



# SAMPLE Stair Building

## Carpentry - Residential Construction

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## STAIR BUILDING OVERVIEW

This text introduces subject matter related to the set out and construction of timber stairs.

The main areas covered are:

- Internal and external stairs and associated balustrades.
- Various stair types are outlined, including dogleg, quarter space and single flights.
- Internal stairs will have closed risers, handrails and balusters, while the external stairs will be open riser with handrails and guardrails.

BCA requirements are covered to allow for design and construction of residential stairs, including slope relationship formula ( $2R + G$ ) and maximum spaces between treads to create safe open riser stairs.

Method of setting out, cutting and assembling internal and external stairs is covered as well as the calculation of quantities and cost of materials for both internal and external stairs.

**Note:** *This text only covers stair types and stair requirements for residential construction.*

A comprehensive 'Glossary of Terms' is included at the end of this text, which provides a detailed description of trade terms, technical content and some trade jargon.

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## STAIRS

A stair consists of a number of steps, made up of treads and risers, combined and supported to provide continuous access between floors and/or landings. It may also be referred to, more commonly, in the plural sense as a 'Stairway'.

**Note:** It is preferable to use the terms *Stair* or *Stairway* as opposed to *Staircase*, which originally referred to the space in which a flight was built.

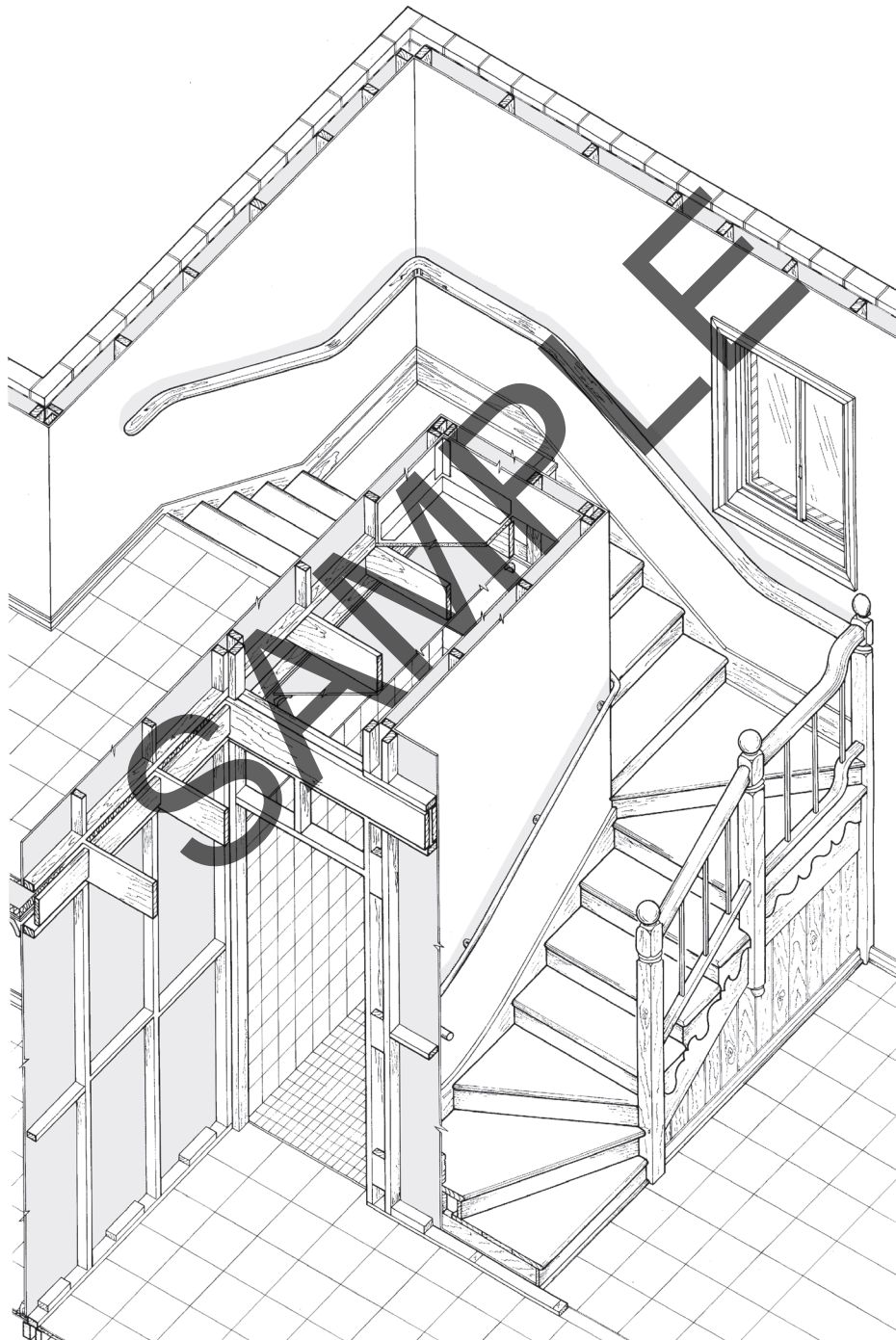


Fig. 1 Stairs for residential construction

## DEFINITIONS - STAIR TYPES

**Bracketed stair:** Also referred to as 'Cut and bracketed', it is a stair with strings having the shape of treads and risers cut out on the top edge and fitted with an ornamental bracket, or fret work, underneath.

**Circular stair:** A stair with or without a central well having steps, which radiate from a common centre.

**Closed stair:** A stair, which has side walls or partitions on both sides and is usually closed by a door at one end. It may also be referred to as a 'Boxed stair', or an 'Enclosed stair'.

**Closed string stair:** A stair in which the treads are not visible in a side view of the stair flight.

