

7.4.8.4 *Ladder landing*

The angle of the slope of the top landing shall not exceed 3° in any direction (see Note 1).

The foot of the ladder shall rest on, or terminate above, the landing (see Note 2).

Where the ladder provides access to a landing, the landing shall be at the same height as the top rung. The landing shall extend to the top rung, or there shall be a gap of not less than 50 mm and not greater than 100 mm between the top rung and the landing (see Note 3).

Ladder landings shall extend forward to at least the projected line of the rear of the stile (see Note 4).

NOTES:

- 1 For the cross-slope of bottom landings, see Clause 7.4.3.5.
- 2 For the required dimensions of landings, see Clause 7.3.6.
- 3 For landings level with the top rung, see Figure 7.12(a).
- 4 For bottom landings extending forward, see Figure 7.12(b).

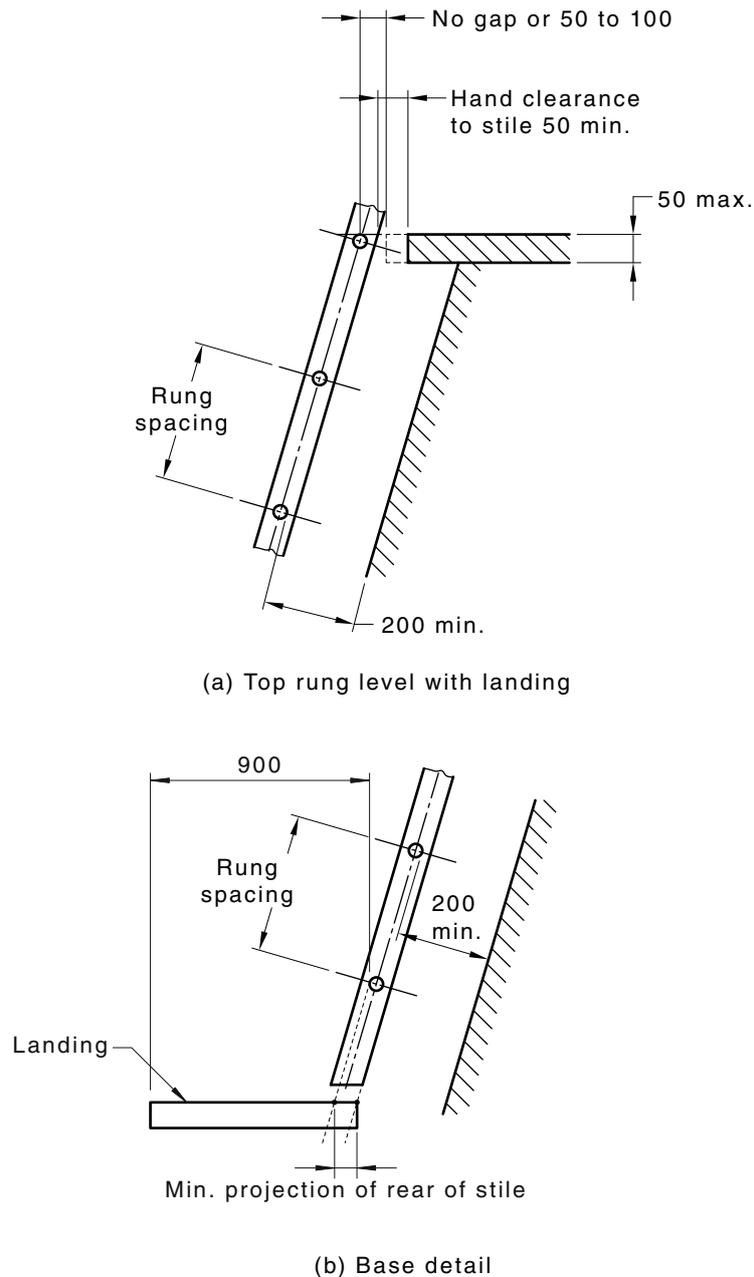
7.4.8.5 *Handrails*

Handrails mounted on stile extensions and projecting towards the user shall not be used (see Note 1).

