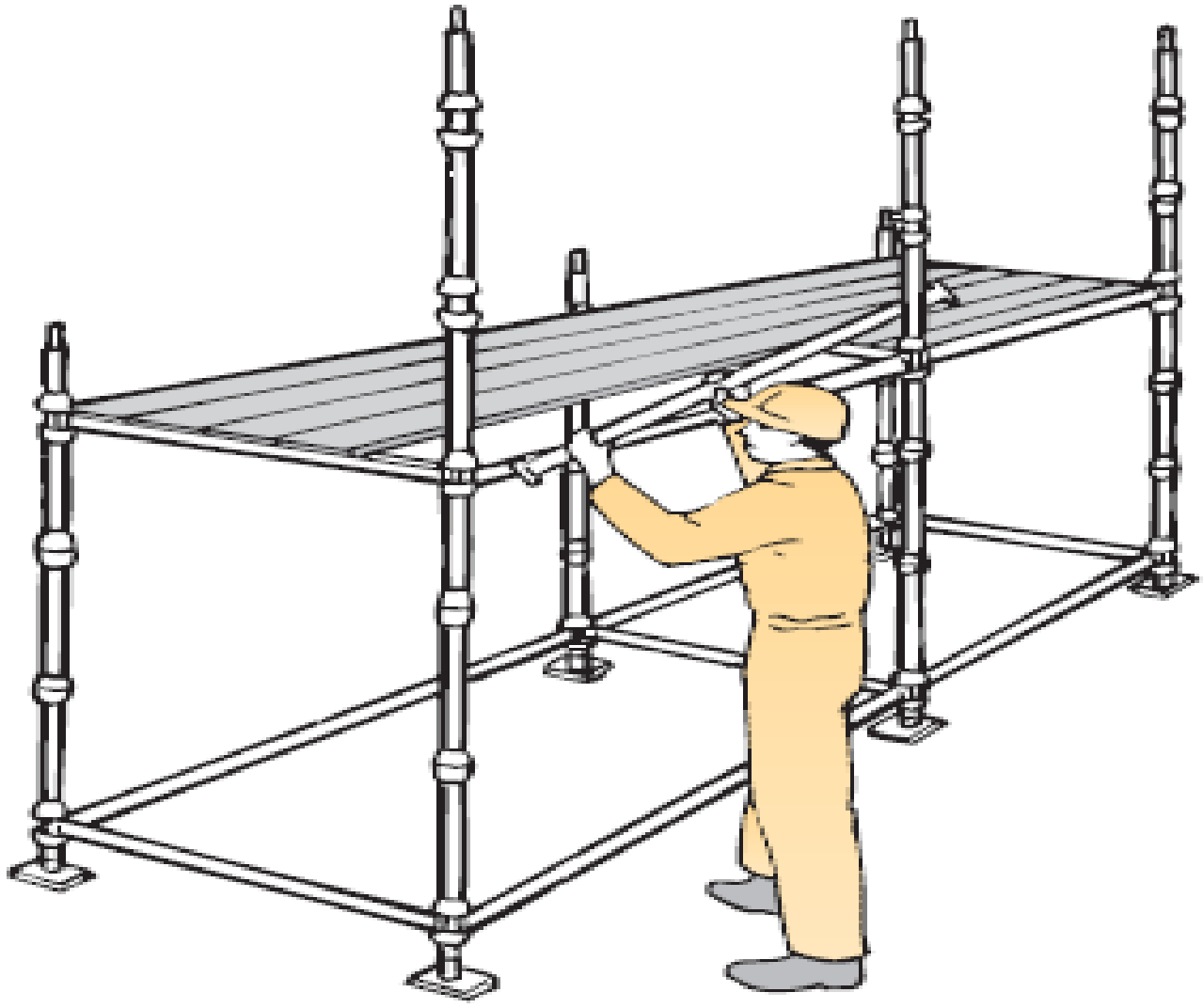
Sequence of Erection



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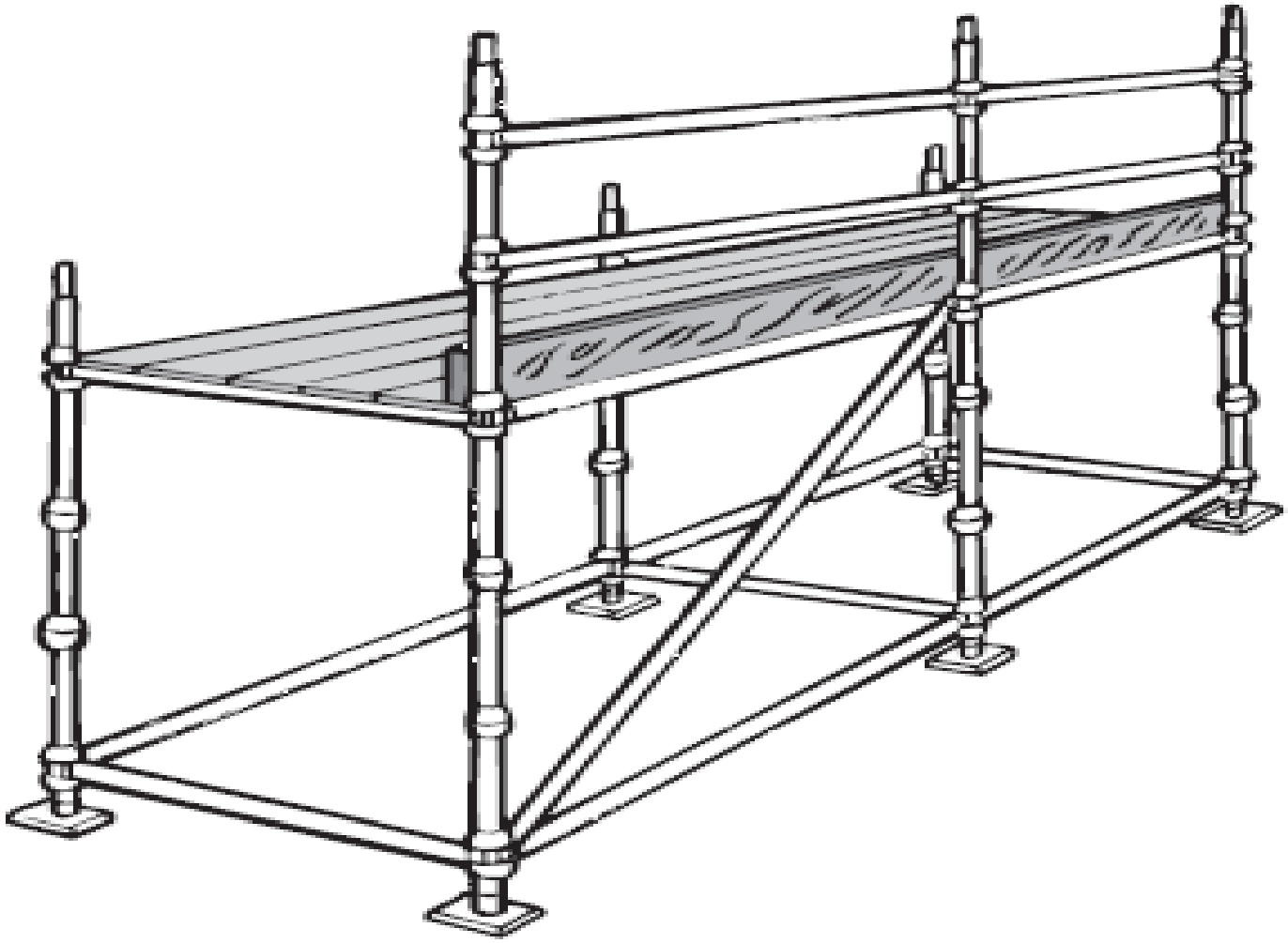
Sequence of Erection



