

Resolution A.757(18)

*Adopted on 4 November 1993
(Agenda item 11)*

STANDARDS FOR THE CALCULATION OF THE WIDTH OF STAIRWAYS FORMING MEANS OF ESCAPE ON PASSENGER SHIPS

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety,

NOTING that, by resolution MSC.27(61), the Maritime Safety Committee adopted amendments to SOLAS chapter II-2 regarding fire-protection requirements in respect of new passenger ships which, *inter alia*, in regulation II-2/28.1.5.1 require that the width of the stairways shall conform to standards not inferior to those adopted by the Organization,

RECOGNIZING the need to develop standards for calculating the width of the stairways before the relevant SOLAS amendments enter into force on 1 October 1994,

1. ADOPTS the Standards for the Calculation of the Width of Stairways Forming Means of Escape on Passenger Ships, set out in the annex to the present resolution;
2. INVITES Governments to apply the above Standards when implementing the amendments to regulation II-2/28.1.5 of the 1974 SOLAS Convention, as amended, adopted by resolution MSC.27(61);
3. REQUESTS the Maritime Safety Committee to keep the Standards under review and improve them, when appropriate, taking into consideration developing designs and experience gained.

Annex

STANDARDS FOR THE CALCULATION OF THE WIDTH OF STAIRWAYS FORMING MEANS OF ESCAPE ON PASSENGER SHIPS

1 SCOPE

1.1 These standards should be used when applying regulation II-2/28.1.5.1 of the 1974 SOLAS Convention as amended by resolution MSC.27(61).

1.2 It should be recognized that the evacuation routes to the embarkation deck may include a muster station. In this case consideration should be given to the fire-protection requirements and sizing of corridors and doors from the stairway enclosure to the muster station and from the muster station to the embarkation deck using these guidelines, noting that evacuation of persons from muster stations to embarkation positions will be carried out in small controlled groups.

1.3 It is the intention that the calculation method should consider evacuation from enclosed spaces within each main vertical zone individually and take into account all of the persons using the stairway enclosures in each zone, even if they enter that stairway from another main vertical zone.

1.4 For each main vertical zone the calculation should be completed for the night time (case 1) and day time (case 2) and the largest dimension from either case used for determining the stairway width for each deck under consideration.

1.5 The calculation method determines the stairway width at each deck level, taking into account the three consecutive stairways leading into the stairway under consideration.

2 CALCULATION OF THE STAIRWAY WIDTHS

2.1 In considering the design of stairway widths for each individual case which allow for the timely flow of persons evacuating to the muster stations from adjacent decks above and below, the following calculation method should be used (see figures 1 and 2):

when joining two decks: $W = (N_1 + N_2) \times 10 \text{ mm};$

when joining three decks: $W = (N_1 + N_2 + 0.5N_3) \times 10 \text{ mm};$

when joining four decks: $W = (N_1 + N_2 + 0.5N_3 + 0.25N_4) \times 10 \text{ mm};$

when joining five or more decks the width of the stairways should be determined by applying the above formula for four decks to the deck under consideration and to the consecutive deck,

where:

W = the required tread width between handrails of the stairway.

The calculated value of W may be reduced where available landing area S is provided in stairways at the deck level defined by subtracting P from Z , such that:

$$P = S \times 3.0 \text{ persons/m}^2; \quad P_{\max} = 0.25Z$$

where:

Z = the total number of persons expected to be evacuated on the deck being considered;