Handrails mounted on stile extensions and projecting away from the user may be used as an aid to access.

NOTES:

- 1 This requirement is to discourage users from moving their centre of gravity further away from the rungs by gripping the handrails.
- 2 Guidance on handrails projecting from stile extensions is given in Appendix I.



DIMENSIONS IN MILLIMETRES

FIGURE 7.12 TYPICAL GAP BETWEEN LANDING AND LADDER

7.5 SINGLE-STILE RUNG-TYPE LADDERS

7.5.1 General

This Clause (7.5) sets out requirements for single-stile rung-type ladders. Single-stile rung-type ladders are typically installed where other means of access cannot be used.

Where single-stile rung-type ladders exceed 3.5 m in fall distance, a fall-arrest system conforming to AS/NZS 1891 series shall be provided.

7.5.2 Angle of slope

The angle of slope shall be not less than 85° to the horizontal. In no case shall the ladder overhang the person climbing the ladder.

7.5.3 Stile cross-section

The front face of central stiles shall not exceed 80 mm in width.

NOTE: See Figure 7.13 for a typical central stile cross-section.

Other cross-sections conforming to the design requirements of this Standard may be used, taking into account that stile is generally used to support rungs and act as the runner for a harness-based fall-arrest system and, as such, needs to be rated for fall-arrest fall loads.

7.5.4 Rungs

7.5.4.1 General

Rungs for single-stile ladders shall be in accordance with the requirements of Clause 7.1.2.2. The following requirements also apply:

- (a) Rungs shall be not less than 20 mm outside diameter.

NOTES:

1 Cross-sections other than circular are permitted and slip-resistant surfaces are recommended.

2 Rungs should provide a comfortable surface upon which to stand.

- (b) Rungs shall be securely fastened to the stile (e.g. by welding or swaging). In highly corrosive areas, rungs shall be completely sealed at the point where they enter or make contact with the stiles.
- (c) The point of attachment of the rung to the stile shall be smooth and free from projections likely to cause injury to the hands or legs.
- (d) Rungs shall be of the same level on both sides of the stile and shall be upturned at the ends for a minimum of 25 mm, as shown in Figure 7.13. The clear width between the upturned ends of the rungs shall be not less than 375 mm and not greater than 550 mm.

7.5.4.2 Rung spacing

Rungs shall be spaced as follows:

- (a) For ladders having a length greater than 1.5 m, not less than 250 mm and not greater than 300 mm.
- (b) For ladders having a length equal to or less than 1.5 m, not less than 200 mm and not greater than 300 mm.

The allowable variation to rung spacing shall be in accordance with Clauses 7.4.3.3 and 7.4.3.4. The spacing of all other rungs shall be uniform and within a tolerance of ± 5 mm. The top rung shall be at the same height as, or integrated into the landing.

The allowable cross-slope at the base of the ladder shall be in accordance with Clause 7.4.3.5.

C7.5.4.2 A closer rung spacing tolerance such as ± 2 mm, where achievable, will allow for safer movement up and down ladders.