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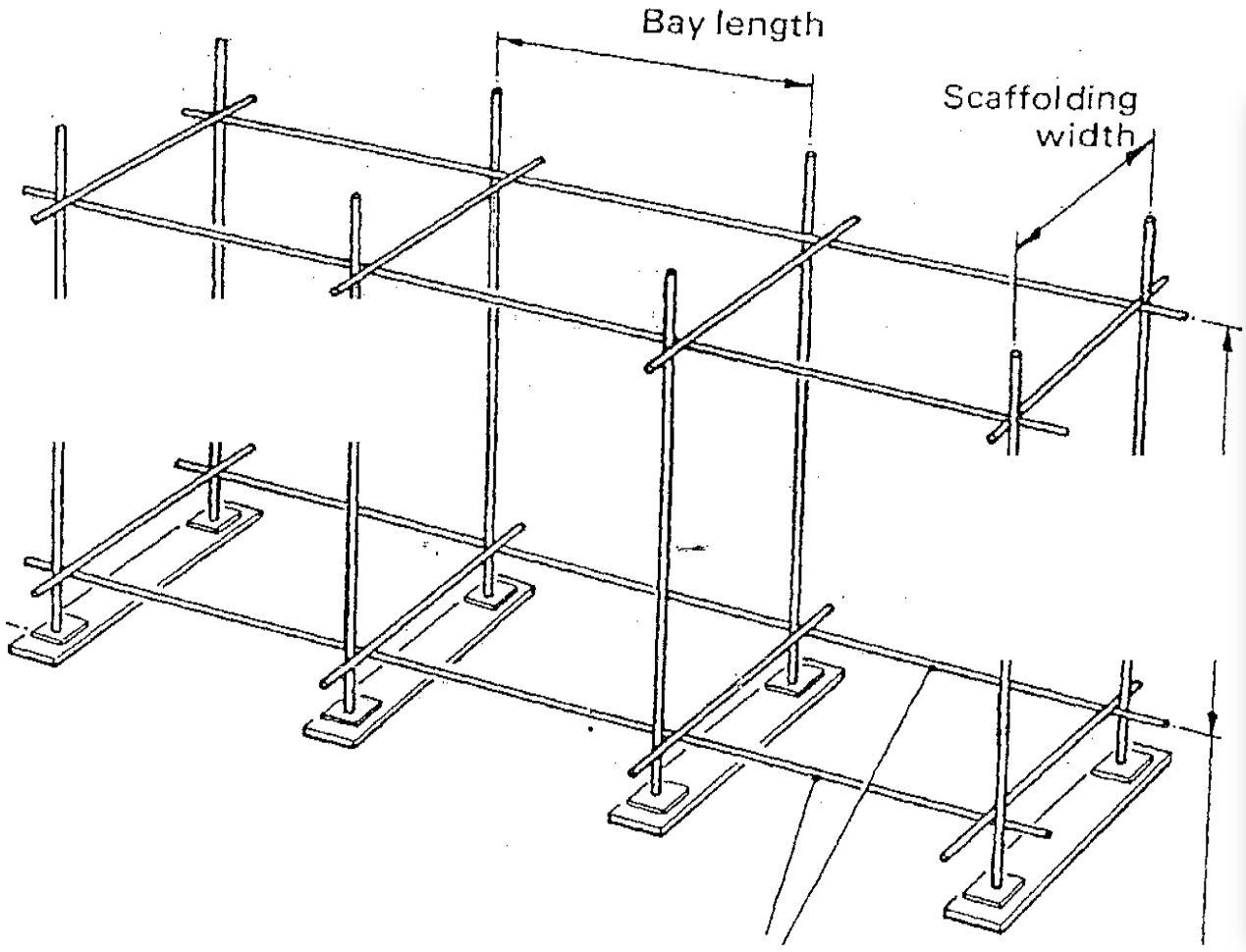
Basic Definitions of Scaffold Component



Foot tie or Kicker lift

lift height or or ledger spacing

Duty	Use of platform	Distributed load on platforms *KN / m^2*	Maximum Number of platforms	Commonly used widths using 225 m boards	Max. bay length m
Inspection and very light duty	Inspection, painting, stone cleaning, light cleaning, cleaning and access	0.75	1 working platform	3 boards	2.7
Light duty	Plastering, painting, stone cleaning, glazing and pointing	1.50	2 working platforms	4 boards	2.4
General purposes	General building work including brickwork, window and mullion fixing, rendering, plastering	2.00	2 working platforms + 1 at very light duty	5 boards or 4 boards + 1 inside	2.1
Heavy duty	Block work, brickwork, heavy cladding	2.50	2 working platforms + 1 at very light duty	5 boards or 5 boards + 1 inside or 4 boards + 1 inside	2.0
Masonry or special duty	Masonry work, concrete block work, and very heavy cladding	3.00	1 working platforms + 1 at very light. duty	6 to 8 boards	1.8

Distance between the foot tie and first lift should be 2M.

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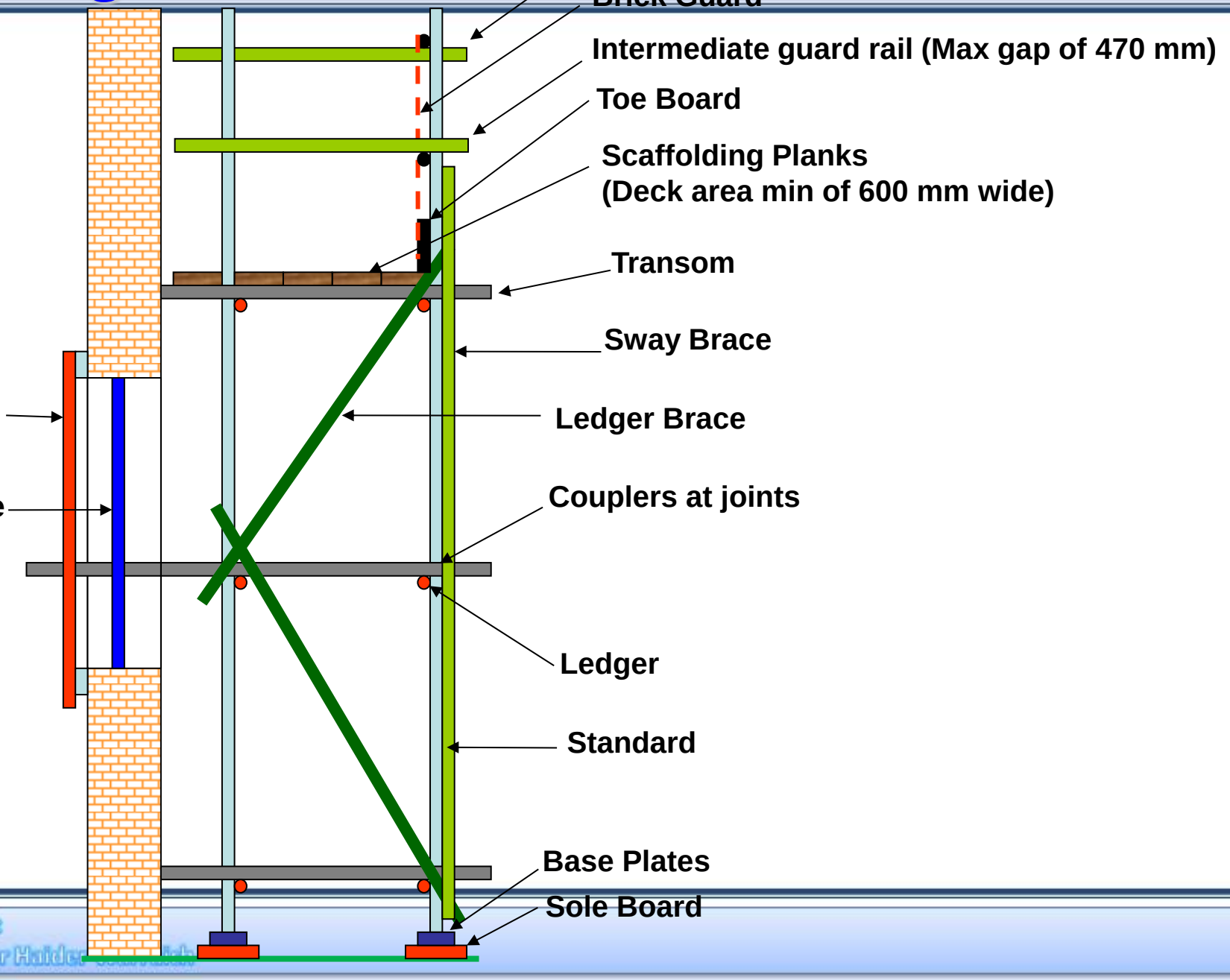
PREVENTING UNATHORIZED ACCESS

