INTERNATIONAL STANDARD

ISO 8100-32

First edition
2020-06

Lifts for the transportation of persons and goods —

Part 32: Planning and selection of passenger lifts to be installed in office, hotel and residential buildings

Ascenseurs pour le transport des personnes et des charges —

Partie 32: Critères de sélection des ascenseurs à installer dans les immeubles de bureaux, les hôtels et les immeubles d'habitation

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

Reference number
ISO 8100-32:2020(E)

© ISO 2020

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **v**
Introduction ... **vi**
1 Scope ... **1**
2 Normative references ... **2**
3 Terms and definitions ... **2**
4 Symbols and abbreviated terms ... **8**
5 Use of this document ... **8**
5.1 Overview ... 8
5.2 Design process ... 9
5.3 Selection of analysis method ... 9
5.4 Selection of design criteria ... 10
5.4.1 General ... 10
5.4.2 Design criteria for calculation method ... 10
5.4.3 Design criteria for simulation method ... 11
5.4.4 Further criteria and considerations ... 12
5.5 Initial lift configuration ... 12
6 Basic, derived and assumed data ... **12**
6.1 Basic and derived data for calculation and simulation methods ... 12
6.2 Building data ... 13
6.3 Determining the population ... 13
6.3.1 General ... 13
6.3.2 Office buildings ... 13
6.3.3 Hotels ... 14
6.3.4 Residential buildings ... 14
6.4 Passenger data ... 14
6.5 Lift data ... 15
6.5.1 Special considerations for accessibility of persons with disabilities ... 15
6.5.2 Selection of rated speed ... 15
6.5.3 Selection of rated load and available car area ... 16
6.5.4 Other lift parameters ... 17
7 Calculation method ... **17**
7.1 Uppeak equations ... 17
7.2 Lift selection graphs ... 19
8 Simulation method ... **19**
8.1 Basis of the method ... 19
8.2 Series of simulations ... 19
8.3 Simulation requirements ... 20
8.4 Evaluation and review of simulation results ... 21
9 Reporting ... **23**
9.1 General ... 23
9.2 Authorship data ... 23
9.3 Information related to the building ... 23
9.4 Design criteria ... 24
9.5 Data related to lift installation ... 24
9.6 Calculated lift performance output data ... 25
9.7 Simulated output data ... 25
Annex A (informative) **Selection of rated load and available car area** ... **26**
Annex B (informative) **Speed selection** ... **28**
Annex C (informative) **Lift selection charts** ... **29**

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

Annex D (informative) **Example of calculation method and report** **37**
Annex E (informative) **Example of simulation method and report** **41**
Annex F (informative) **Building data form** **44**
Annex G (informative) **Flow chart of design process** **46**
Bibliography **47**

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*.

This first edition cancels and replaces ISO 4190-6:1984.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

Introduction

A lift installation describes a set of lifts by detailing the number, size, floors served, speed and various other characteristics of the lifts. An appropriate lift installation is usually one which provides good service to potential passengers with the least cost in terms of building core space.

In earlier years, the lift industry relied on probability based uppeak analysis formulae which calculated interval and handling capacity values. If the interval and handling capacity values of a specific lift installation meet recommended criteria, then the configuration is assumed to be acceptable. This traditional uppeak analysis worked well when lifts were relay-based and is still used for evaluating simple situations or to obtain initial estimates for more complex situations.

Some lifts now include sophisticated computer program-based traffic control systems. These control systems are difficult to describe with formulae but can be evaluated with the use of computer simulation programs.

This document provides two methods to determine an appropriate lift installation. The methods areas follows.

1) Calculation: the calculation method uses traditional uppeak analysis formulae. Selection charts in Annex C based on the calculation method provide a quick way of determining the lift installation for simple scenarios. The calculation method determines interval and handling capacity values that can be used to evaluate a lift installation. This method is recommended for relatively simple situations or to obtain an initial lift installation to be further analysed via simulation. The ISO calculation method is described in Clause 7 and a typical example using the formulae is given in Annex D.