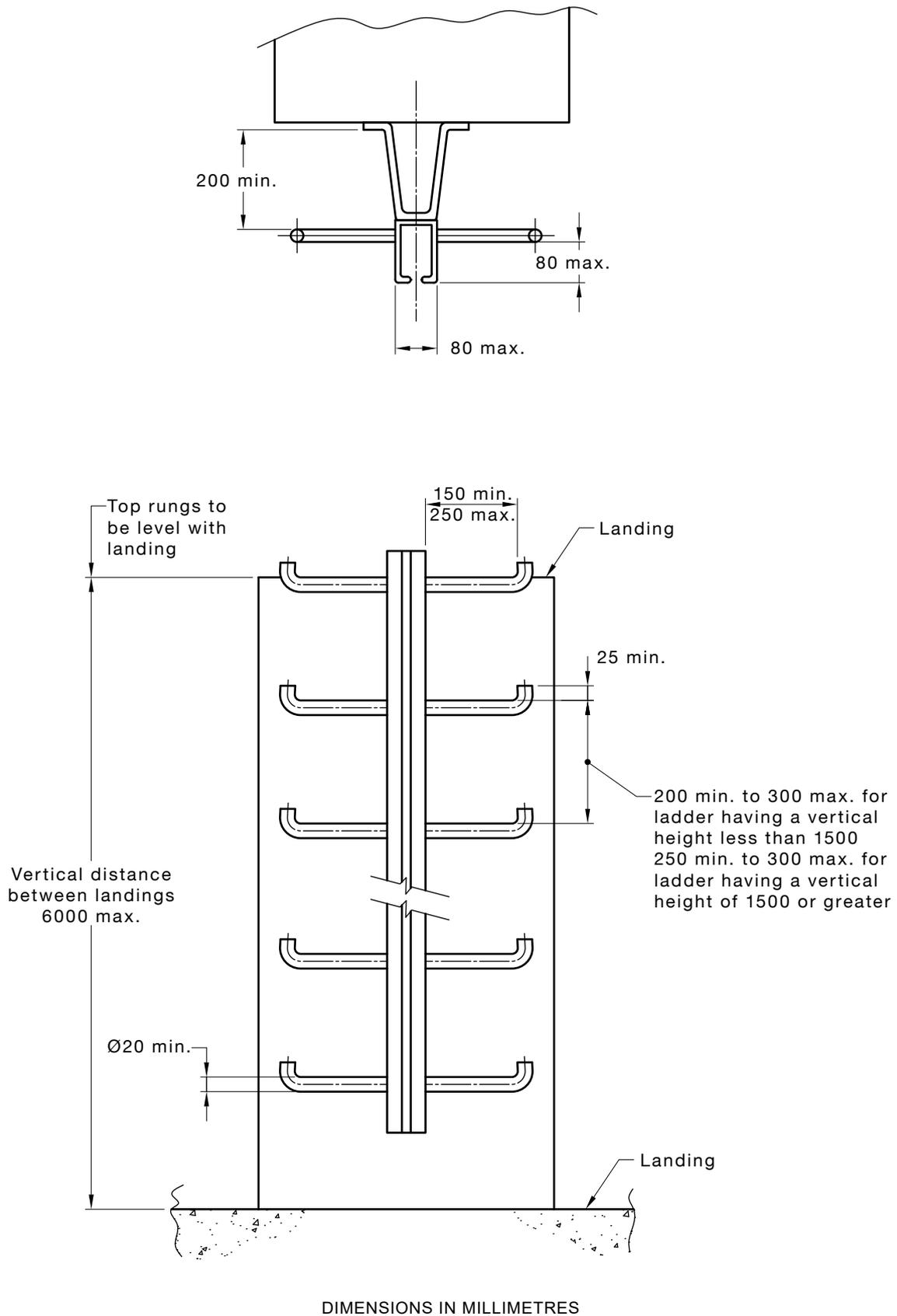


FIGURE 7.13 PRINCIPAL DIMENSIONS OF SINGLE-STILE RUNG-TYPE LADDERS

7.5.4.3 Fastenings

The ladder shall be secured with fastenings at the top and at the foot of the ladder and at intervals, to minimize lateral swaying and twisting during use.

The design of the ladder shall determine the distance between the fastenings and shall take account of potential twisting of the ladder as a person climbs or descends the ladder.

NOTE: The fastenings should be on the back of the ladder.

7.5.5 Clearances

Clearances between the single-stile ladder and all permanent objects that are not part of the ladder installation shall be in accordance with the requirements of Clause 7.4.5.

7.5.6 Landings

Landings for single-stile ladders shall be in accordance with the requirements of Clause 7.3.6.