- *If the scaffold is incomplete use warning notice.*

Scaffolding Ties



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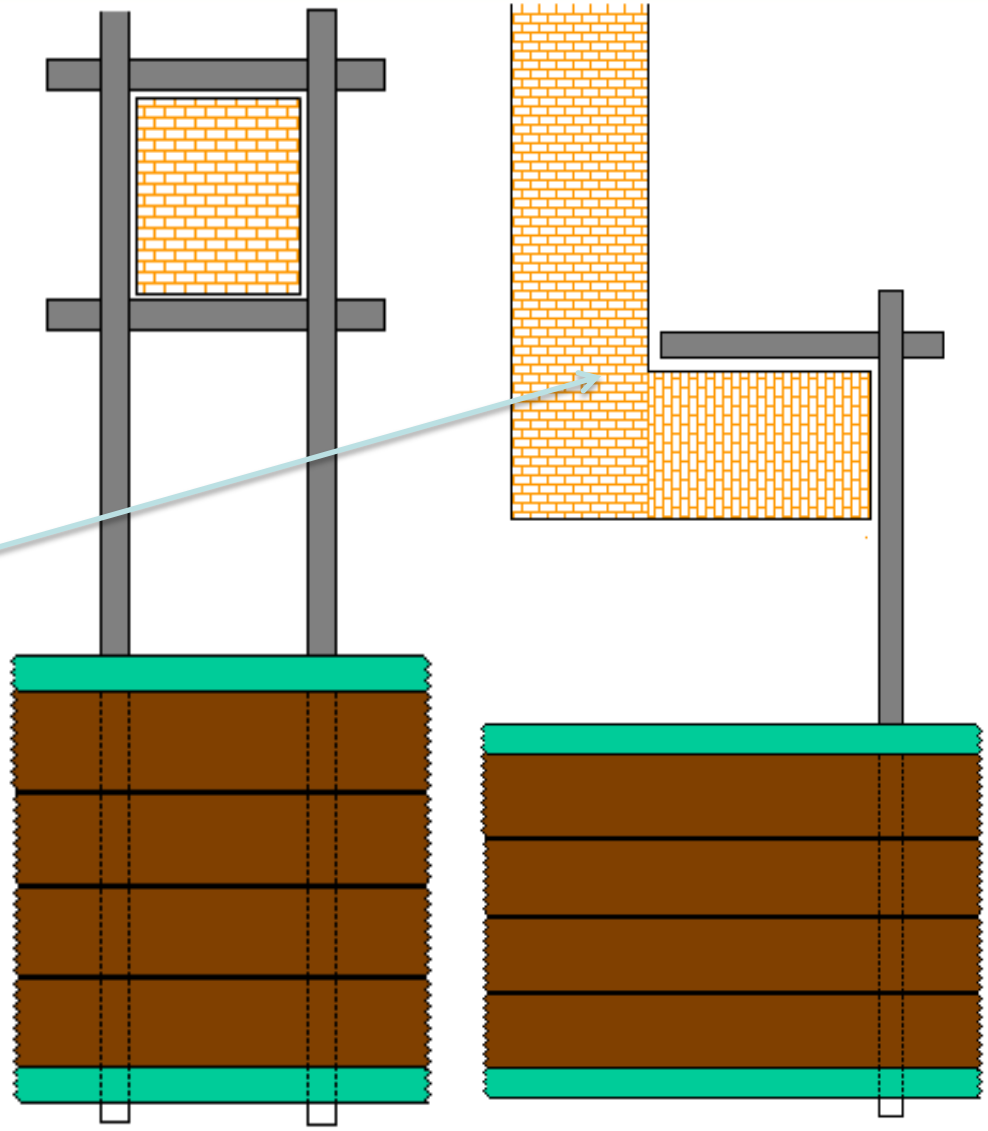
Scaffolding Ties Cont.

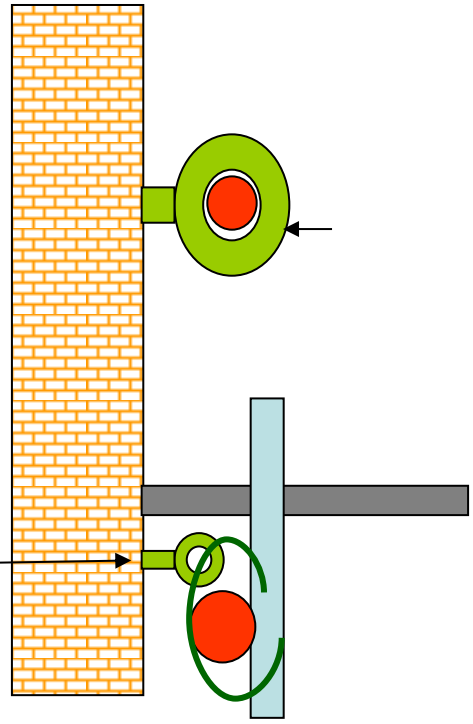
- Box Tie:
- Around a pillar/column etc.
  - Strength is125kg, inwards and outwards
- Lip Tie:
- Around a Lip
- Strength is 62.5kg, inwards and outwards



Scaffolding Ties Cont.

- Proprietary Tie Bolt, or Ring/ Hilti Tie
- May be of two sizes:
- Rings between 50-55mm internal diameter, through which scaffold tubes are passed
- Smaller rings, for use with wire or steel banding ties

Large Eye Bolt



Eye Bolt and Strap

Scaffolding Bracing

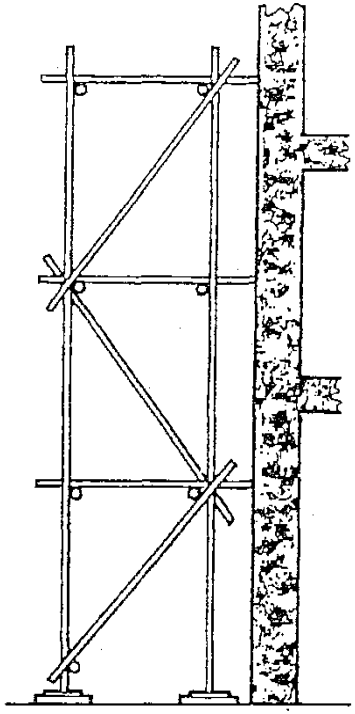
- Sway Brace:
  - A diagonal tube
    - Tied-off on the vertical or horizontal members
    - From left to right and right to left and so on
    - Fit a guard rail on the bottom lift's

Risk Assessment

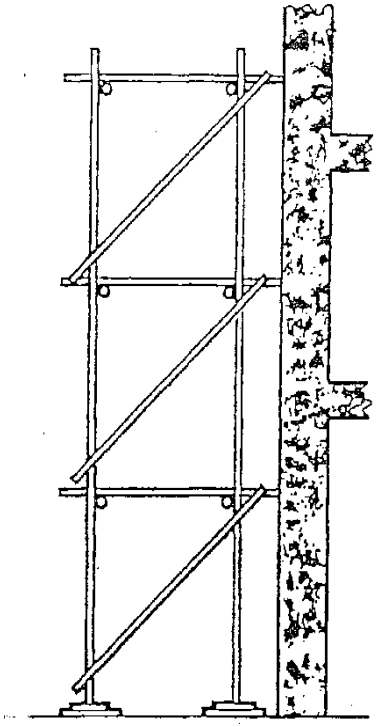
Hazards Identification

- Structure Collapse
- Personal Falls
- Object Falling / Material Falling
- Electrocution
- Struck by
- Fire Broke out (Cutting Welding / Planks with Grease, Oil etc)