**Dogleg stair:** Also referred to as a 'Half-turn stair', it is a stair with two flights between storeys, which are connected by a rectangular half landing for a 180° turn. The outer strings of each flight are housed into a common newel post, which does not allow for any stairwell.

**Geometric stair:** A continuous sweeping or flying stair, with no newel posts or landings, having a continuous curved string and handrail. It may be designed to fit a semicircular or elliptical stairwell.

**Helical stair:** A stair with a circular plan where all the treads are winders. This stair is also known as a 'Spiral stair' or 'Winding stair'.

**Open newel stair:** An open stairwell with two landings between floors, short flights between landings, and newel posts at the corners.

**Open riser stair:** A stair consisting of strings and treads with no riser boards between treads, thus leaving the risers open.

**Open stair:** A stair, which is not enclosed by walls or separated from the space where it is placed.

**Open string stair:** A stair with a cut string to the shape of the risers and treads, on one or both sides, facing the stairwell.

**Quarter turn stair:** A stair with two flights at right angles to each other with a quarter space landing between them.

**Return flight stair:** A dogleg stair where the outer strings of each flight are vertically above each other.

**Spine string stair:** An open riser steel stair with a single central spine (spine string) and welded tread supports.

**Winding stair:** A circular or curved stair, which changes direction by means of winders, with or without landings.

## MATERIALS USED FOR STAIRS

Stairs may be constructed from a wide range of materials, which include stone, brick, timber, steel, concrete and/or combinations of these.

### STONE

This was probably the first material used for purpose made stairs in the history of building. Evidence of this can be seen in such early structures produced firstly by the Egyptians in many of their *temples and sarcophagi* (burial tombs), then the Greeks in structures found at the *Acropolis*, followed by the Romans in structures like the *Colosseum* and the *Forum Romanum*.

Spiral stone stairs were also very popular throughout history with many being used in medieval English castles through to more modern Spanish structures, as found in the towers of Antonio Gaudi's *Sagrada Familia* in Barcelona.