7.5.7 Extension above landings

7.5.7.1 General

Where it is necessary for a person to step off the ladder onto a landing, the ladder shall extend not less than 1500 mm above the landing level and provision shall be made to ensure that any fall-arrest system remains connected while the user moves onto the landing and, if necessary, connects to another anchor point before disconnection from the ladder fall-arrest system.

7.5.7.2 Side access

A ladder rung shall be located level with the landing and any fall-arrest system shall be configured to allow the user to move to the landing and, where required, transfer safely to another anchor system before disconnection from the fall-arrest system on the ladder. The horizontal distance from the centre-line of the ladder to the landing edge shall be 400 mm to 450 mm.

7.5.7.3 Access through horizontal openings

Where access is provided through a horizontal opening (e.g. through a trapdoor or roof hatch), the following requirements shall apply:

- (a) The ladder shall extend not less than 1500 mm above the opening.
- (b) Handgrips above the level of the opening shall be provided. Provision shall be made for the user to safely connect to an alternative anchor system before disconnection from any fall protection system on the ladder.

Where it is necessary for a person to open a trapdoor while standing on a ladder—

- (i) provision shall be made for opening the trapdoor by remote means, or by the use of one hand; or
- (ii) a platform shall be provided to enable the opening of the trapdoor.

7.5.8 Ladder stile

The foot of the ladder stile shall terminate at or within 150 mm of landing, and the rear face of the first rung shall be within the vertically projected area of the landing.

NOTES:

- 1 For the required dimension of landings, see Clause 7.3.6.
- 2 Where guardrails are fitted to the landing platform, toeboards should not extend across ladder openings.

7.5.9 Handrails

Handrails shall not be used on single-stile rung-type ladders.

7.6 INDIVIDUAL-RUNG (STEP-IRON) LADDERS

7.6.1 General

Step-iron ladders shall be in accordance with this Clause (7.6) and with the general requirements and test methods of EN 13101, which applies to step-irons manufactured from cast iron, steel or aluminium. Where a conflict occurs, the requirements of this Clause (7.6) shall prevail.

NOTES:

- 1 EN 13101 specifies performance criteria for mechanical stability and resistance of step-irons. Corresponding test methods and evaluation conformity are included.
- 2 A step-iron type ladder should only be used where it is not reasonably practicable to use any other type of ladder.

7.6.2 Angle of slope

The angle of slope shall be not less than 80° to the horizontal (see Figure 2.1). In no case shall the ladder overhang the person climbing the ladder.

7.6.3 Rungs

7.6.3.1 General

The rungs for step-iron ladders shall conform to the following requirements:

- (a) The rungs shall be of size and cross-sectional shape conforming to the performance criteria of EN 13101 and this Standard.
- (b) The rungs shall be manufactured from cast iron, steel, aluminium or other material in accordance with EN 13101.
- (c) The rungs shall be provided with corrosion protection (e.g. plastic encapsulation) in accordance with EN 13101.

NOTES:

- 1 Corrosion protection measures include hot-dip galvanizing, electroplated galvanizing, anodizing or plastic encapsulation.
- 2 Corrosion protection should ensure the durability of the rungs for the design life of the structure in which they are embedded.
- 3 Where step-irons are to be used in highly corrosive environments, additional corrosion protection measures may be required. For example, electroplated galvanizing may be used together with plastic encapsulation.
- 4 Highly corrosive environments include sewers, industrial effluent systems, marine or salt spray environments and chemical plants.
- 5 Alternative design methods and materials may be used, provided it can be demonstrated the result satisfies the requirements of this Clause (7.6).
- 6 Figures 7.13 to 7.16 provide typical details and dimensional notation for step-iron type ladders.

7.6.3.2 Rung spacing

Rungs shall be spaced as follows:

- (a) For ladders having a length of greater than 1 m, a rung spacing of not less than 250 mm and not greater than 300 mm.
- (b) For ladders having a length of less than or equal to 1 m, rungs shall be evenly spaced but not greater than 300 mm apart.

