Carpentry

Level-II

Learning Guide-56

Unit of Competence: Construct Stairs and Stair Components

Module Title: Constructing Stairs and Stair Components

LG Code: EIS CRP2 M13 0919LO2-LG-56

TTLM Code: EIS CRP2 M13 0919V1

LO2: Select and prepare materials and components.

Instruction Sheet	Learning Guide # 56

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

- Selecting and preparing Material for packing and glue blocks
- Checking components.
- Determining method of assembling and fixing

Selecting and preparing Material for packing and glue blocks Checking Components. Determining Method of assembling and fixing

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:

- Material for packing and glue blocks selected and prepared to designed requirements.
- Components checked for appropriate locations in stair structure.
- Method of assembling and fixing determined in accordance with stair design and location.

Learning Instructions:

Read the specific objectives of this Learning Guide.

Follow the instructions described below

Read the information written in the information sheet “below ‘’

Accomplish the “Self-check

If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet

Do the “LAP test”

Information Sheet # 1	Selecting and preparing Material for packing and glue blocks

1.1 Selecting and preparing Material for packing and glue blocks

The selection of materials for the construction of stairs depends up on the availability of materials and ease of transportation.

- Funds
- Desired life of building
- Aesthetical importance
- Freedom of design
- Expected fire resisting quality

Thus, stairs may be made either of timber, bricks, stones, mild steel, Wrought iron, or plain and reinforced concrete.

- Timber stairs
- Light in weight and easy to construct.
- They have poor fire resistance and sound insulation.

They are unsuitable for high rise residential buildings and for public buildings.

1.1.1 Timber stairs

The timber to be used should be well treated before use. Timber is very good material for stair construction.

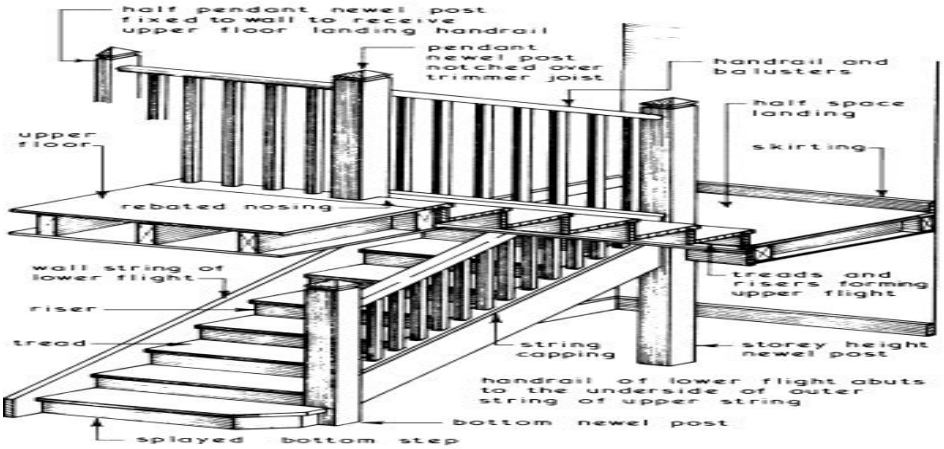

Fig-1 timber stair

1.1.2 Concrete stairs

They are most widely used for residential, public and industrial buildings.

They are strong, durable, can take any desired shape and have good fire resistance.

They are less noisy, can be kept clean and may have more attracting appearances if suitable finishes are used.

Reinforced concrete stairs can be cast-in-situ or prefabricated.