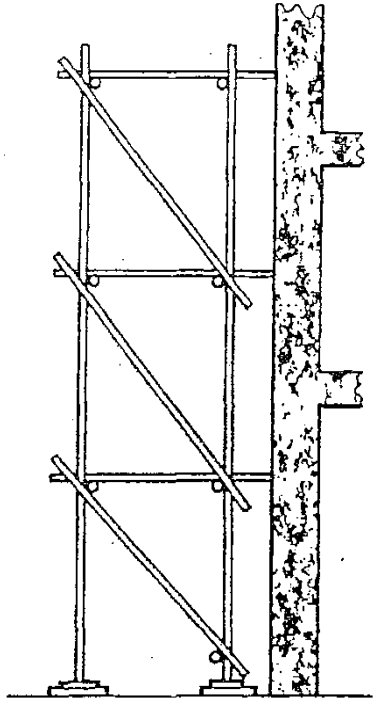
Scaffolding Bracing Systems



Dog leg or zig-Zag bracing

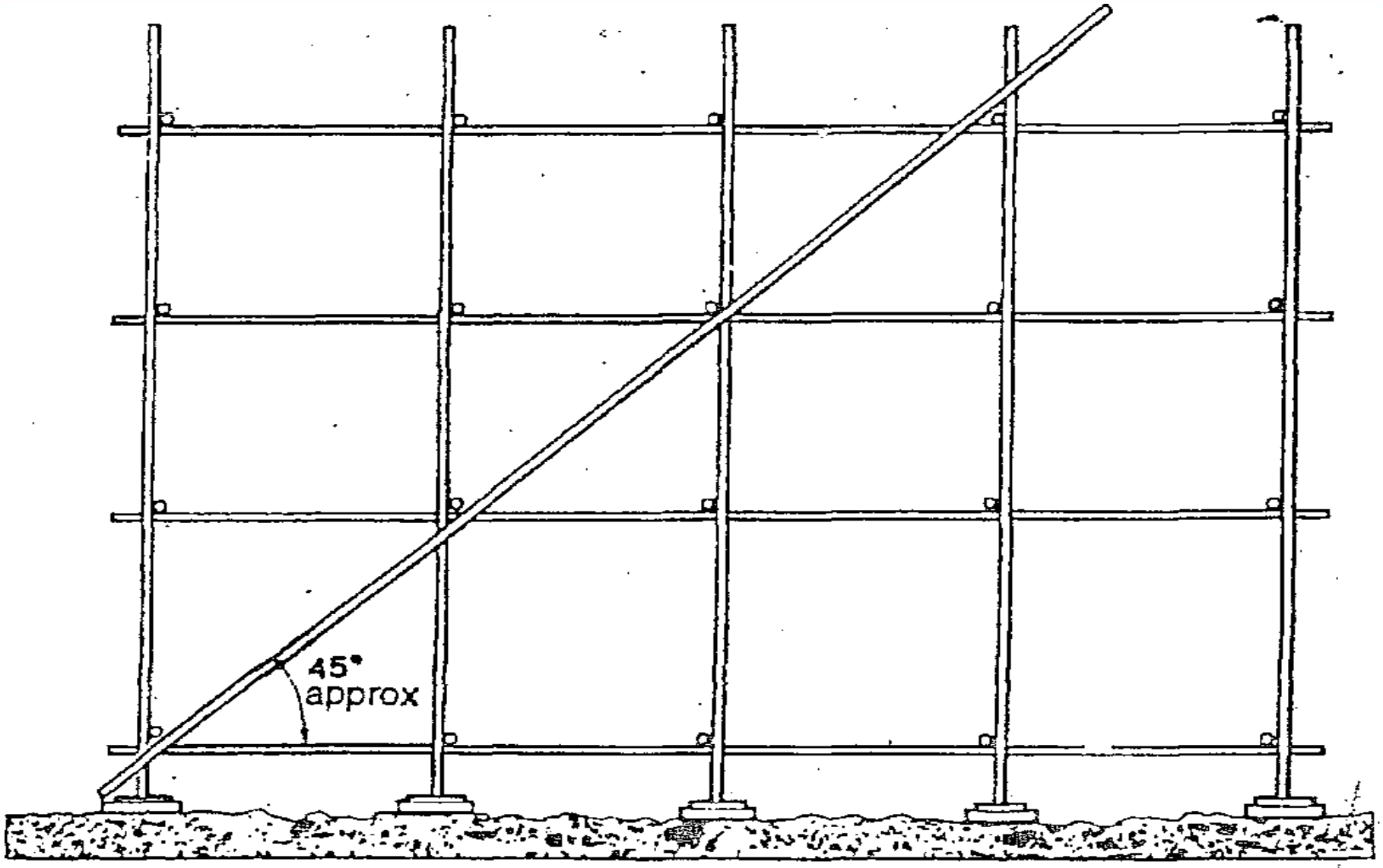


Cross braces fixed with swivel couplers to the standards



Alternative Method

Scaffolding Bracing Systems



HSE Project Leade:
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Sway Brace / Facade Brace