The distance between rungs, including landing to the bottom rung, in the same ladder shall be uniform and within a tolerance of ± 5 mm.

7.6.3.3 Rung dimensions

The minimum diameter of the rung or width of the tread (T) shall be 20 mm.

NOTE: For typical examples, see Figures 7.14 and 7.15.

The minimum length of the tread (L) shall be 150 mm for single steps and 350 mm for double steps. The maximum length of the tread (L) shall be 550 mm.

The minimum clearance to the back edge of the rung ($P - T$) shall be—

- (a) 100 mm where the ladder access effective diameter is less than 650 mm; and
- (b) 150 mm where the ladder access effective diameter is 650 mm and over.

The rungs shall be provided with a minimum upstand height (H) of 20 mm on each end of the tread so that the foot cannot slip off the end of the rung.

All other dimensional requirements for the rungs shall be in accordance with EN 13101.

The dimensions of all rungs on the same ladder shall be uniform and within a tolerance of ± 2 mm.

The rungs shall be in accordance with the load testing and deflection requirements of EN 13101.

7.6.3.4 Fastenings

Every rung shall be permanently fixed to the adjoining structure or equipment.

Rungs shall be fixed so as to be coplanar where possible. The use of cranked rungs on circular or curved walls is permitted.

NOTE: For an example of coplanar rungs, see Figure 7.17.

7.6.3.5 Product testing and evaluation

The rungs for step-iron ladders shall conform to the initial type testing and factory production control requirements of EN 13101, with the following modifications:

- (a) The size of a production lot for factory production control shall be ≤ 5000 specimens.
- (b) There shall be no limit on the maximum number of production days.

NOTE: For further details of the product testing and evaluation requirements, see EN 13101.

7.6.4 Landings

Landings for step-iron ladders shall be in accordance with the requirements of Clause 7.3.6.

NOTE: The vertical rise for a step-iron ladder should not exceed 6 m. Where this is not reasonably practicable, one or more landings should be used and the vertical distance between landings should not exceed 6 m.

7.6.5 Ladder cage

A ladder cage conforming to Clause 7.4.7 shall be provided where—

- (a) the ladder access minimum clearance in front of the rungs is greater than 750 mm; and
- (b) a person could fall more than 6 m from a step-iron ladder, irrespective of landings.

Where installation of a ladder cage is not possible (e.g. lighting and transmission towers, wind turbines towers, pits and the like) a fall-arrest system conforming to AS/NZS 1891 series shall be provided.

7.6.6 Extension above landings

A step-iron ladder shall have a means that allows a person to gain safe access onto and off the ladder rungs at the top of the ladder and at any intermediate landing. A suitable means of safe access at the top of the ladder shall include—

- provision of permanent brackets and fixings to allow the use of portable step-through guardrails at the top of the ladder; or
- permanent extendable posts or guardrails at the top of the ladder; or
- provision of step-irons that extend at least 1500 mm above the top landing.

NOTE: A safe means of access at the top of a step-iron ladder is also by the use of a fall-arrest system conforming to AS/NZS 1891 series.

Where it is necessary for a person to step onto or off the step-iron ladder at an intermediate landing, the ladder rungs shall extend not less than 1500 mm above the intermediate landing level.