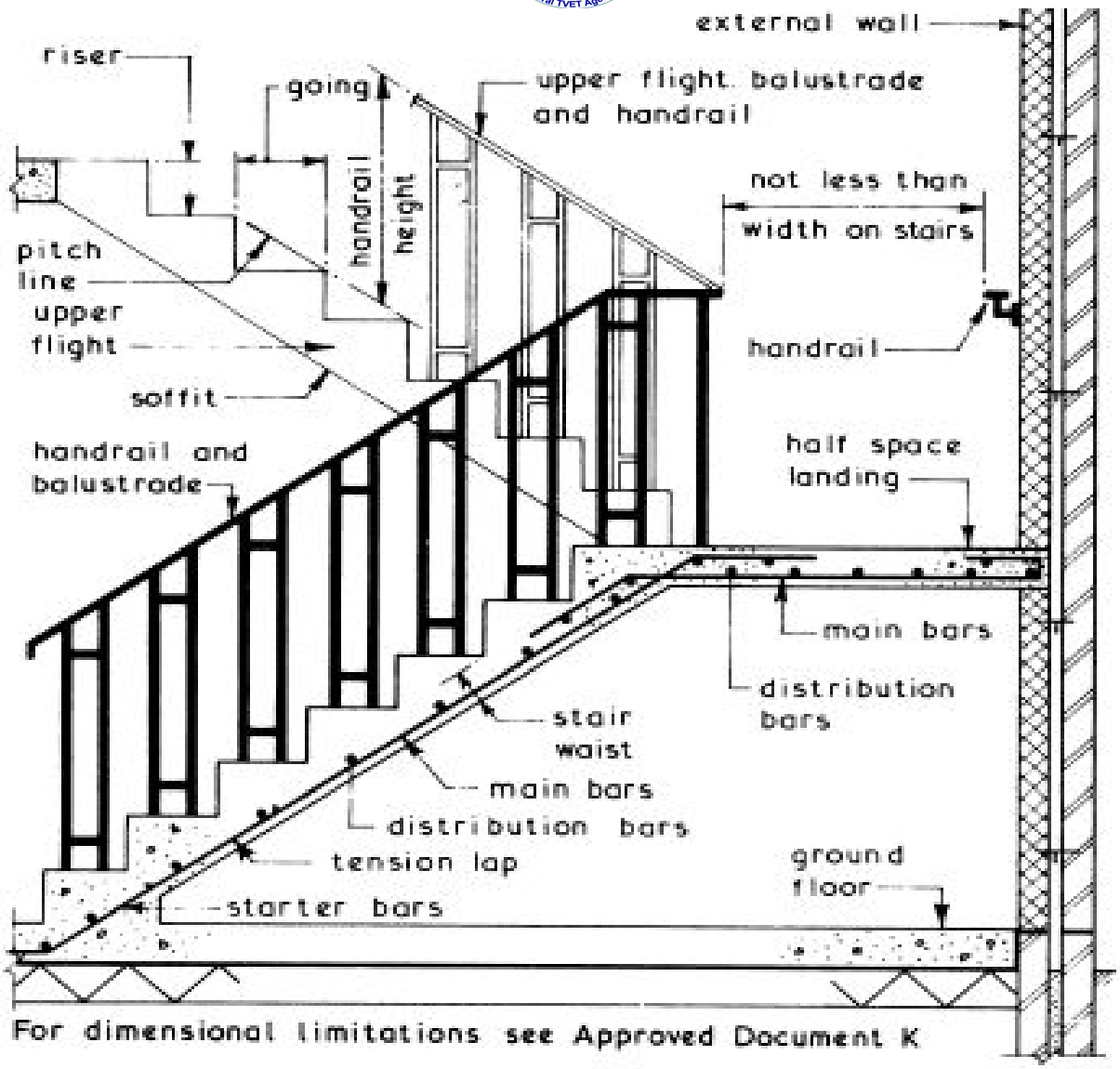

Fig-2 concrete stair

1.1.3 Pre-cast Concrete stairs

Have the following advantages:

Good quality control of finished product.

Saving in site space since formwork fabrication and storage will not be required. The stairs can be installed at any time after the floors have been completed thus giving full utilization to the stair shaft as a lifting or hoisting space if required. Hoisting, positioning and fixing can usually be carried out by semi-skilled labor.