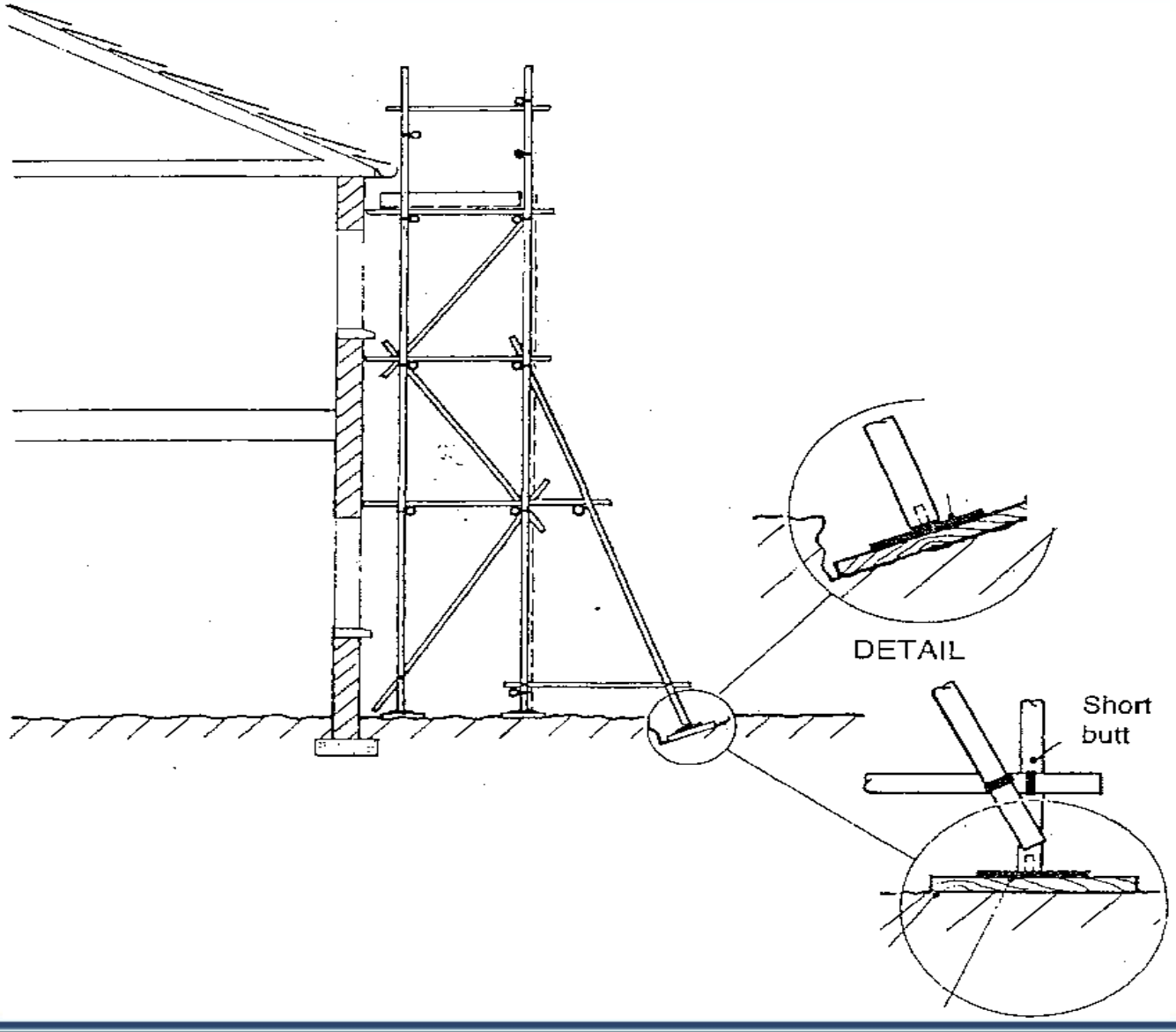
Knee Brace / Section Brace / Spur

1. Knee Brace
2. Section Brace
3. Spur

Scaffolding Bracing Systems

Plane Brace

Raker System



HSE Project Leade:
Chaudhry Zulfiqar Haider Warraich

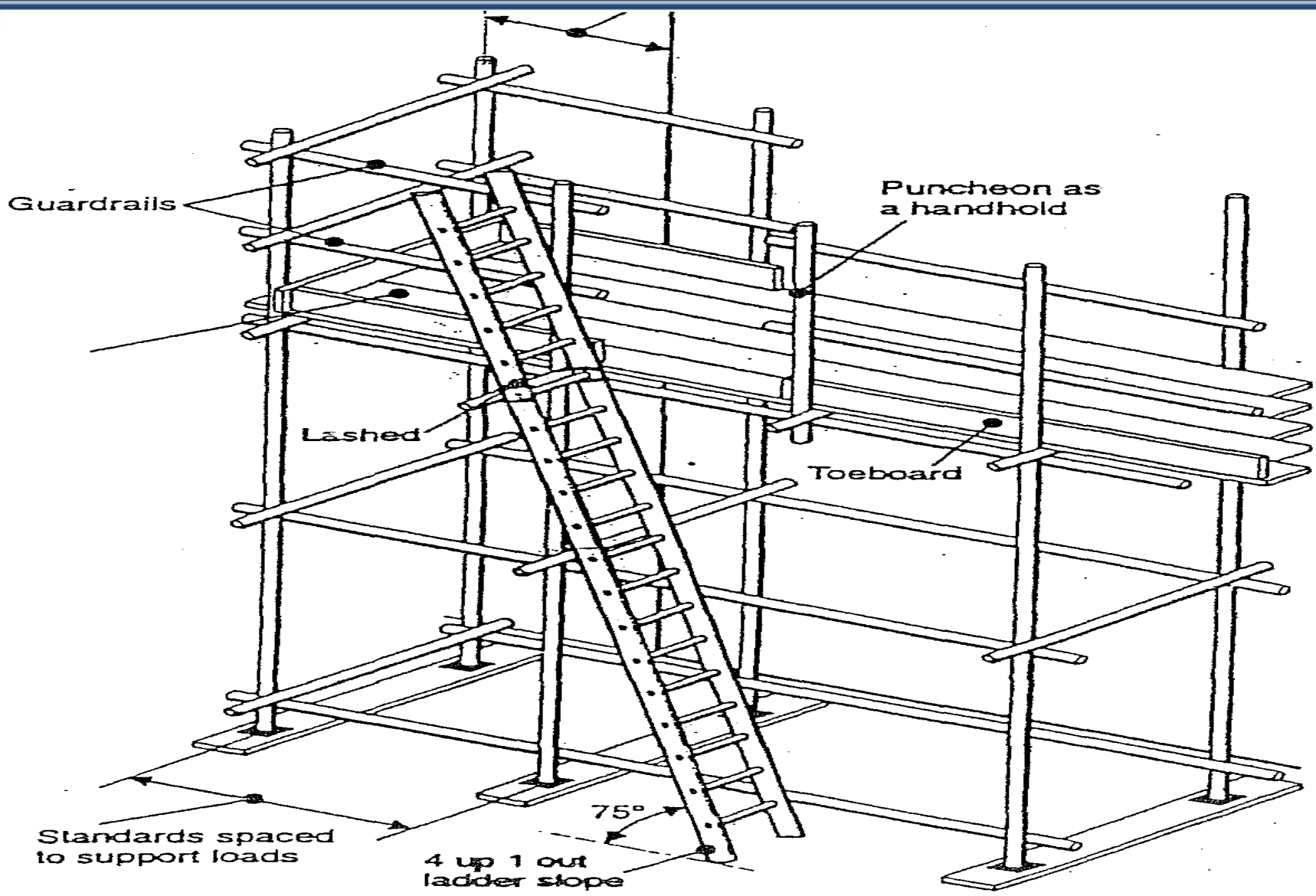
Proper Installation of Raker

HSE Project Lead:
Chaudhry Zulfiqar Haider Warraich

Installation of Raker

HSE Project Lead:
Chaudhry Zulfiqar Haider Warraich

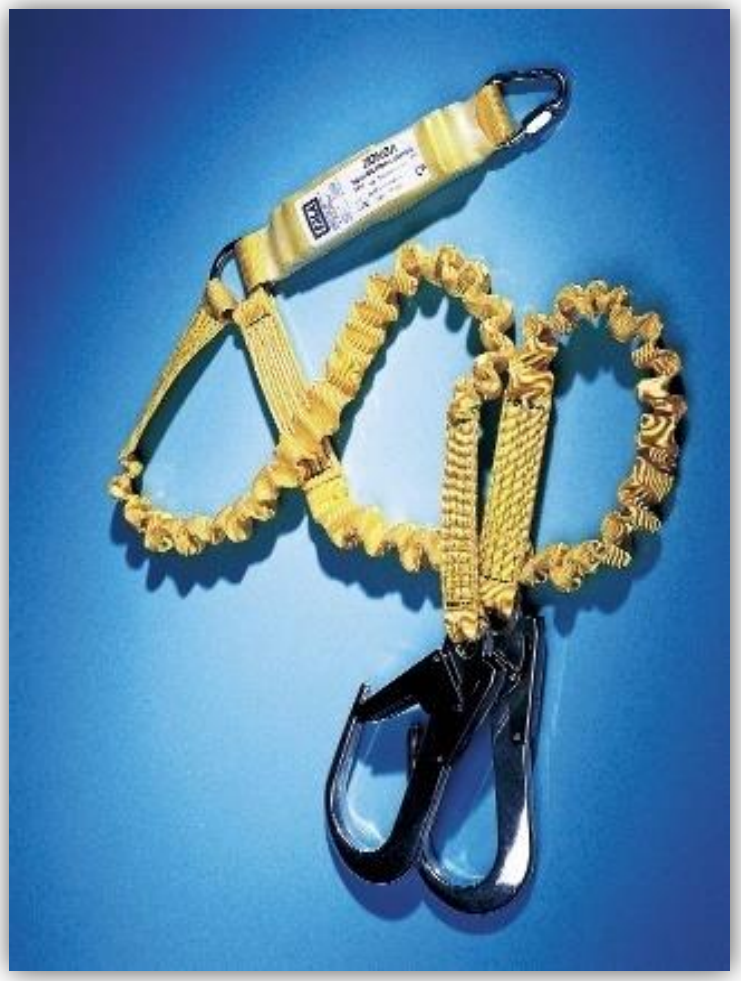
WORKING PLATFORM



Duty	Use of platform	Distributed load on platforms *KN / m^2*	Maximum Number of platforms	Commonly used widths using 225 m boards	Max. bay length m
Inspection and very light duty	Inspection, painting, stone cleaning, light cleaning, cleaning and access	0.75	1 working platform	3 boards	2.7
Light duty	Plastering, painting, stone cleaning, glazing and pointing	1.50	2 working platforms	4 boards	2.4
General purposes	General building work including brickwork, window and mullion fixing, rendering, plastering	2.00	2 working platforms + 1 at very light duty	5 boards or 4 boards + 1 inside	2.1
Heavy duty	Block work, brickwork, heavy cladding	2.50	2 working platforms + 1 at very light duty	5 boards or 5 boards + 1 inside or 4 boards + 1 inside	2.0
Masonry or special duty	Masonry work, concrete block work, and very heavy cladding	3.00	1 working platforms + 1 at very light. duty	6 to 8 boards	1.8

HSE Warning

Twin-tailed energy absorbing lanyards specifically comprise two lanyards that are attached to a single energy absorber in such a way that either lanyard can transmit a load to the energy absorber.

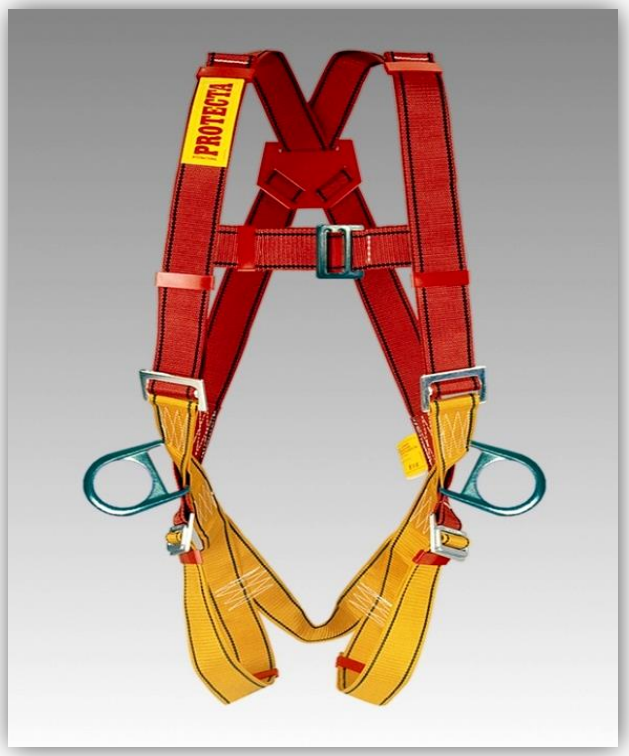


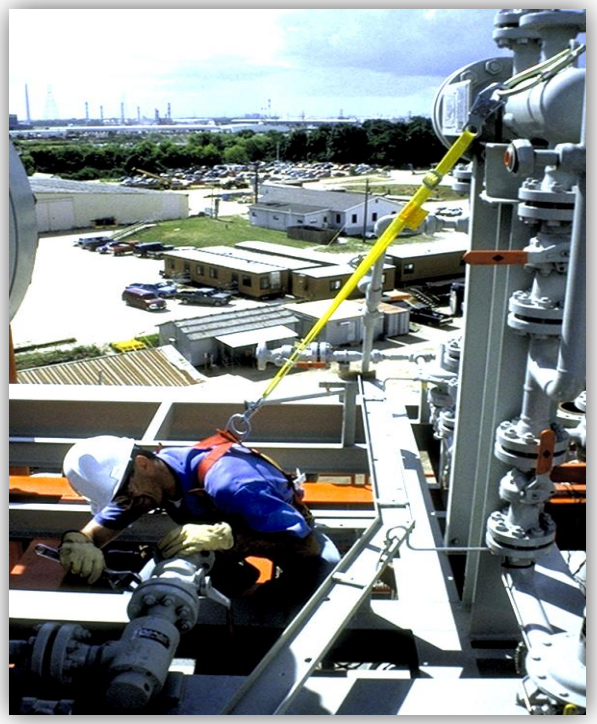
Cantilever loading bays

HSE Project Lead:
Chaudhry Zulfiqar Haider Warraich

Solution Special PFAS System

- Full body harness with extended lanyard or Fall Arrestor.