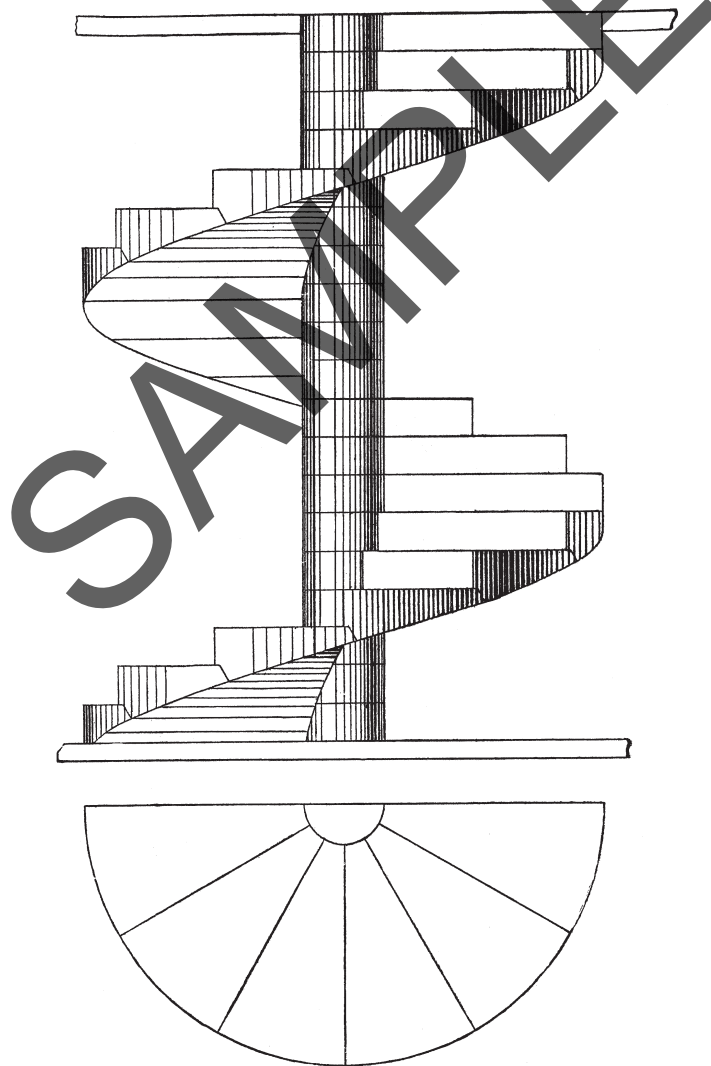


Fig. 7 Detail of a typical stone spiral flight

## BRICK

Small flights of solid brick stairs are used externally for access to and from low patios and verandahs. They are usually laid on a concrete strip footing on either side to support the enclosing wing walls and may have treads constructed of brick-on-flat, brick-on-edge or a rendered brick finish. Dry pressed bricks are preferred for brick stairs and steps as they don't have holes through them, like the extruded types, and may be laid frog down to provide a neat finish.

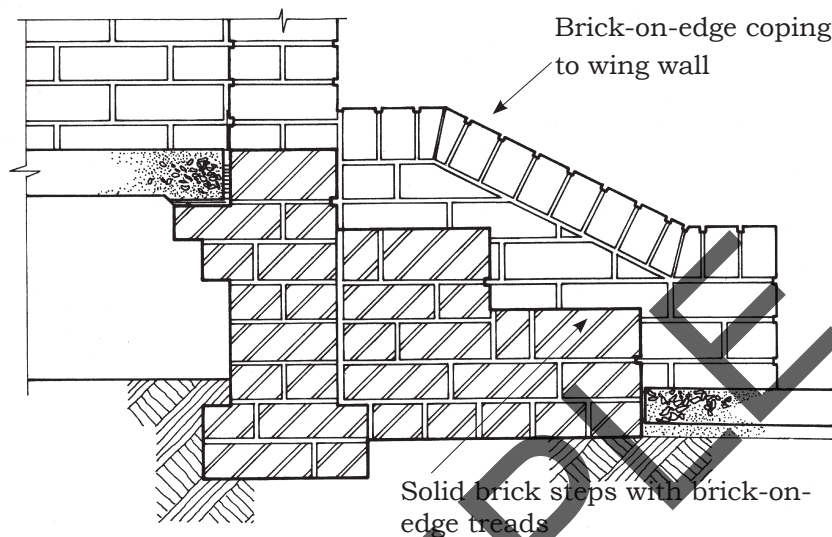


Fig. 8 Small solid brick flight of stairs

## CONCRETE

Reinforced concrete stairs are more commonly found in commercial construction, however this method of construction may also be used in residential buildings where the upper floor is also concrete. The most common use of concrete stairs in residential construction, is externally from balconies and verandahs.