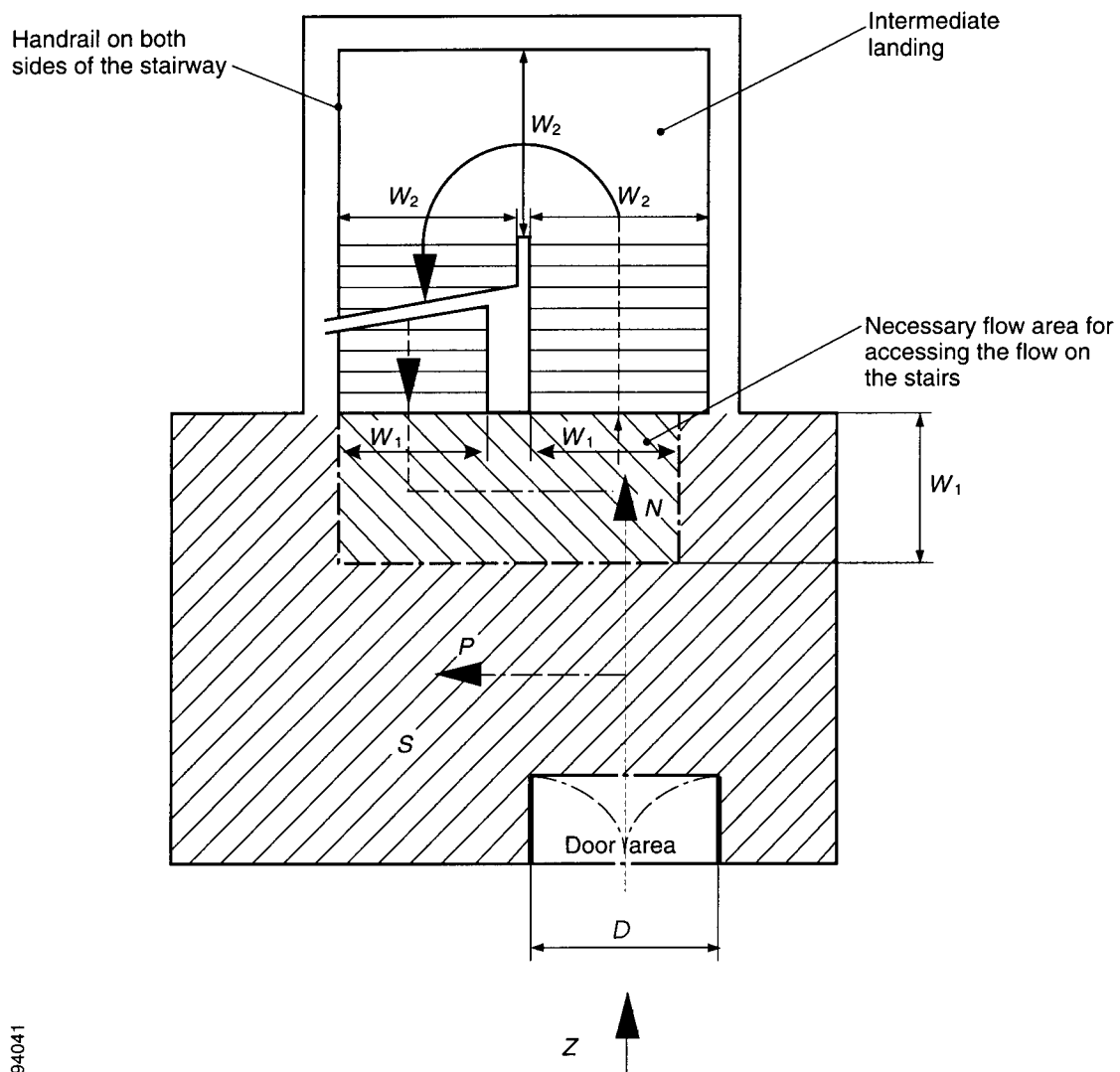
P = the number of persons taking temporary refuge on the stairway landing, which may be subtracted from Z to a maximum value of $P = 0.25Z$ (to be rounded down to the nearest whole number);

S = the surface area (m^2) of the landing, minus the surface area necessary for the opening of doors and minus the surface area necessary for accessing the flow on stairs (see figure 1);

N = the total number of persons expected to use the stairway from each consecutive deck under consideration; N_1 is for the deck with the largest number of persons using that stairway; N_2 is taken for the deck with the next highest number of persons directly entering the stairway flow such that, when sizing the stairway width at each deck level, $N_1 > N_2 > N_3 > N_4$ (see figure 2). These decks are assumed to be on or upstream (i.e. away from the embarkation deck) of the deck being considered.