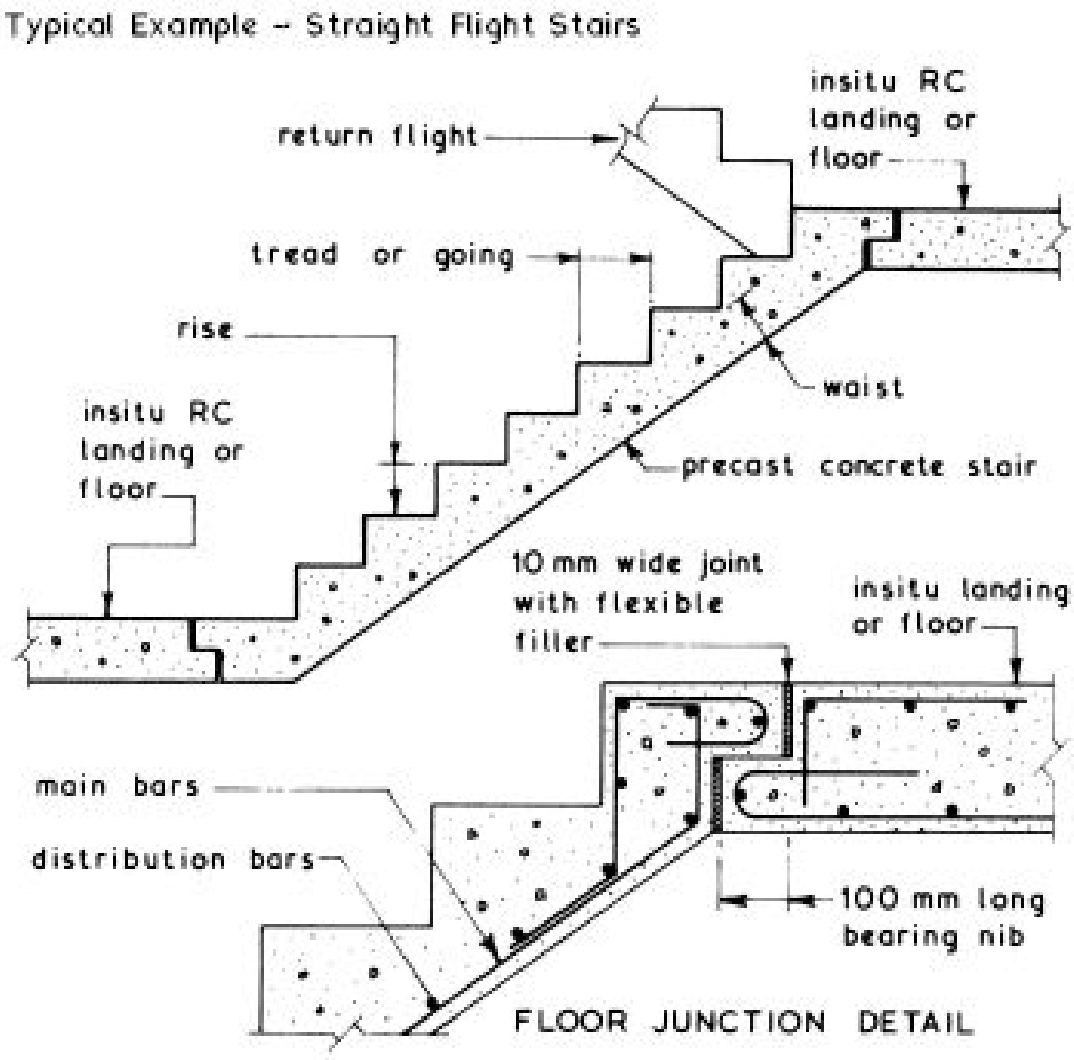

Fig-3 pre cast Concrete stairs

1.1.4 Metal stairs

These can be produced in cast iron, mild steel or aluminum alloy for use as escape stairs or for internal accommodation stairs. They make a lot of noise and can be built in a smaller area. They are normally manufactured in a workshop and fixed on site, which makes it faster and will be functional immediately.

Their main advantage is the elimination of the need for formwork.

Spiral stairs are mainly made of metal.