Protection Of Workers

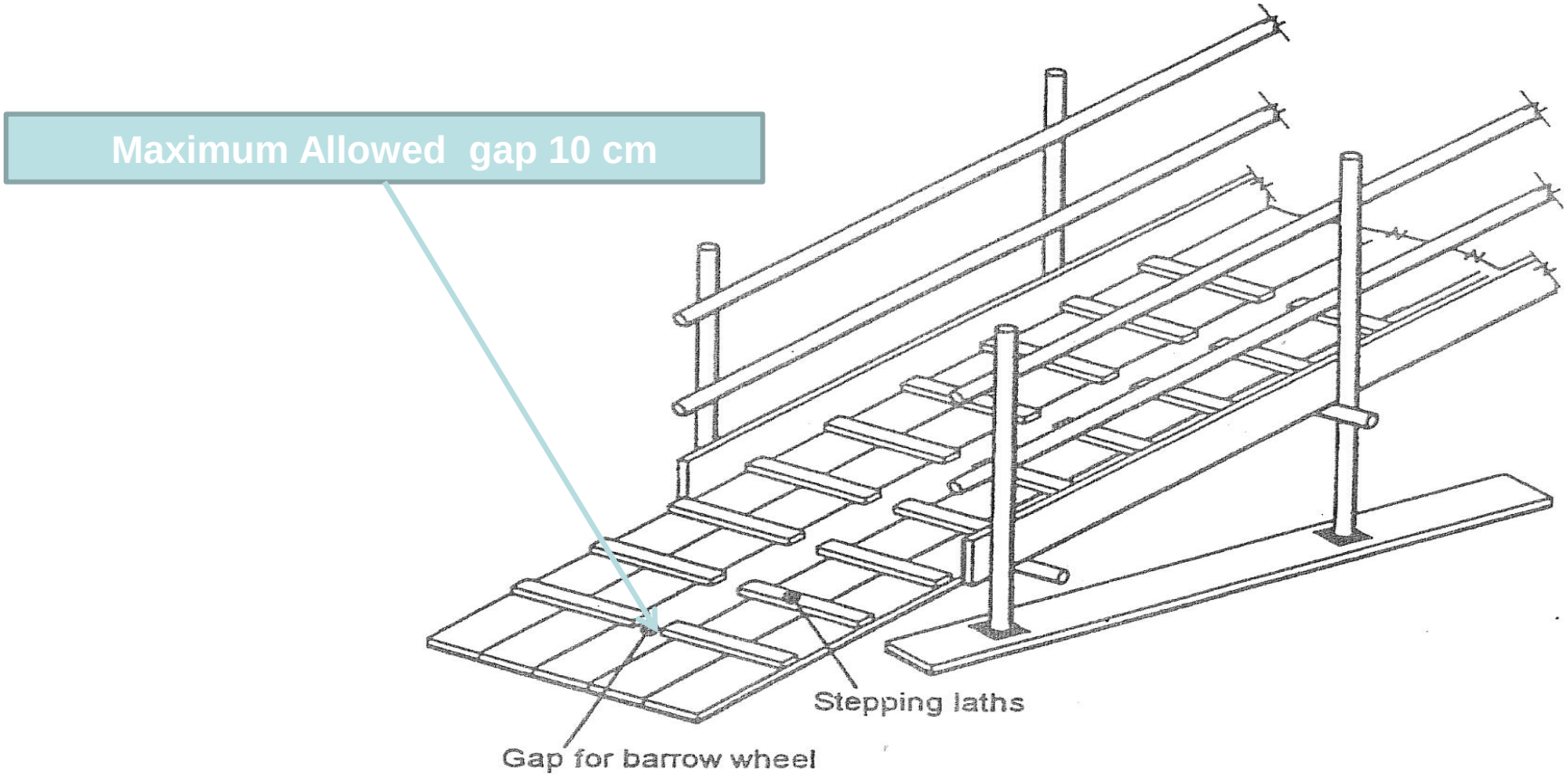
Fall arrestor

INSTALLATION OF LADDERS

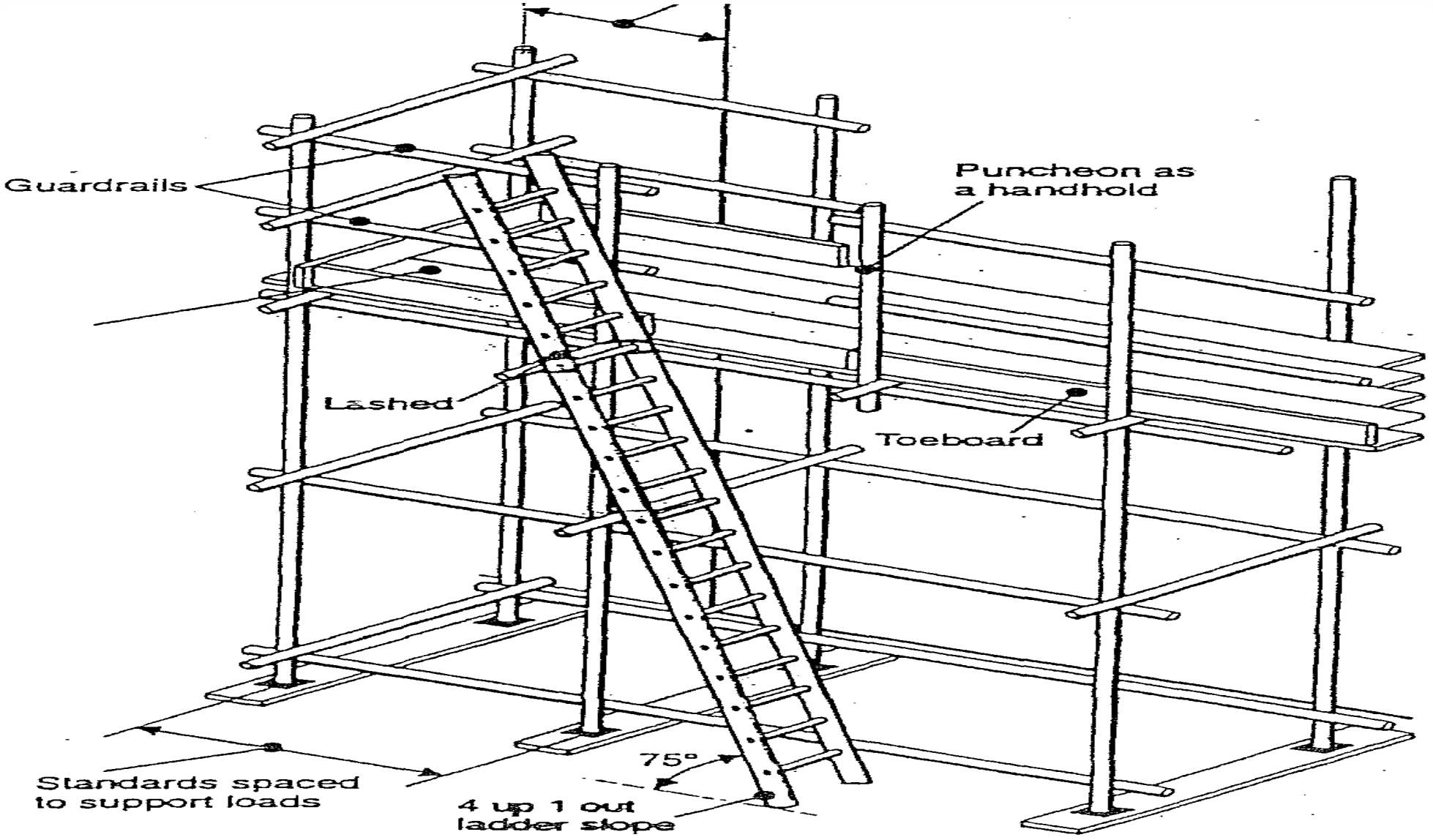
- There are three ways to install the ladder in scaffolding;

- **Right Angle**
- **Side Wise / Along side**
- **Inside the Scaffold**

- Gangways and working platform should be horizontal ideally but may go up to 20 Degree without cleats and more steeper should be cleats and guard rails to be installed.



WORKING PLATEFORM



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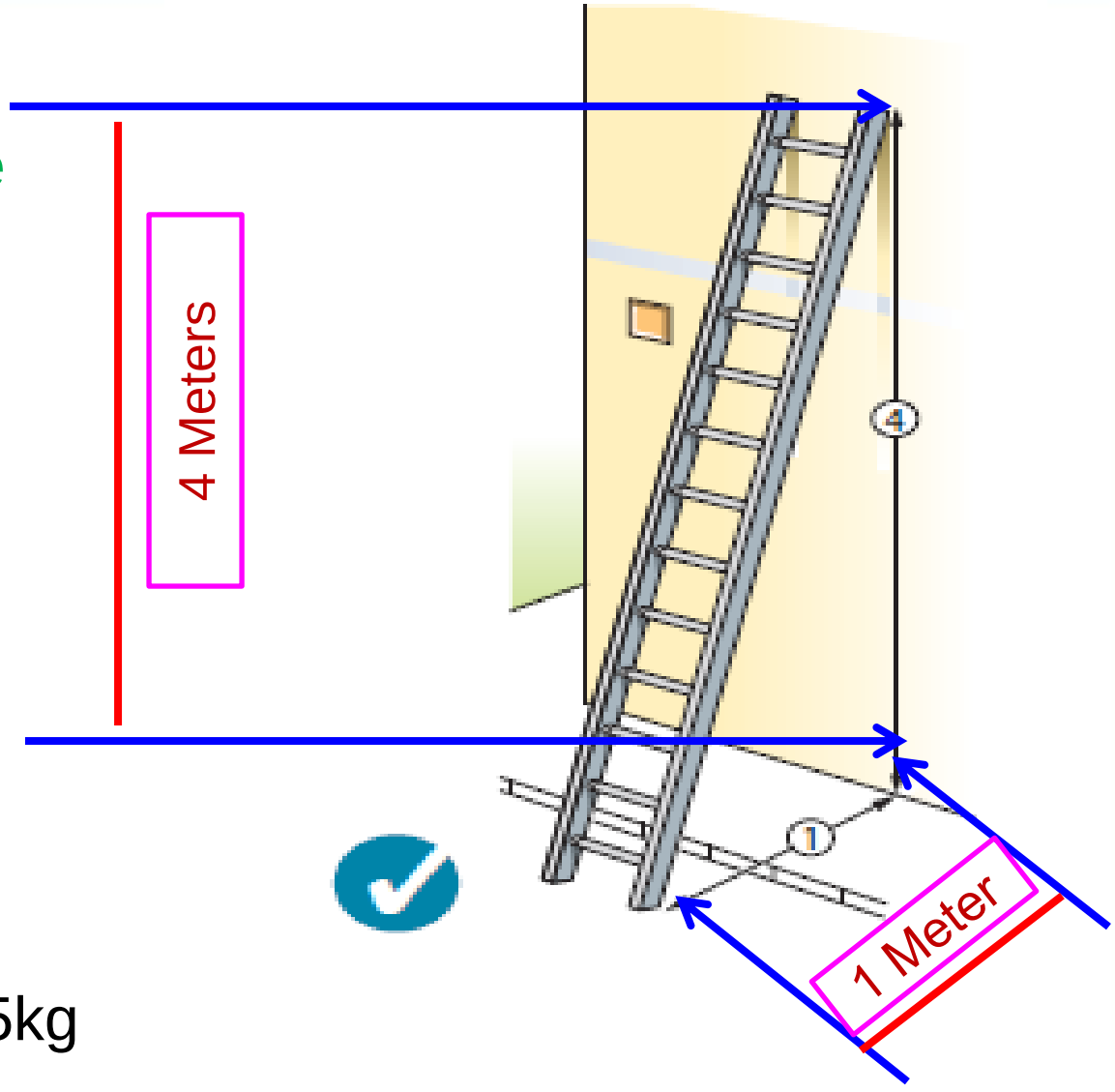
Installation of Ladder