2.2 The stairway should not decrease in width in the direction of evacuation to the muster station, except in the case of several muster stations in one main vertical zone the stairway width should not decrease in the direction of the evacuation to the most distant muster station.

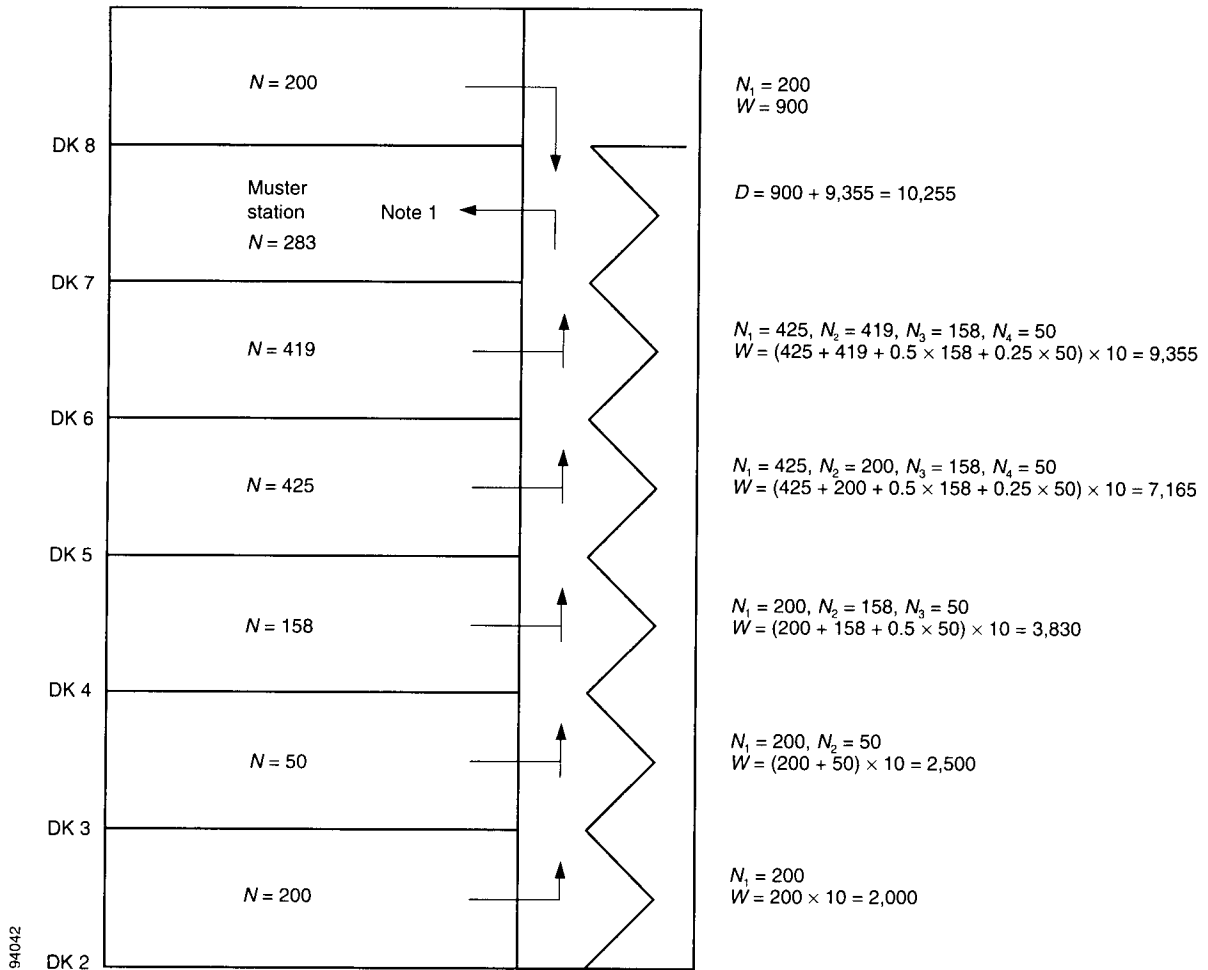
2.3 Where the passengers and crew are held at a muster station which is not at the survival craft embarkation position, the dimensions of stairway width and doors from the muster station to this position should be based on the number of persons in the controlled groups. The width of these stairways and doors need not exceed 1,500 mm unless larger dimensions are required for evacuation of these spaces under normal conditions.