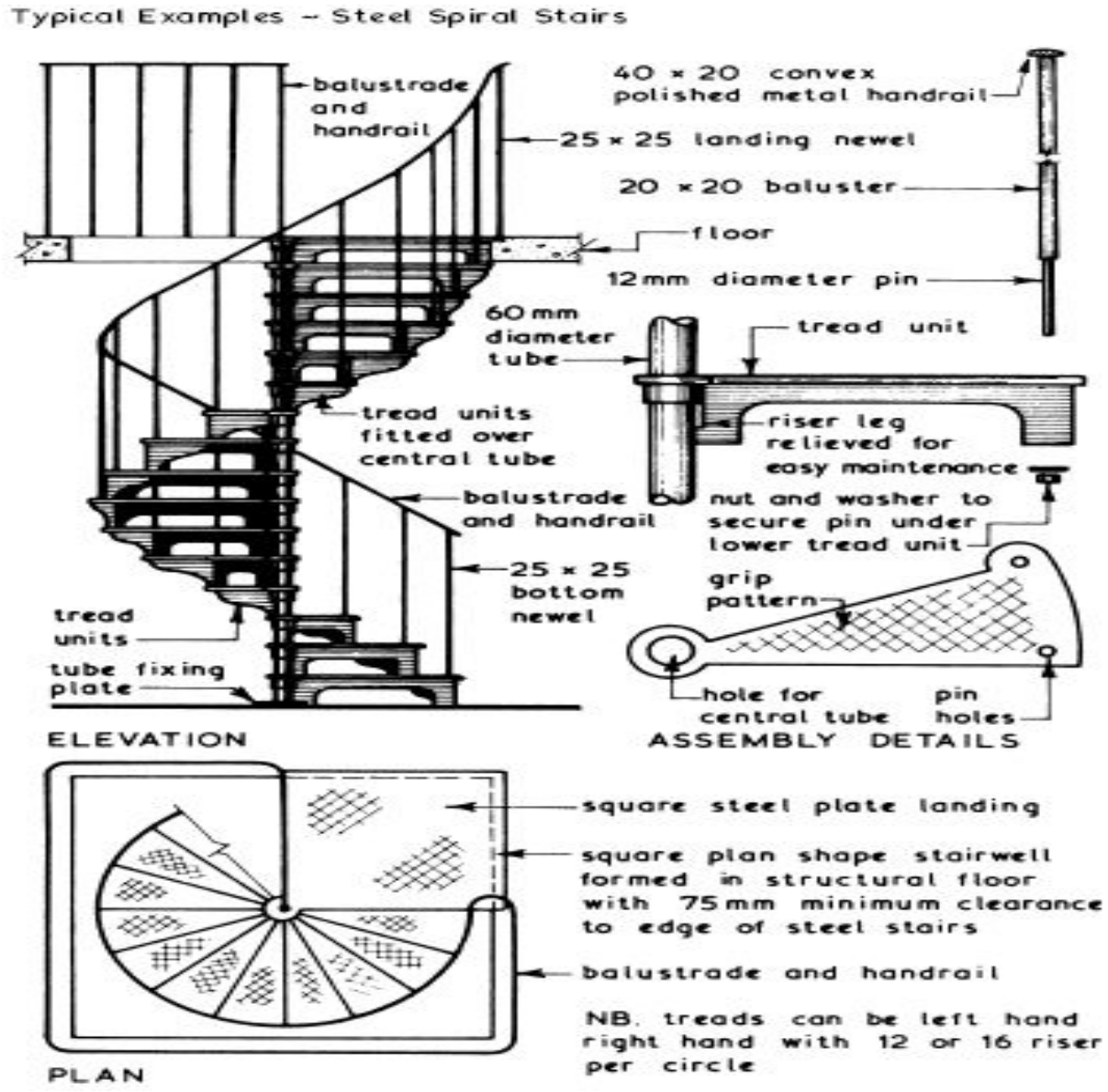

Fig-4 metal stair

1.1.5 Stone stairs

They are strong and rigid and are widely used at the main entrance of public buildings. Stones for such stairs should be dressed and properly bounded to each other. Stone used for the construction of stairs should be hard, strong, and resistant to wear.

1.1.6 Brick stairs

Similar to stone stairs, brick stairs are used at the entrance of a building. Special quality of bricks should be used for the construction of stairs. Brick steps may be plastered or pointed at all the joints. If properly made, brick stairs are durable, have good aesthetic value, but requires frequent maintenance.

Fig - Brick stairs

Self check # 1	Written test

Name: _____ Date: _____

Part: - I choose the best answers

Direction: schuss the best answers for the following questions from given alternatives on space provided. (2 mark each)

_____1.which one of the martial used for stair construction?

A. Stone B. metal C. wood D. concrete E. all

_____ 2. Brick is used for stair construction.

A. True B. false

_____ 3. Aluminum and timber to give good appearance to stair

A. True B. false

Note: Satisfactory rating – above 50% **Unsatisfactory - below 50%**

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

Name: _____ Date: _____

Answer sheet

_____ 1.

_____ 2.

_____ 3.

Score = _____

Rating: _____

Information Sheet #2	Checking Components.

2.1 Checking Components.

Thus, the Building Codes regarding the performance criteria specific to ramps and stairs, for pedestrian traffic in construction, based on which stairs should currently be designed refer to:

1. Mechanical resistance and stability;
2. Safety in use;
3. Fire safety;
4. Noise protection.

Regarding the requirement of mechanical resistance and stability, "responsible" for ensuring this goal, and in the stairs' case, too, is the structural engineer; the architect answers - under the law - to ensure compliance with the other three requirement (requirements of Law 10). But there is an interference area between the stair composition, in terms of structure, stair geometry, which includes its appearance in plan, as well as the image seen underneath the stair, handrail turn at the stair eye.

Before anything else, a terminological convention is required. This exists, regulated in a number of official materials (building codes and law abiding design guide), according to which the terms below, presented in alphabetical order, have the following meaning:

Table 1 name of parts of stair

Handrail	The sill generally made out of vertical (rails) and or horizontal elements.
Staircase Shaft	The enclosed space, limited by the walls confining the staircase
Nosing	The frontal part of the tread that is excluded from the plane of the riser ;it has a decorative purpose

Riser	Vertical surface connecting 2 treads Observation: there can also be stairs with reads and no risers
Under stairs	The lower part of the flight of stairs that can be seen from the landing or a flight of stairs found on an inferior altitude Observation: the over stair.
Total height Headroom	The circulation space between the sheer limits of 2 superimposed flight of stairs or a flight of stairs and a landing ,measured using the normal on the line of walk ,from the nosing of the tread to the plane generated by the backside of the flight of stairs or the landing's beams
Total length	The circulation space between the wall and the railing
Line of walk	The Graphic indicator of the way to the stairs; in case of circular or balanced staircases, it's considered to be 50 cm from the handrail towards the smaller arch of the curve, for flight of stairs smaller than 1m; in axes of flights of stairs longer than 1.0 m it's considered to be at 60 cm
Tread edge	The intersection between the horizontal plane and the vertical one of the tread
Rail	Vertical construction element (continuous or with gaps) that offers protection to the people going up and down or pausing on the (flight of) stairs.
Landing	Horizontal construction element built for people to rest on when going up/down stairs
Flight of stairs	Flight of stairs Circulation construction element with a slope, with /without treads
Staircase	Construction subcomponent that serves pedestrian circulation in between more floors, consisting in flights of stairs and eventually a landing