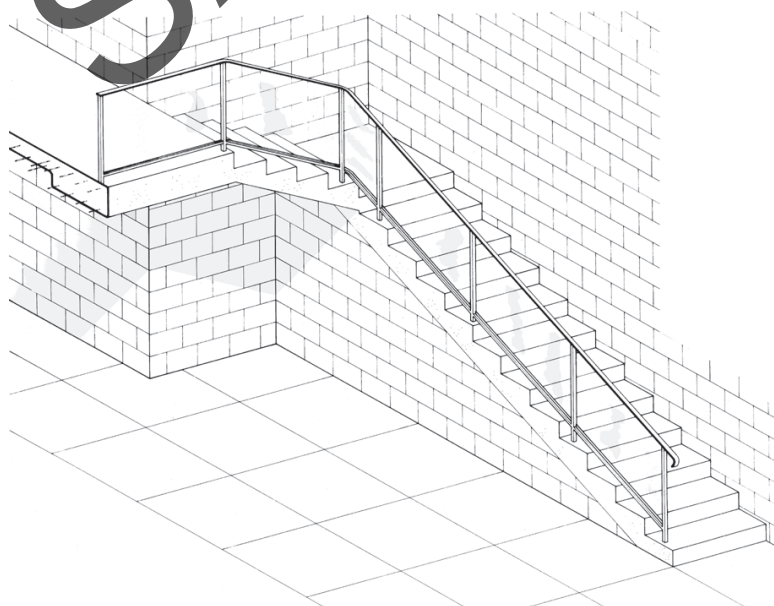


Fig. 9 External reinforced concrete stairs



## STEEL OR IRON

Steel stairs are more commonly associated with external commercial fire stairs, however they may also be used internally.

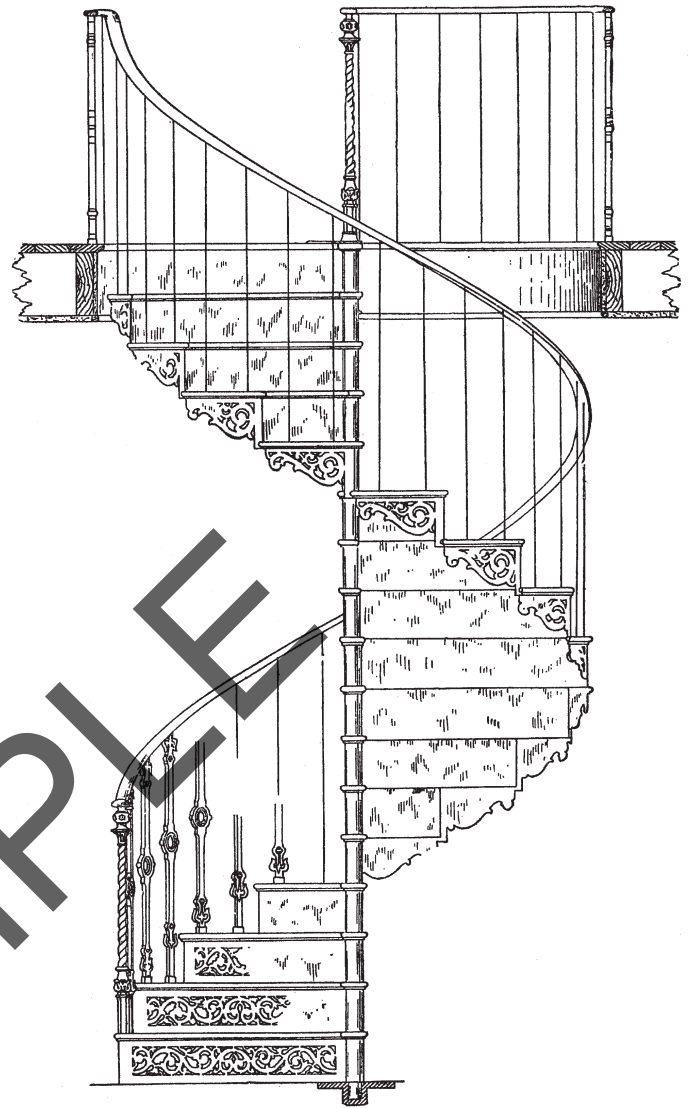
The most common construction type is the spiral stair, used in many Victorian period buildings where narrow building designs only provided compact areas for stairs.