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- $P = S \times 3 \text{ persons/m}^2 =$ the number of persons taking refuge on the landing to a maximum of $P = 0.25Z$;
- $N = Z - P =$ the number of persons directly entering the stairway flow from a given deck;
- $Z =$ number of persons to be evacuated from the deck considered;
- $S =$ available landing area (m^2) after subtracting the surface area necessary for movement and subtracting the space taken by the door swing area. Landing area is a sum of flow area, credit area and door area;
- $D =$ width of exit doors to the stairway landing area (mm)

Figure 1 - Landing calculation for stairway width reduction



Z (pers) = number of persons expected to evacuate through the stairway

N (pers) = number of persons directly entering the stairway flow from a given deck

W (mm) = $(N_1 + N_2 + 0.5 \times N_3 + 0.25 \times N_4) \times 10$ = calculated width of stairway

D (mm) = width of exit doors

$N_1 > N_2 > N_3 > N_4$ where:

N_1 (pers) = the deck with the largest number of persons N entering directly the stairway

N_2 (pers) = the deck with the next largest number of persons N entering directly the stairway, etc.

Note 1: The doors to the muster station should have aggregate width of 10,255 mm

Figure 2 - Minimum stairway width (W) calculation example

3 INITIAL DISTRIBUTION OF PERSONS ON BOARD

3.1 The calculations of stairway widths should be based upon the crew and passenger load on each deck. Occupant loads should be as rated by the designer for passenger and crew accommodation spaces, service spaces, control spaces and machinery spaces. For the purpose of the calculation the maximum capacity of a public space should be defined by either of the following two values: the number of seats or similar arrangements, or the number obtained by assigning 2 m² of gross deck surface area to each person.

3.2 The dimensions of the means of escape should be calculated on the basis of the total number of persons expected to escape by the stairway and through doorways, corridors and landing (see figure 3). Calculations should be made separately for the two cases of occupancy of the spaces specified below. For each component part of the escape route, the dimension taken should not be less than the largest dimension determined for each case:

Case 1 Passengers in cabins with maximum berthing capacity fully occupied;
members of the crew in cabins occupied to $\frac{2}{3}$ of maximum berthing capacity; and
service spaces occupied by $\frac{1}{3}$ of the crew.

Case 2 Passengers in public spaces occupied to $\frac{3}{4}$ of maximum capacity;
members of the crew in public spaces occupied to $\frac{1}{3}$ of maximum capacity;
service spaces occupied by $\frac{1}{3}$ of the crew; and
crew accommodation occupied by $\frac{1}{3}$ of the crew.

3.3 The maximum number of persons contained in a vertical zone, including persons entering stairways from another main vertical zone, should not be assumed to be higher than the maximum number of persons authorized to be carried on board for the calculation of the stairway widths only.

4 ADDITIONAL NOTATIONS

4.1 The aggregate width of stairway exit doors to the muster station should not be less than the aggregate width of stairways serving this deck.

4.2 The area of landings at each deck level required by regulation II-2/28.1.5.5 should be based on the total number of persons (Z) expected to be evacuated in accordance with regulation II-2/28.1.5.5 and should be considered prior to the calculation of the stairway width W .

4.3 Means of escape plans should be provided indicating the following:

- .1 the number of crew and passengers in all normally occupied spaces;
- .2 the number of crew and passengers expected to escape by the stairway and through doorways, corridors and landings;
- .3 muster stations and survival craft embarkation positions;
- .4 primary and secondary means of escape;
- .5 widths of stairways, doors, corridors and landing areas.

4.4 Means of escape plans should be accompanied by detailed calculations for determining the width of escape stairways, doors, corridors and landing areas.