Outer, open staircase	A staircase situated outside the building, standing alone (independent) or adjacent to the building with a maximum of 3 sides
Inside/Inner, open	A staircase situated inside the building, in lobbies, hallways,
Inside, closed staircase	A staircase situated inside the building specific to isolation and fire safety codes
Staircase with multiple landings	A staircase that has multiple straight flights of stairs and the relative orientation of some over others occurs at particular angles (Most common at 180° or 90°)
Monumental staircase	A staircase that's designed with the purpose of achieving a specific architectural impression and built to ensure (only if necessary) safety evacuation
Main staircase	A staircase that can ensure functional circulation throughout the building
Curved/Helical Staircase	A staircase that has curved flight of stairs either continuous or interrupted by landings
Straight flights staircase	Straight flights staircase a staircase that has straight flight of stairs either continuous or interrupted by landings
Straight staircase	A staircase that has straight flight of stairs hat are positioned one after another, in the same direction
Secondary staircase	A staircase for secondary circulation, passing through all floors or at least parts of them, ensuring even safety evacuation if built to code
Abrupt staircase	A staircase that has treads with the width between 22.6 and 30
Balanced or "dancing" staircase	A staircase with one or more straight flight of stairs in which some parts of the flights are curved (the area of direction changing) or a staircase posed of a strait flight of stairs and a curved one, with or without landing.

Staircase with high risers	A staircase with risers of height between 17.6 and 22.5cm
Staircase with low risers	A staircase with risers of height lowers than 16.5cm
Inside, closed staircase	A staircase situated inside the building specific to isolation and fire safety codes
Staircase with multiple landings	A staircase that has multiple straight flights of stairs and the relative orientation of some over others occurs at particular angles (Most common at 180° or 90°)
Monumental staircase	A staircase that's designed with the purpose of achieving a specific architectural impression and built to ensure (only if necessary) safety evacuation
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Secondary staircase	A staircase for secondary circulation, passing through all floors or at least parts of them, ensuring even safety evacuation if built to code
Abrupt staircase	A staircase that has treads with the width between 22.6 and 30
Balanced or "dancing" staircase	A staircase with one or more straight flight of stairs in which some parts of the flights are curved (the area of direction changing) or a staircase posed of a strait flight of stairs and a curved one, with or without landing.
Staircase with	A staircase with risers of height between 17.6 and 22.5cm

high risers	
Staircase with low risers	A staircase with risers of height lowers than 16.5cm
Staircase with regular risers	A staircase with risers of height between 16.6 and 17.5
Tread	The horizontal surface, with a relatively low width, situated vertically on equal distance between other treads
Balanced treads	Treads that go follow a curved path, with tread edges that converge to centers of different radius. In a drawing plan, each tread has a different shape.
The "eye" of the staircase	The free space bound by the inner parts of flight of stairs
Stringer	The lateral or central beam going along the flight or stairs bearing all its weight.

2.2 Composing parts of staircases

1. Staircase Shaft the walls that define the space of the staircase, it given the case
2. Flight of stairs construction element with a slope, with /without treads, that connects more slabs or a slab and a landing.
3. Landing Horizontal construction element that allows changing of direction for the flight of stairs or, in the case of very long flights, allows people to rest on while using the staircase
4. Rail Vertical construction element (continuous or with gaps) that offers protection to the people going up and down or pausing on the (flight of) stairs.
5. Handrail Construction element from the superior part of the sill/rail and/or on the adjacent wall of the (flight of) stairs with the purpose of giving support to the people using the (flight of) stairs
6. Tread – horizontal element that allow circulation on the circulation.
7. Riser – vertical element that connects 2 treads
8. The "eye" of the staircase the free space bound by the inner parts of flight of stairs

9. Stringer The lateral or central beam going along the flight or stairs bearing all its weight .There are staircases with one or more stringers .

2.2.1 Minimum widths (recommended) for flights of stairs

Table 2 widths of flights of stairs

Minimum widths (recommended) for flights of stairs no	Building type	Width main staircase /m	Width secondary staircase /m
1	Industrial buildings	1.20	1.10
2	Tall and high rise buildings	1.50	1.20
3	Hospital buildings	1.50	1.50
4	Kindergarten, senior retreats	1.20	1.20
5	Educational buildings maximum 500 students	1.50	1.20
6	Educational buildings over 500 students	1.70	1.20
7	Public buildings maximum 200 people	1.50	1.20
8	Public buildings over 200 people	1.70	1.20
9	Residential buildings maximum 2 floors	1.05	0.90
10	Residential buildings 3-5 floors	1.15	1.00
11	Residential buildings 6-8 floors	1.25	1.10
12	Residential buildings over 9 floors	1.30	1.20

13	Buildings with overcrowded halls – public evacuation	1.70	1.20
14	Buildings with overcrowded halls –bureaus	1.30	1.20

Self check 2	Written test

Name: _____ Date: _____

Part: I fill the blank space

Direction: fill the blank spaces with proper words on given space provided.

_____ 1. The sill generally made out of vertical (rails) and or horizontal elements

_____2. Vertical surface connecting 2 treads

_____3. The circulation space between the wall and the railing

_____4. Vertical construction element (continuous or with gaps) that offers protection to the people going up and down or pausing on the (flight of) stairs.

_____5. Horizontal construction element built for people to rest on when going up/down stairs

Note: Satisfactory rating – above 50% **Unsatisfactory - below 50%**

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

Name: _____ Date: _____

Answer sheet

_____ 1.

_____ 2.

---------- 3.