2) Simulation: the simulation method is used to clarify service levels with different traffic control systems such as destination control. This method is recommended in complex situations or when detailed information other than interval and uppeak handling capacity values is desired. The ISO simulation method is described in Clause 8 and a typical example is given in Annex E.

Both levels require building, passenger and lift data (Clause 6). An initial data form is shown in Annex F.

This document applies the recommendation of ISO/TR 11071-2 which says:

> "While the entire subject of capacity and loading has historically been treated in safety codes as one and the same, it might be more meaningful in the future writing of safety codes to cover loading as a separate issue from capacity. One refers more appropriately to the traffic handling capacity, whereas the other refers to the maximum carrying capacity, which has a direct bearing on safety."

Accordingly, this document distinguishes car capacity and car loading by passengers when discussing the selection of rated load and available car area (6.5.3 and Annex A).

This document is intended to be a reference in the early stages of a project and can be especially useful to clients or building owners, architects, general and specialized engineering consultants, building managers, lift consultants, lift contractors, building developers, principal contractors and other interested parties.

This document reflects the requirements of the global marketplace and takes into account the special needs such as accessibility of persons with disabilities (6.5.1). Although this document does not give recommendations for the planning or selection of goods (US: freight[1]) lifts, goods lifts are an important aspect of lift planning.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

1) Hereinafter, the term "goods" is used in place of the term "freight".

 © ISO 2020 – All rights reserved

Lifts for the transportation of persons and goods —

Part 32: Planning and selection of passenger lifts to be installed in office, hotel and residential buildings

1 Scope

This document covers traffic planning and selection of new passenger lift installations in office, hotel and residential buildings. The requirements and recommendations given are applicable to both simple and complex lift installations.

This document gives guidance to select the most appropriate method of traffic planning for each case within the scope.

This document permits the number and configuration of lifts and their main characteristics to be determined at the early stages of building design, provided that the size and intended use of the building is known.

This document is applicable to lifts classified according to Table 1.

Table 1 — Classification of lifts according to ISO 8100-30

Class	Purpose
Class I	Lifts designed for the transport of persons
Class II	Lifts designed mainly for the transport of persons but in which goods can be carried
Class VI	Lifts designed to suit buildings with intensive traffic, i.e. lifts with speeds of 2,5 m/s and above

This document is applicable to mixed use buildings provided that the mixed use can be evaluated separately as either office, residential or hotel use. This document proposes a standardized method of lift traffic planning. Alternative methods can be valid but are not in the scope of this document.

This document gives basic requirements and recommendations as part of the planning and selection of lift(s) relating to:

a) the design criteria to be evaluated;

b) the values of design criteria to be used;

c) a calculation method (see Clause 7) to be used as part of simple planning and selection of lifts (5.3);

d) a simulation method (see Clause 8) to be used as part of simple and more complex planning and selection of lifts (5.3);

e) output report format of lift planning and selection analysis to be provided to interested parties;

f) consideration of existing safety standards and cultural norms for determining the number of persons that can fit into a specific size of car[2];

g) accommodation for luggage, bicycles, prams, etc., or other non-personal items that can be transported with passengers in the lifts;

h) accessibility for persons with disabilities.

2) The European Lift Directive 2014 refers to the car as a carrier.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

This document does not address:

i) the transportation of goods only;

j) the transportation of passengers using multiple cars sharing a single hoist way;

k) the transportation of passengers using double deck systems;

l) terminal to terminal travel in excess of 200 m and/or rated speed above 7 m/s;

m) variations to the calculation method (e.g. traffic conditions other than uppeak, door dwell time definitions, unequal floor heights, unequal floor populations, speed not being reached in one floor jump, etc.);

n) variations to the simulation method (e.g. passenger batches or traffic templates with variable passenger demand);

o) design of simulator models or traffic control systems;

p) advanced passenger features (e.g. walking speed);

q) performance verifications of the design after installation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4190-5, *Lift (Elevator) installation — Part 5: Control devices, signals and additional fittings*

ISO 8100-30:2019, *Lifts for the transport of persons and goods —Part 1: Safety requirements for passenger and goods passenger lifts*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4190-5, ISO 8100-30 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
available car area
A_{car}
area of the car, which is available for passengers or goods during operation of the lift

Note 1 to entry: The available car area is expressed in m^2.