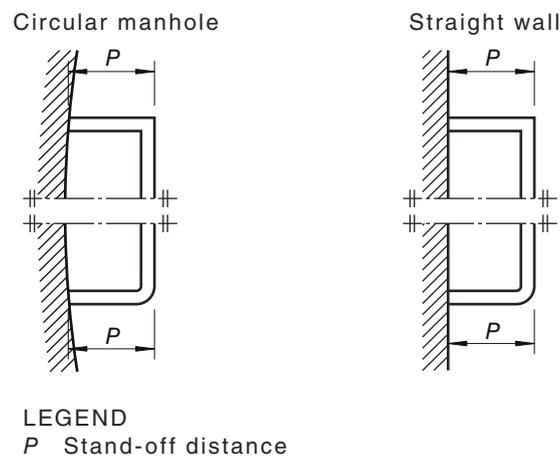


FIGURE 7.14 TYPICAL INDIVIDUAL-RUNG LADDER—CLEARANCE DIMENSIONS

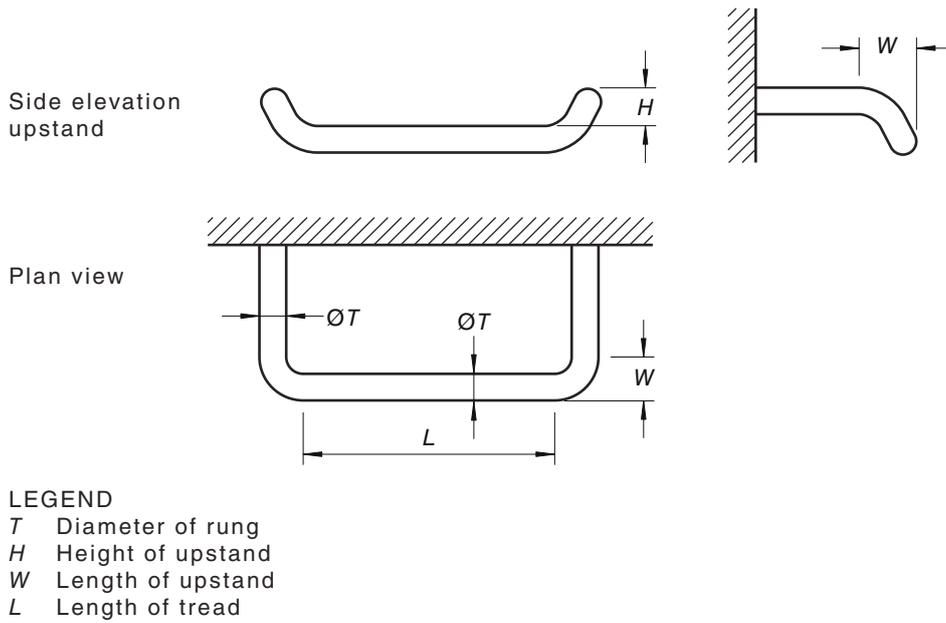


FIGURE 7.15 TYPICAL INDIVIDUAL-RUNG LADDER—
EXAMPLE FOR CIRCULAR TREAD