Spiral stairs had a revival during the 1960's and early 70's in many contemporary cottages, although they were simplified in design and detail using a steel spine and handrail, supporting timber treads.

Some newer versions are of all timber construction using modular units and spacers to construct the flight.

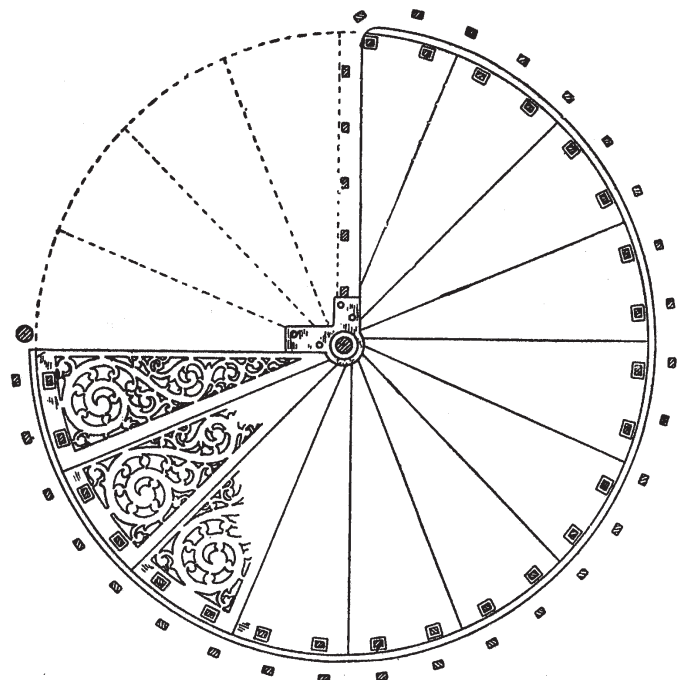
The tread width in the slope relationship, i.e. the preferred going width to step rise, is calculated at  $7/10$  (seven tenths) of the distance between the outside of the centre pole and the inside of the handrail.

This allows a person to ascend or descend the flight safely and easily.



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Fig. 10 Typical elevation and plan of an iron spiral stair



## OTHER TYPES

Straight flight steel stairs are most commonly used in commercial work as fire stairs and catwalks. They are normally constructed of galvanised steel with chequer-plate treads and landings, having open risers.