[SOURCE: EN 81-20:2014, 3.3, modified — Note 1 to entry has been added.]

3.2
conventional control system
lift system with collective control that requires call buttons on each landing and floor selection buttons in the car

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

3.3
destination control system
lift system that provides landing controls for selecting destination floors, lobby indicators designating which lift to board, and a car indicator designating the floors at which the car will stop

Note 1 to entry: Also called hall call allocation or destination-oriented lift system (DO) (see ISO 4190-5:2006, 3.1.3).

3.4
door closing delay time
t_{cd}
delay after passenger clearance before door closing

Note 1 to entry: The door closing delay time is expressed in s.

3.5
door closing time
t_c
period of time measured from the instant the car doors start to close until the doors are closed

Note 1 to entry: The door closing time is expressed in s.

3.6
door opening time
t_o
period of time measured from the instant that the car doors start to open until they are open to a specified width

Note 1 to entry: Measurements may be completed at the instant that the doors are either 800 mm open or until the doors are fully open.

Note 2 to entry: The opening width used shall be reported.

Note 3 to entry: The door opening time is expressed in s.

3.7
door pre-opening time
advance door opening time
t_{pre}
period of time measured from the instant that the car doors start to open until the lift is level at a landing

Note 1 to entry: Door pre-opening may compensate for lift levelling, which is the final (slow) approach of the lift to a landing.

Note 2 to entry: The door closing time is expressed in s.

3.8
entrance bias
proportion of traffic attributed to a specific *entrance floor* (3.9)

3.9
entrance floor
floor with building entrance or utility floor, e.g. restaurant, which attract people from populated floors

3.10
express zone
building zone situated between an *entrance floor* (3.9) and served floors where lift travels nonstop

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

3.11
flight time
t_f
period of time from the instant the lift starts to move until the lift is level at the next stop floor

Note 1 to entry: Flight time is usually calculated by assuming ideal lift kinematics based on the rated speed, rated acceleration and jerk.

3.12
handling capacity
C_h
maximum sustainable number of passengers per specified time period that a single lift or a *lift group* (3.15) can transport for a specific *traffic mix* (3.34) under specified loading constraints

Note 1 to entry: Handling capacity is usually expressed as a number of passengers per five minutes (C_h) or as a percentage of population per five minutes (%C_h).

Note 2 to entry: Typical loading constraints are limiting the number of passengers in the cars and are determined by comfort and/or safety considerations that may reflect cultural and/or national norms.

Note 3 to entry: The average waiting time increases rapidly and passengers are constantly left behind the departing lift, when passenger demand exceeds handling capacity.

3.13
incoming traffic
component of traffic where passengers travel from *entrance floors* (3.9) to the populated floors

3.14
interfloor traffic
component of traffic where passengers travel between the populated floors

3.15
lift group
set of lifts having the management of calls in common

Note 1 to entry: Usually a lift group serves the same set of floors, for example, low rise served, high rise served, etc.

3.16
loading limit
F_l
ratio between the maximum number of passengers allowed in the car during simulation, P_{sim} (Clause 4), and the *rated passenger capacity* (3.26)

Note 1 to entry: Used in selection of rated load according to Formula (4).

Note 2 to entry: Loading limit is in the range 0,5 to 1,0, where a value of 0,8 or less should be selected to avoid overcrowding.

3.17
lunch traffic
traffic that mostly consists of *incoming* (3.13) and *outgoing* (3.20) passengers and also contains *interfloor* (3.14) traffic

Note 1 to entry: Lunch traffic is typical for office buildings. A typical traffic mix can be 45 % incoming, 45 % outgoing and 10 % interfloor for office buildings.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

3.18
net internal area
A_{ni}
usable area within a building measured (at each floor level) to the internal finishes of structural external or party walls, but excluding washrooms, mechanical equipment rooms, stairs and lift well, common entrance halls, lobbies and corridors, internal structural walls and columns

Note 1 to entry: Net internal area and other similar terms are defined in more detail by other documents; they may depend on national norms and local practice.