- Angle Should be 75 Degree
- Ratio 1:4



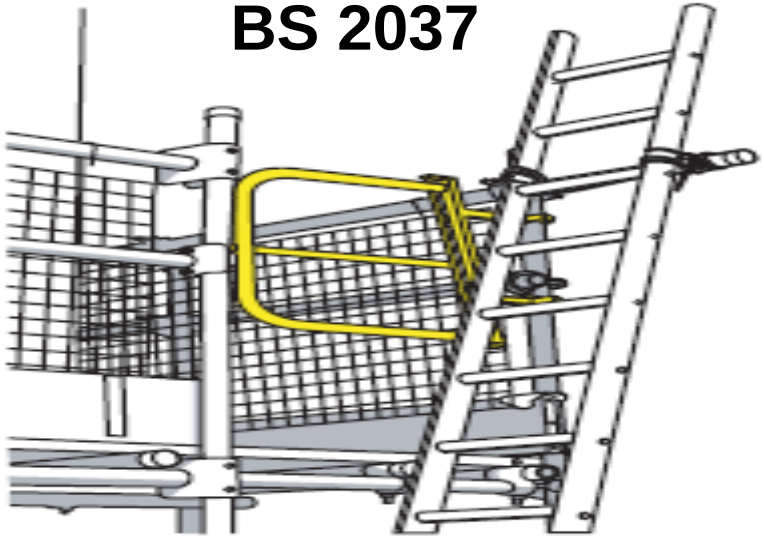
BS 2037: 1994

Portable Aluminum Ladders

Max safe working load - 175kg

- Installation of top rail in ladder for access.
- Readymade Gate can be used if available

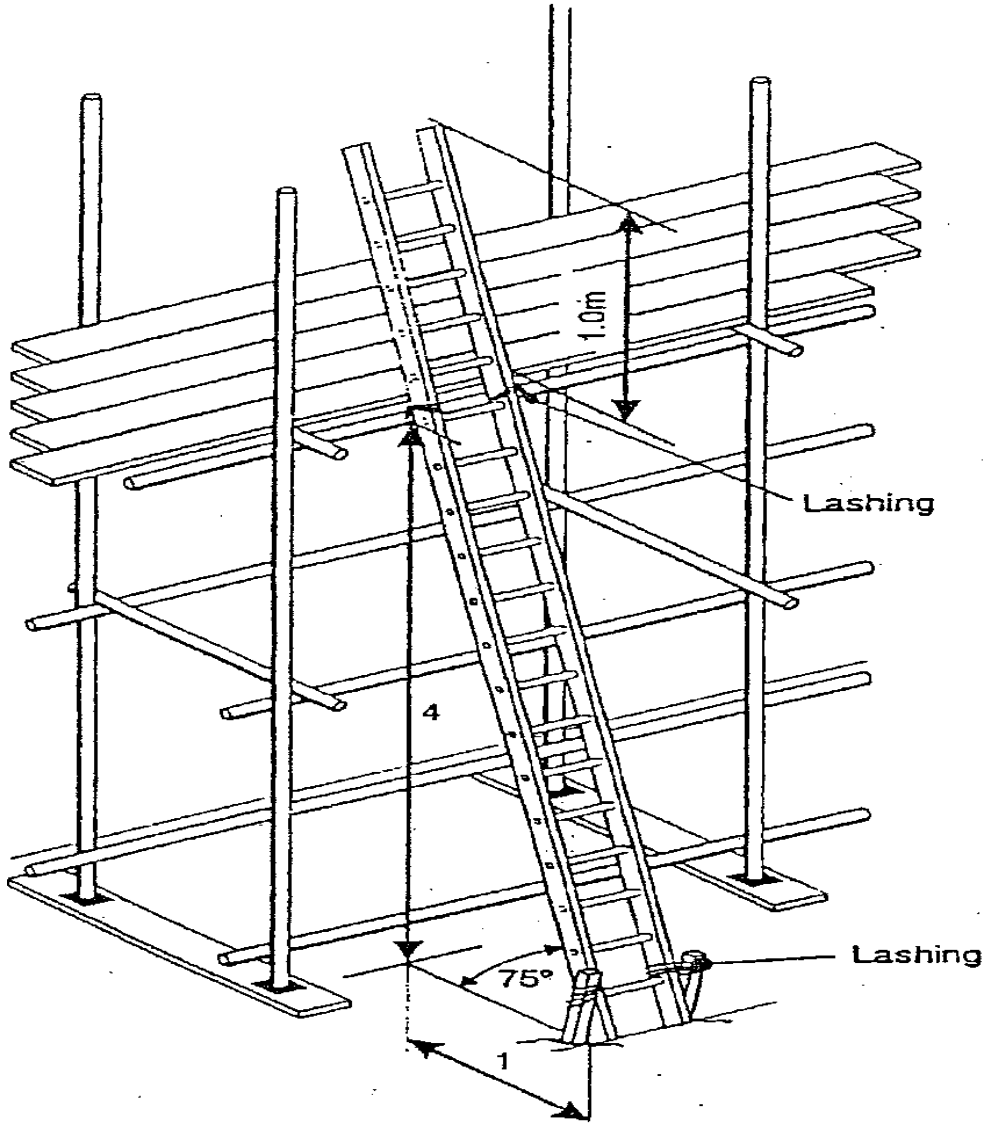
BS 2037



LADDER SAFETY

LEDDERS

- Always put against width side and inside if possible.
- Angle 75 degree.
- Ladders must be lashed @ 2 points at least.
- Projection of ladder should be 1Meter.
- If more ladders are required in the same scaffold put in the opposite transoms.



LADDER SAFETY

Gap between planks for ladder 3 planks to remove

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LADDER SAFETY

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Maintain Suitable Distance / Angle

LADDER SAFETY

Base of the ladder should be strong, rigid and level also to stop the ladder from slipping there should be stopper to install.