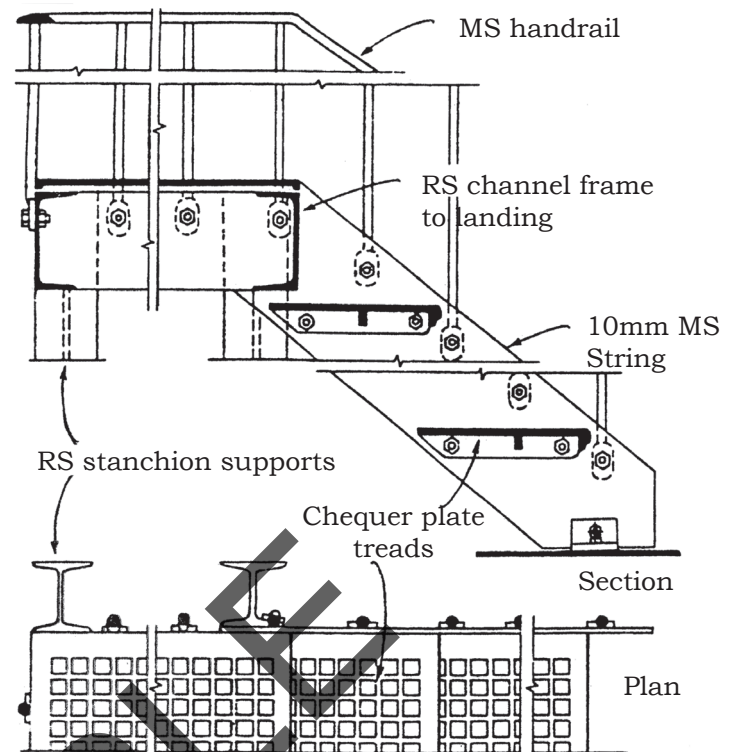


Fig. 11 Steel external stairs

Combinations of steel and timber may be used for internal stairs or steel and precast concrete treads for external use.

The usual method of design is to have a steel spine or carriage piece with welded angular brackets, to support and provide fixing for the treads.

Solid or laminated timber may be used for the treads and the handrails are typically made of fabricated steel.

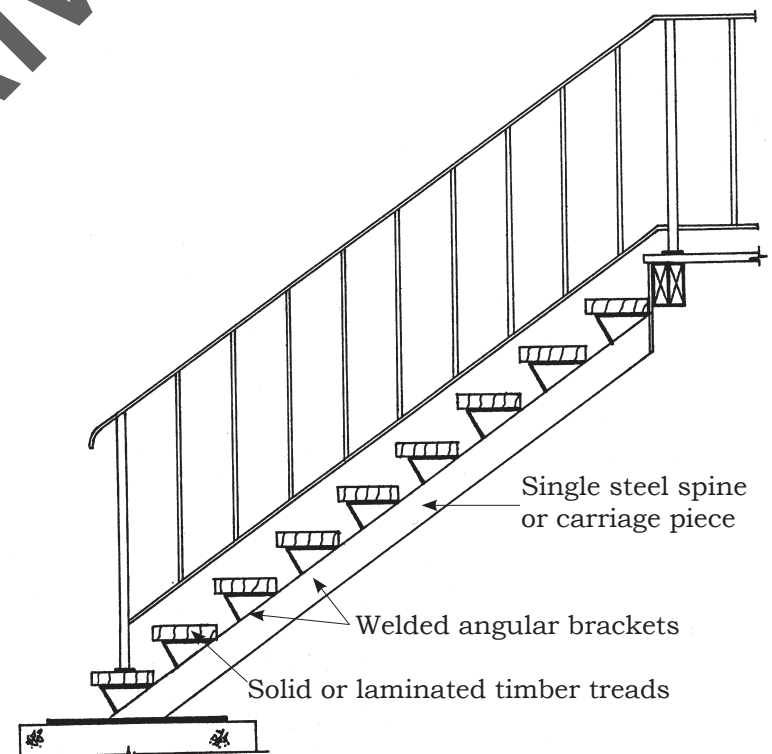


Fig. 12 Combination stairs

## TIMBER STAIRS

Timber stairs are probably the most common form of stair found in a residential building. They comprise of strings, treads, risers, landings and handrails and are normally closed riser construction, for internal use, and open riser construction for external use.

Where the treads and risers are to be covered with carpet the base material may be of structural particleboard or MDF (Medium Density Fibreboard).

Timber stairs, which are to be stained or clear finished, are normally made from hardwood timbers, as they provide the best resistance to wear and tear. Commonly used timbers may include meranti, brushbox, Sydney bluegum, jarrah, grey gum, turpentine and many other species. Naturally soft timbers, such as most of the conifers, should be avoided for traffic areas.