Note 2 to entry: The net internal area is expressed in m^2.

3.19
nominal travel time
theoretical time of travel
t_{nt}
time period in seconds for a lift to travel from the lowest floor to the highest floor without any stops at *rated speed* (3.27)

Note 1 to entry: The nominal travel time is expressed in s.

3.20
outgoing traffic
component of traffic where passengers travel from the populated floors to *entrance floors* (3.9)

3.21
passenger demand
λ
rate at which people request service from a lift system normally expressed in conjunction with a *traffic mix* (3.34)

Note 1 to entry: Passenger demand is usually expressed as a number of passengers per five minutes (λ) or as a percentage of population per five minutes (%λ).

3.22
passenger transfer time
t_p
average time for a single passenger to enter or leave the car

Note 1 to entry: The passengers usually move out faster than they move in. Transfer time is an average of both of them.

Note 2 to entry: The passenger transfer time is expressed in s.

3.23
performance time
door-to-door time
t_{perf}
period of time between the instant the car doors start to close and the instant that the car doors are open to a specified width at the next adjacent floor

Note 1 to entry: The performance time is expressed in s.

Note 2 to entry: Measurements may be completed at the instant that the doors are 800 mm open or until the doors are fully open.

3.24
population
U
maximum population a target building is going to be designed for

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

3.25
rated load
Q
load for which the lift has been built and under which it is designed to operate

Note 1 to entry: The rated load is expressed in kg.

[SOURCE: ISO 8100-30:2019, 3.4.2, modified — The symbol Q and Note 1 to entry have been added.]

3.26
rated passenger capacity
maximum number of passengers in a lift car that must not be exceeded due to safety norms

3.27
rated speed
v_n
speed for which the lift has been built and at which it is designed to operate

Note 1 to entry: The rated speed is expressed in m/s.

[SOURCE: ISO 8100-30:2019, 3.4.1, modified —Note 1 to entry has been added.]

3.28
required handling capacity
$C_{\mathrm{h,req}}$
number of passengers per specified time period that a single lift or a *lift group* (3.15) shall be able to sustainably transport according to the design criteria for a specific *traffic mix* (3.34) under specified loading constraints

Note 1 to entry: Required handling capacity is usually expressed as a number of passengers per five minutes ($C_{\mathrm{h,req}}$) or as a percentage of population per five minutes ($\%C_{\mathrm{h,req}}$).

Note 2 to entry: Typical loading constraints are limiting the number of passengers in the cars and are determined by comfort and/or safety considerations that can reflect cultural and/or national norms.

3.29
reversal floor
number of floors above the *entrance floor* (3.9) at which point the car reverses to return back to the entrance floor

Note 1 to entry: Used in the *round trip time* (3.31) calculation where it is calculated with a formula to determine an average value.

3.30
rise
set of floors served by a lift group

3.31
round trip time
t_{rt}
average period of time for a single lift car trip during uppeak traffic conditions, measured from the time the car doors open at the main terminal until the car doors reopen at the main terminal after serving the registered car calls

Note 1 to entry: The round trip time is expressed in s.

3.32
start delay time
t_{sd}
period of time from the instant the car doors are closed until the lift starts to move

Note 1 to entry: The start delay time is expressed in s.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

3.33
time to destination
period of time from when a passenger either registers a landing call, or joins a queue, until the responding lift begins to open its doors at the destination floor

3.34
traffic mix
traffic consisting of specified proportions of *incoming* (3.13), *outgoing* (3.20), and *interfloor traffic* (3.14)

3.35
transit time
period of time from when a responding lift begins to open its doors at the boarding floor until the doors begin to open again at the destination floor

Note 1 to entry: The transit time commences when a passenger arrives, if the responding lift doors are open or opening.

3.36
two-way traffic
traffic mix (3.34) that consists of *incoming* (3.13) and *outgoing* (3.20) passengers without any *interfloor traffic* (3.14)

3.37
uppeak interval
t_{int}
average time between successive car departures from the main *entrance floor* (3.9)

Note 1 to entry: In the calculation method (Clause 7), the interval is defined as the round trip time divided by the number of lifts in the group.