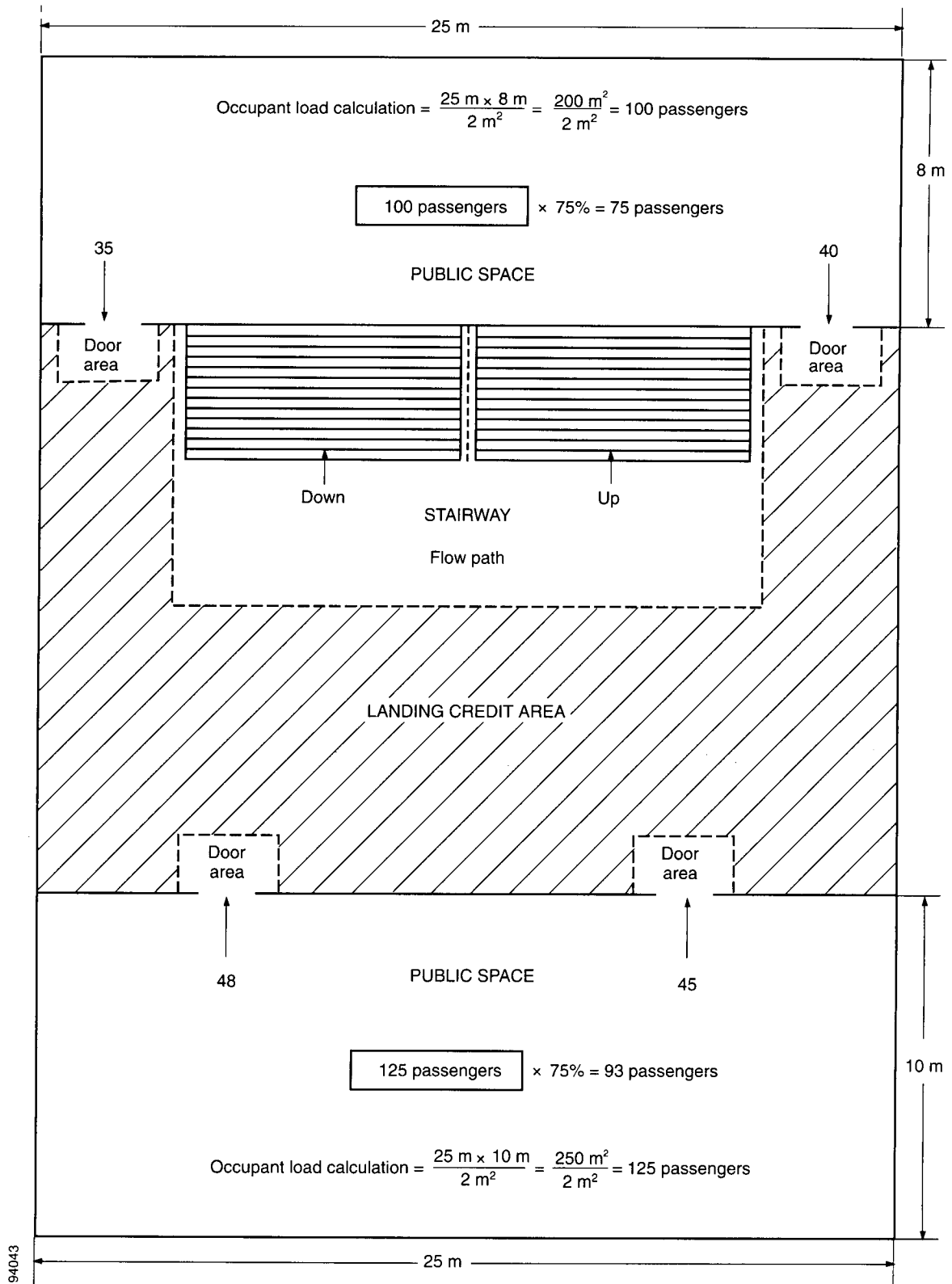


Figure 3 – Occupant loading calculation example