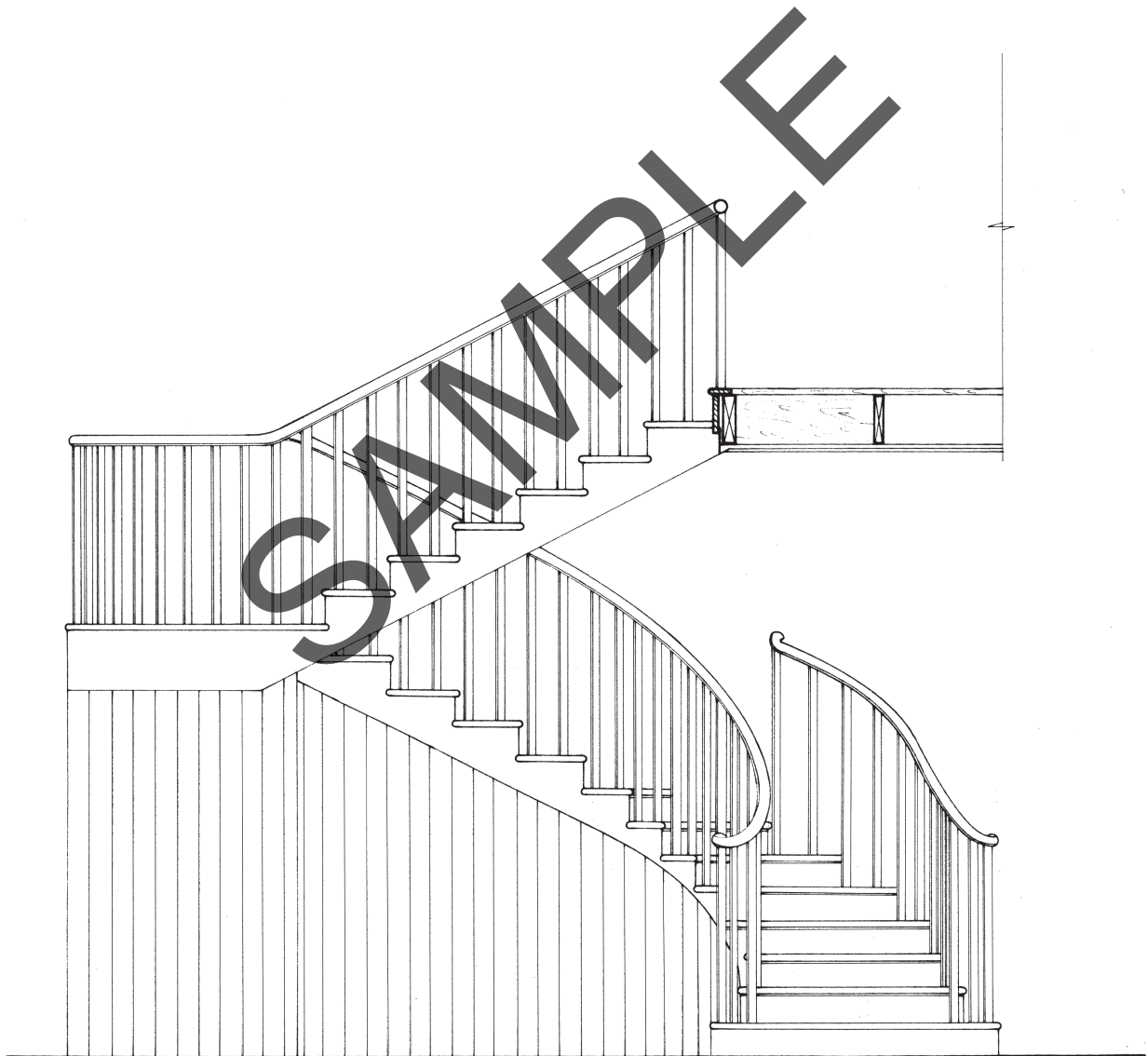


Fig. 13 Timber stairs for residential construction