Note 2 to entry: The uppeak interval is expressed in s.

3.38
uppeak traffic
traffic that consists mostly of *incoming* (3.13) passengers

Note 1 to entry: Pure uppeak traffic consists of 100 % of incoming passengers.

Note 2 to entry: In practice, pure uppeak is rarely encountered, and the traffic mix can include proportions of outgoing and interfloor traffic (e.g. 85 % incoming, 10 % outgoing and 5 % interfloor traffic).

3.39
utilization factor
F_u
ratio of the utilized space (where people are physically seated) in relation to the *net internal area* (3.18)

3.40
waiting time
period of time from when a passenger either registers a call on a landing, or joins a queue, until the responding lift that will accommodate the passenger begins to open its doors at the boarding floor

Note 1 to entry: The passenger waiting time continues if a passenger does not enter the responding lift, e.g. it is full (a refusal).

Note 2 to entry: The passenger waiting time is zero, if the responding lift doors are open or opening when the passenger arrives.

Note 3 to entry: There can be a difference between waiting times measured at a site and waiting times produced by a simulation due to the difficulty of accurately measuring waiting times at an actual site.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

3.41
workplace area
A_{wp}
subset of an office area that represents the average amount of space allocated as working space for a single person

Note 1 to entry: The workplace area is expressed m^2 per person.

4 Symbols and abbreviated terms

A_p	average area per person (m^2)
C_h	handling capacity (passengers per 5 min)
$\%C_h$	handling capacity (% of population per 5 min)
D	terminal to terminal travel (m)
d_f	average interfloor distance (m)
H	average highest reversal floor
L	number of lifts
m_p	average mass per person (kg)
N	number of landings served above entrance floor
P_{calc}	average number of passengers in the car at departure from the main entrance floor (for calculation method)
P_{sim}	maximum number of passengers allowed in the car during simulation (input for simulation method)
S	probable number of stops
t_{aw}	average waiting time (s)
$t_{aw,req}$	required average waiting time (s)
$t_{int,req}$	required uppeak interval (s)
$t_f(1)$	single (1) floor flight time (s)
t_s	time consumed in stopping (s) NOTE Sometimes called time losses per stop or stop loss time.
t_v	time to travel between two standard pitch adjacent floors at rated speed (s)
$\%\lambda$	percentage passenger demand (% of population per 5 min)

5 Use of this document

5.1 Overview

The purpose of this document is to determine solutions for lift installations to serve the expected passenger demands in a building. The selection should meet the design criteria to avoid poor service at

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

all times, as this can limit the usability of the building. It is also important to avoid an over provision of equipment and the excessive use of space.

Consideration should be given to the long-term use of the building and its potential changes in the future, including densification, accessibility, usage and signalling.

NOTE ISO 8100-30 gives a globally agreed range of standardized layouts, rated loads and rated speeds to meet different vertical transportation needs and also provides the type of and size of entrance, the shape of car, etc.

To achieve higher efficiency, buildings with large numbers of floors may be split into rises, for example, by dividing buildings into a low-rise group and a high-rise group with an express zone. Parking floors, restaurant levels, shopping areas, gyms, observation decks, etc., can be served by separate lifts or escalators.

5.2 Design process

The steps of the design process and their sequence aim to make the overall process comprehensive, reproducible and well documented. Each step is described in this document.

The processing order of the steps is important and shall be followed as described below (Annex G).

a) The building data shall be collected, including the type of the building and its population (6.3).

NOTE 1 The quality of any traffic design is dependent on the quality of the data obtained.

b) The method of traffic analysis shall be selected (5.3).

c) The design criteria shall be selected (5.4).

d) An initial lift configuration shall be chosen for each lift group (5.5).

NOTE 2 If there are multiple lift groups, each one is considered separately.

e) A traffic analysis for the chosen lift configuration shall be carried out, using the method selected above (Clauses 7 and 8).

f) The lift configuration shall be changed if the results from the traffic analysis do not meet the design criteria or are significantly in excess, or if alternative design criteria are considered (see also 5.4.3 and 6.1). If the lift configuration is changed, the process shall be repeated from step e).

g) The results from selected traffic analysis for the final lift installation shall be presented in a report that documents the assumptions and design decisions, as well as the method of the traffic analysis and its outcome (Clause 9).