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Ladder Clamp

Used to connect ladder to the support tube in scaffolding

Securing Ladder

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LADDER SAFETY

Secure the ladder from proper place without making obstruction

Wrongly secured,
Tie should be fixed at rung level

Ladder to be installed opposite direction in a Multiplatform scaffold

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Handrail in Ladder

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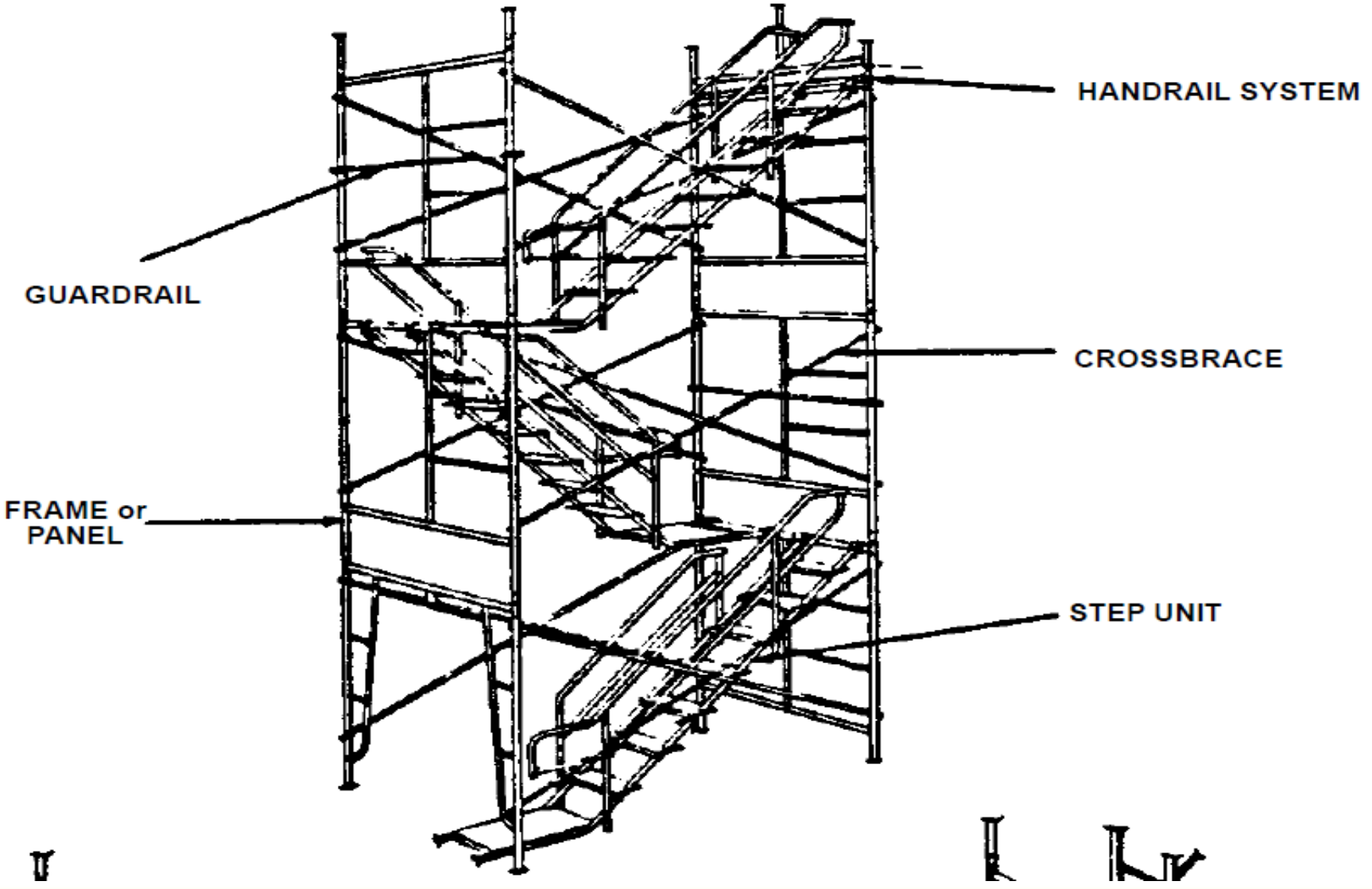
LADDER SAFETY

Bracing in support tube

Fabricated Frame Scaffold



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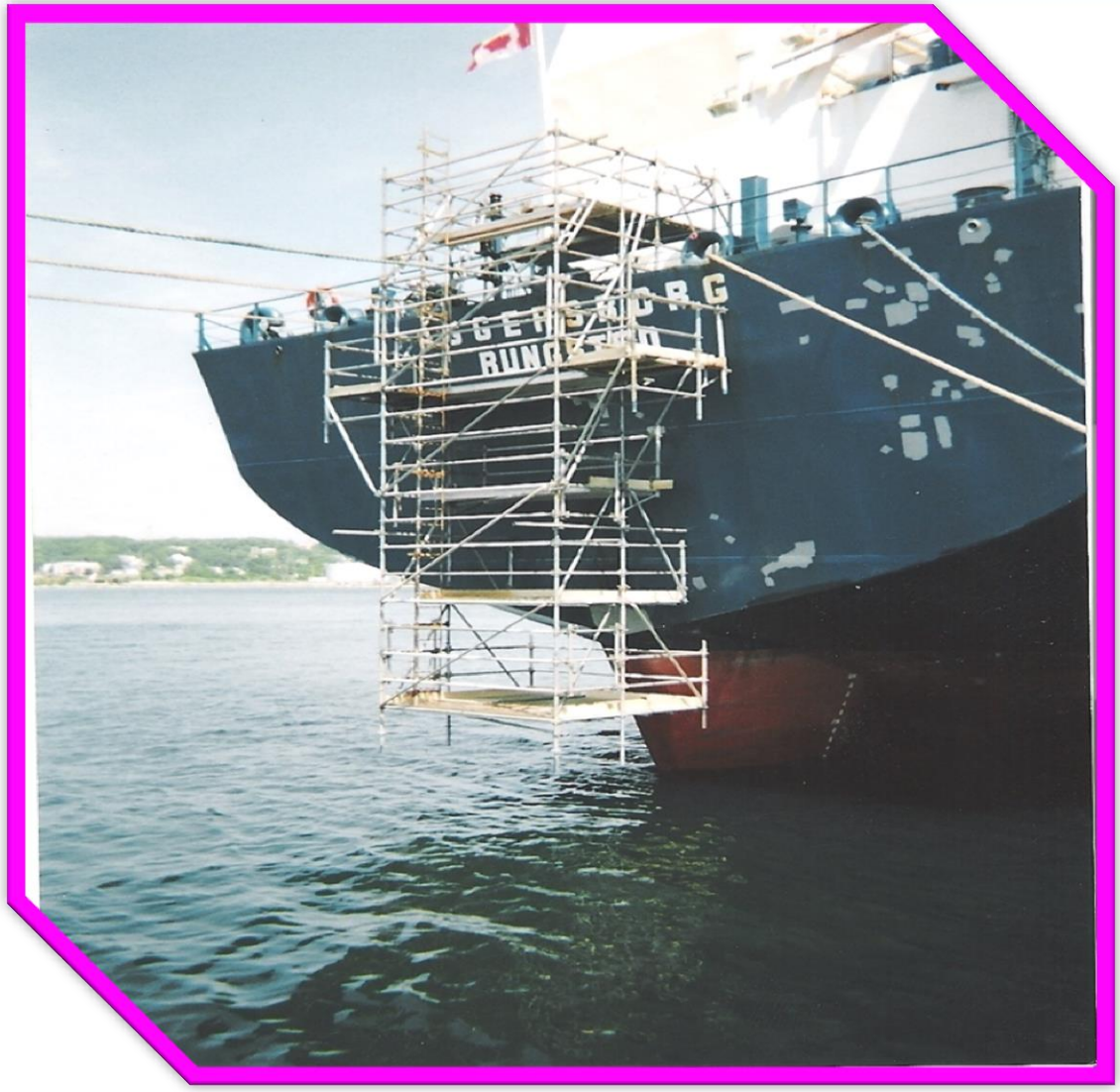
Suspended Scaffold Cont.

- **Buts should be fixed to supplement with the load bearing couplers**
- **Vertical tubes should be in one length**
- **Where not possible, then overlapped at least 62cm vertically.**
- **Using at least two load bearing couplers**



Pre-fabricated Beams

- Various types are available, to simplify the construction of beams and trusses, in scaffolding
- Beams can be welded lattice structures, or assembled on site
- Manufacturers recommendations must be strictly observed
- When splices are used to join units,
- The bolts are used, the following should be specified by the manufacturer of the beam:
  - Size
  - Type, and
  - Grade of steel

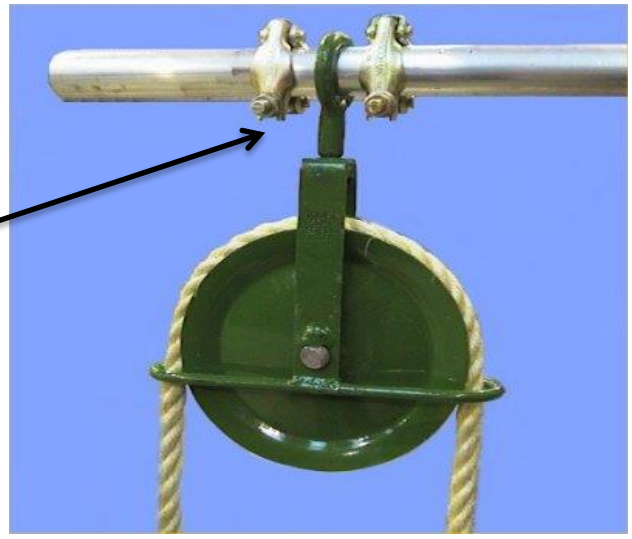
Gin Wheel

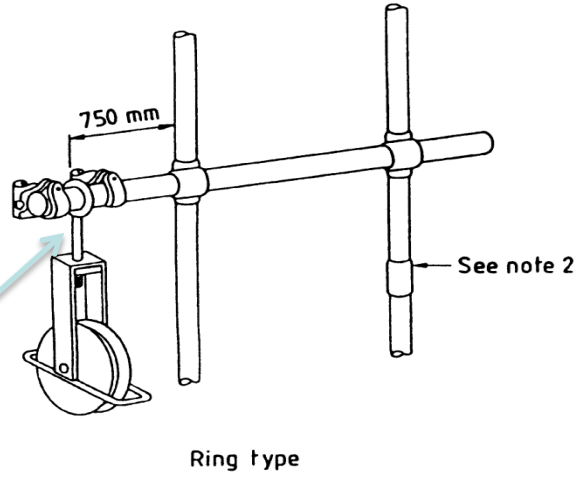
- **Two types:**
  - **Ring type, and**
  - **Hook type**

- **Maximum of 750mm diameter**

- **Rope 18mm diameter, with**
  - **Figure of 8 knot tied to end of rope, or above the load**
  - **Maximum load of 50kg**
  - **Load tested frequently.**

Ring Type





(a) Ring type

Ring Type

What Are Your New Observations ?

HSE Project Lead:
Chaudhry Zulfiqar Haider Warraich

HSE Project Lead:
Chaudhry Zulfiqar Haider Warraich