---------- 4.

----------5.

Score = _____

Rating: _____

Information Sheet #3	Determining Method of assembling and fixing

3.1 Determining Method of assembling and fixing

In new build properties safety on site is crucial at all times. At JELD-WEN we have developed a simple temporary guardrail and edge protection solution to provide additional safety measures while properties are under construction. During construction the new staircase strings, treads, risers and newel posts are secured in place at the first fix stage, and temporary safety measures will be required to remove the risk of falling prior to the second fix of the baluster and spindles. Our temporary guardrail and edge protection provides a temporary safety barrier both up the stairs and across landings that alleviates the risk of falling, whilst allowing access for materials to be moved easily up the stairs. Testing has been conducted for the resistance against static loading in accordance with en 13374: 2013 class.

3.1.1 Assembling and fixing

Step 1

Install the pre-sized principal raking guardrail by fixing each end to the newel posts using the fixing bolts supplied.

Step 2

Hang both hanging brackets over the upper guardrail and position evenly from each end to create three equal gaps. Fix using 2 no. m4x40mm marked screws on each bracket.

Step 3

Measure the overall width of the guardrail system from the outer edge of each newel post as per illustration, and cut the mid-guardrail to suit this dimension.

Step 4

Locate the mid-guardrail into the hanging bracket as per illustration. Fix using 2 no. m4x40mm marked screws per hanger. Ensure the length of the mid-guardrail overhangs the newel post at both ends.

Step 5

The finished system should look as per illustration 5. Ensure all fixings are in place and secure. Please note the gap between the upper and mid guardrails will be determined by the hanging brackets, illustration for reference only.