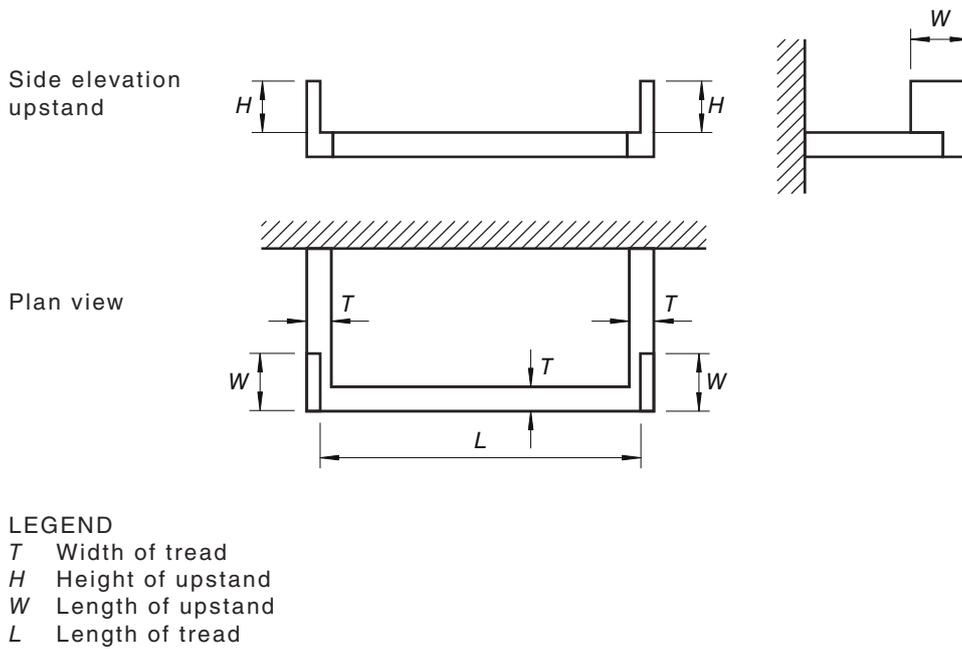


FIGURE 7.16 TYPICAL INDIVIDUAL-RUNG LADDER—
EXAMPLE FOR FLAT TREAD

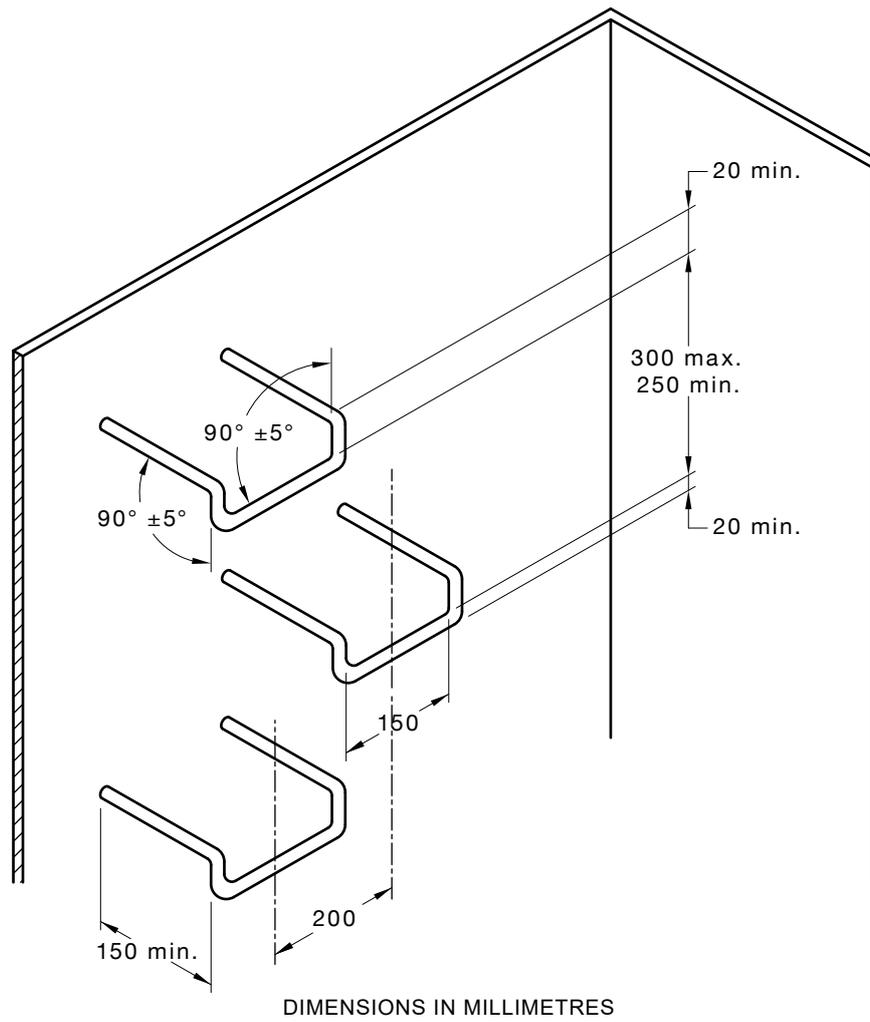


FIGURE 7.17 TYPICAL INDIVIDUAL-RUNG LADDER WITH COPLANAR RUNGS