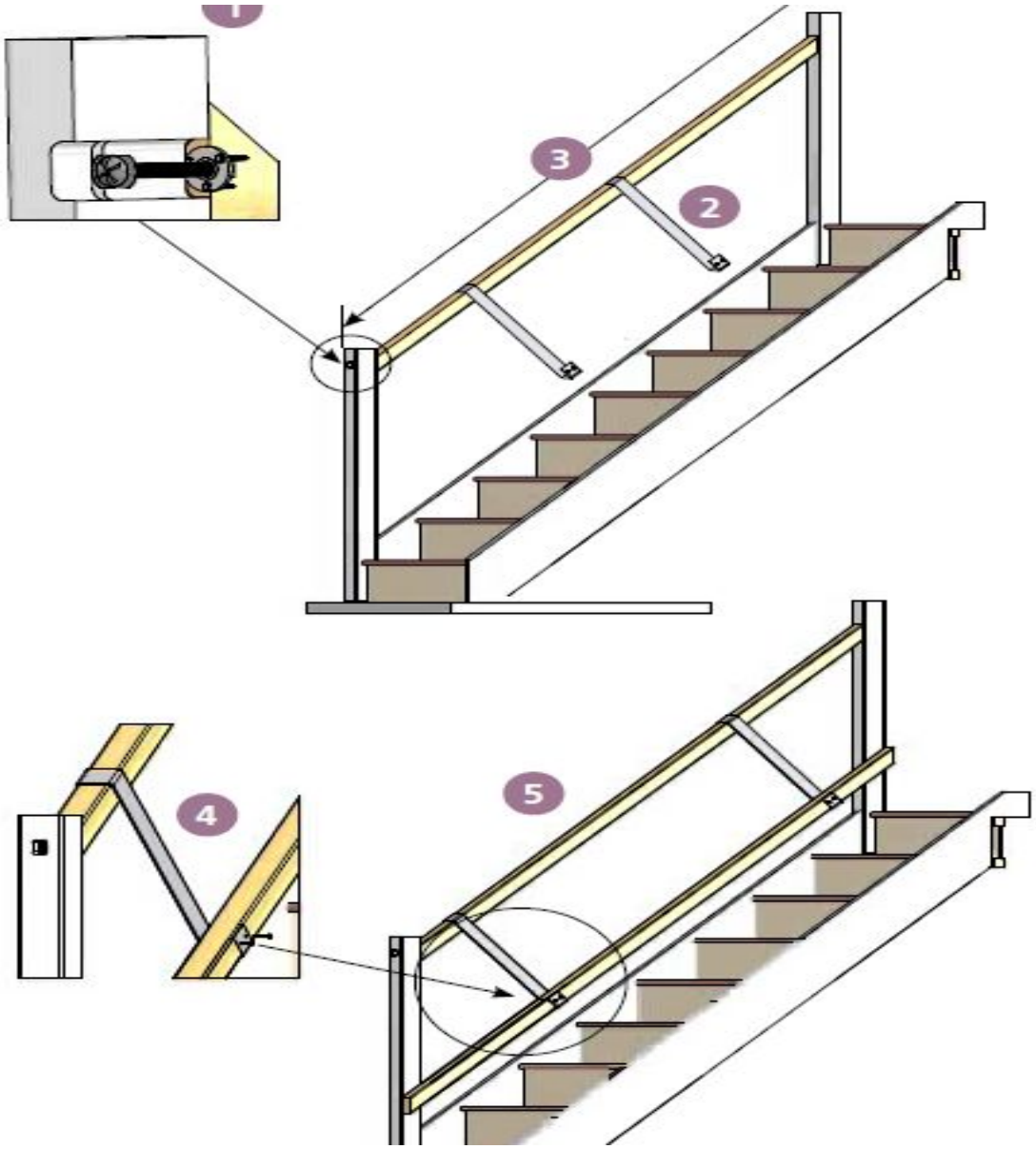


Fig-1 Temporary guardrail

3.1.2 Assembling and fixing landing return

Step 1

Locate temporary newel post into metal floor plate. Secure using 4 no. M5x60mm CE marked screws. Repeat this to create both ends of the landing return.

Step 2

Fix both floor plates to the floor at either end of the edge to be protected using 4 no. M5x60mm CE marked screws for each plate. Please note overall width of the complete system should not exceed 2500mm.

Step 3

Measure between the two fixed newel posts and ensure the guardrail is the correct length. Trim to suit if necessary.

Step 4

Locate L bracket into the pre-machined recess in the newel post and fix using 2 no. M4x40mm CE marked screws on each newel post. Locate upper guardrail onto the L bracket as illustrated, ensure It sits central over the L bracket and screw from underside as per Illustration using 2x m4x40mm screws. Please note image shows Cross-sectional detail.

Step 5

Hang both hanging brackets over the upper guardrail and position. Evenly from each end to create three equal gaps. Fix using 2 no. M4x40mm CE marked screws on each bracket.

Step 6

Measure the overall width of the guardrail system from the outer edge of each newel post as per illustration and cut mid-guardrail to Suit this dimension.

Step 7

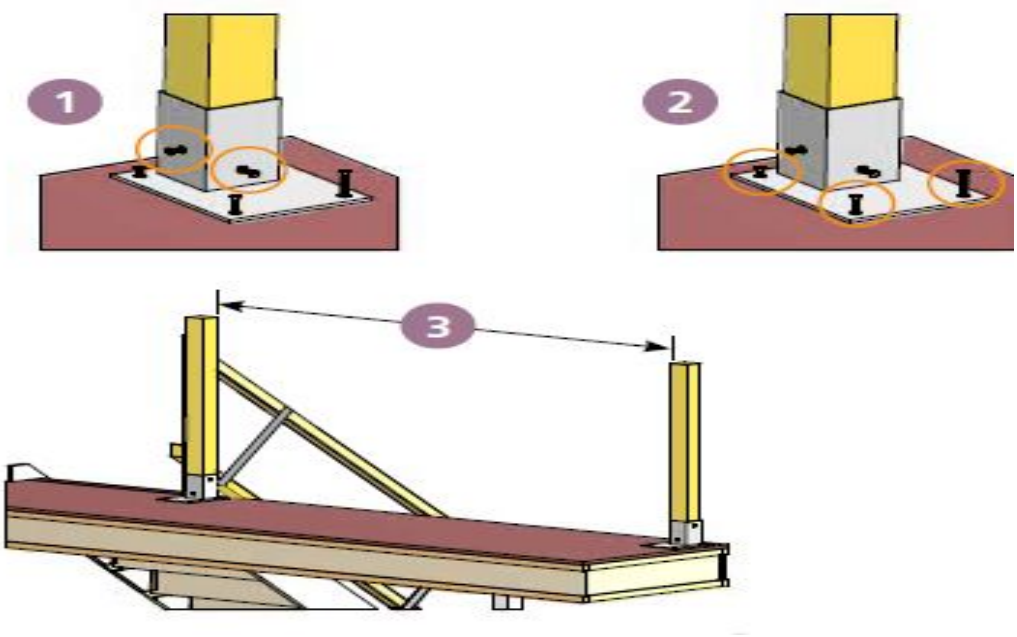
Locate the mid-guardrail into the hanging bracket as per illustration both ends.

Step 8

Fix the mid-guardrail to the hanging bracket using the 2 no. M4x40mm CE marked screws per hanger.

Step 9

The finished system should look as per illustration 9. Ensure all fixings are in place and secure. To ensure full compliance with BS EN 13374:2013 A toe boards should be fitted.



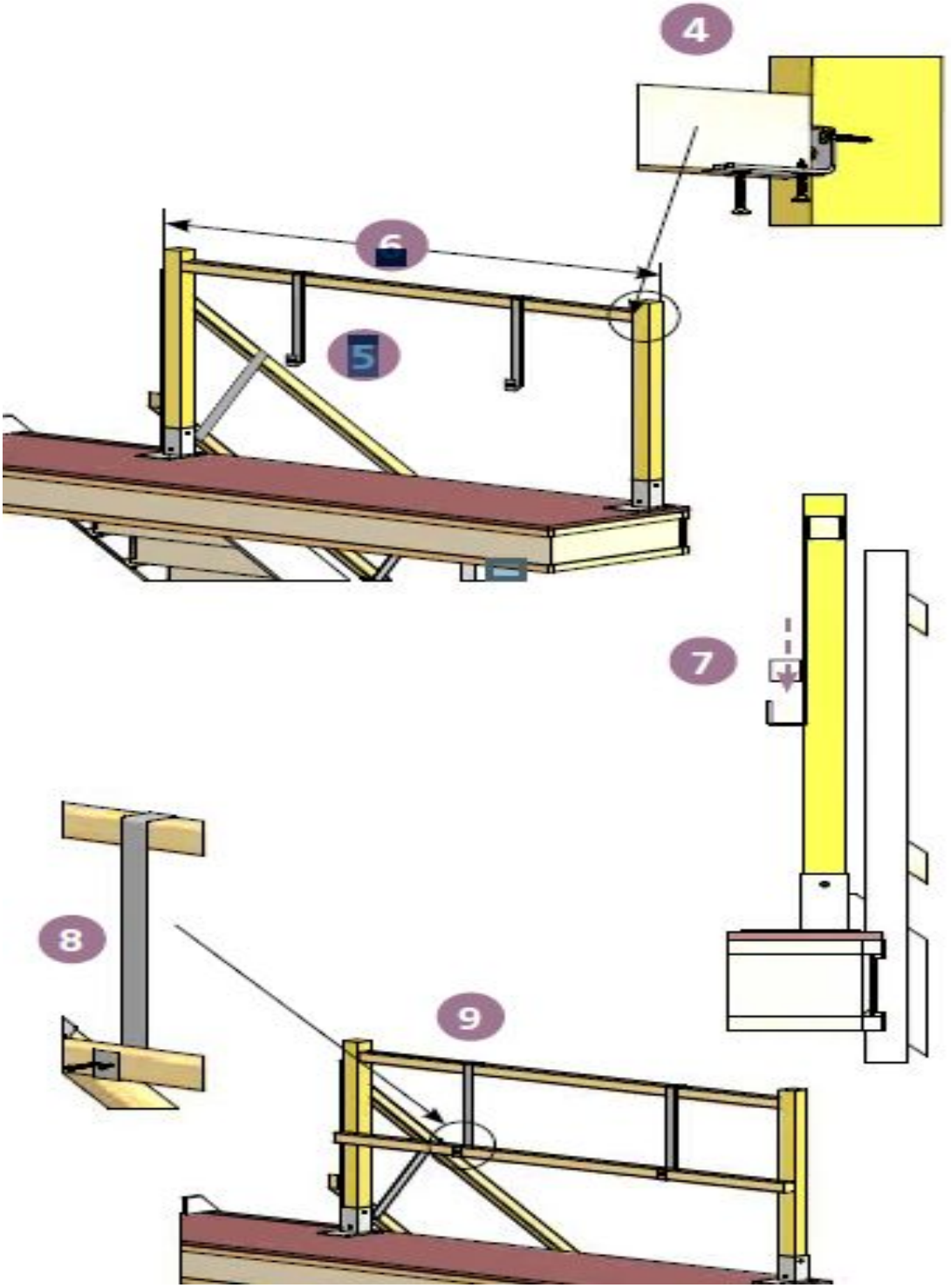


Fig-2 assembling of landing return

Operation sheet # 1	Determining Method of assembling and fixing landing & handrail

Steps determining method of assembling and fixing landing & handrail

Step 1

Install the pre-sized principal raking guardrail by fixing each end to the newel posts using the fixing bolts supplied.

Step 2

Hang both hanging brackets over the upper guardrail and position evenly from each end to create three equal gaps. Fix using 2 no. m4x40mm marked screws on each bracket.

Step 3

Measure the overall width of the guardrail system from the outer edge of each newel post as per illustration, and cut the mid-guardrail to suit this dimension.

Step 4

Locate the mid-guardrail into the hanging bracket as per illustration. Fix using 2 no. m4x40mm marked screws per hanger. Ensure the length of the mid-guardrail overhangs the newel post at both ends.

Step 5

The finished system should look as per illustration 5. Ensure all fixings are in place and secure. Please note the gap between the upper and mid guardrails will be determined by the hanging brackets, illustration for reference only.

La p Test #1	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary equipments, tools and materials you are required to perform the following tasks within 2 hour each.

Task1. Determining Method of assembling and fixing landing

Task -2 Determining Method of assembling and fixing handrail

Note: Satisfactory rating – above 50% **Unsatisfactory - below 50%**

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

Name: _____ Date: _____

Score = _____

Rating: _____

Reference

Publications about wood Order at www.swedishwood.com/publications.

Prepared by: Colin Mackenzie Timber Queensland Limited First produced: April 2007 Revised: May 2012, October 2013

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Design Guide 34 Steel-Framed Stairway Design

Answers key for self check information sheet LG 56 1-2

Self check -1

1. E
2. A
3. A

Self check-2

1. Handrail
2. Riser
3. Total length
4. Rail
5. Landing

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