5.3 Selection of analysis method

As part of a specific design process (5.2), this document uses two methods of traffic analysis.

For simpler cases, a calculation method (Clause 7) can be sufficient. It is based on the concept known as uppeak traffic and determines uppeak handling capacity and interval.

For all cases with more complex traffic demands and all cases with destination control systems, the simulation method (Clause 8) shall be used. In an analysis using the simulation method, the lift parameters and the served floors of lifts can be defined individually and the group control system shall be defined. The simulation method can produce diversified results including waiting times, and the saturation point can be analysed to show where the passenger demand is too high for the lifts to handle the traffic.

A design shall be considered as complex, when one or more of the following conditions apply, including:

a) the traffic control is a destination control system;

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

b) the number of floors served by the lift group is greater than 18 floors;

c) the lift group serves more than one entrance floor, each with given entrance bias;

d) there are more than eight lifts in the group;

e) the group contains lifts of different specification (e.g. capacity, speed, door type, car shape, etc.);

f) not all lifts in the group serve all floors;

g) the lift group serves levels below the entrance floor;

h) there are "magnet" floors (e.g. restaurant, fitness centre, shopping level, etc.) other than the main entrance floor.

5.4 Selection of design criteria

5.4.1 General

The design criteria shall be specific to the analysis method selected (5.3).

5.4.2 Design criteria for calculation method

The calculation method (Clause 7) is based on pure uppeak traffic. All lifts in the group are assumed to be same. The building entrance is on the lowest floor, and passengers travel to the upper floors with equal bias per floor.

The design criteria for the calculation method shall be:

a) a required uppeak handling capacity, $\%C_{\mathrm{h,req}}$;

b) a required uppeak interval, $t_{\mathrm{int,req}}$.

The values of a) and b) shall be selected to ensure the peak passenger demand is served at the required level of service. Typical values are shown in Table 2 for guidance.

Table 2 — Typical design criteria for calculation method, depending on building type

Building type	Required uppeak handling capacity $\%C_{\mathrm{h,req}}$ % of population per 5 min	Required uppeak interval $t_{\mathrm{int,req}}$ s
Office	≥12	≤30
Hotel	≥12	≤40
Residential	≥6	≤60

The values shown in Table 2 accommodate standard designs and assume that car selection has been based on both mass and area (see 6.5.3 and Annex A). If only mass is considered for car selection, higher values for the required uppeak handling capacity should be considered. Higher performance designs can also require higher handling capacity and lower interval values for more comfort.

A selected lift configuration fulfils the design criteria if the values from the calculation method are equal or better than the required values.

NOTE 1 For an example, see Annex C (selection charts) and Annex D (calculation method example).

NOTE 2 Other values can be used provided they are documented with reasons. The values given can change depending on national and cultural norms, building usage, etc. For example, in single-tenant office buildings with heavy interfloor traffic, a higher handling capacity can be required.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

5.4.3 Design criteria for simulation method

For the simulation method (Clause 8), one or more traffic mixes shall be selected according to the anticipated passenger demands. The selected traffic mixes should represent peak traffic situations where the passenger demand in the building is high.

A traffic mix can be defined by specifying the percentage of incoming, outgoing and interfloor traffic and, for each component (incoming, outgoing, interfloor), the frequency of passengers per boarding floor and per destination floor.

The design criteria for the simulation method shall be, for each selected traffic mix:

a) a required handling capacity, $\%C_{\mathrm{h,req}}$;

b) a required average waiting time, $t_{\mathrm{aw,req}}$.

Other design criteria may be added.

For each selected traffic mix:

a) the value of the required handling capacity, $\%C_{\mathrm{h,req}}$, shall be selected at least as high as the maximum expected passenger demand;

b) the value of the required average waiting time, $t_{\mathrm{aw,req}}$, shall be selected at the level of the maximum acceptable average waiting time over all boarding floors.

Typical sets of traffic mix and design criteria are shown in Table 3 for guidance.

Table 3 — Typical design criteria for simulation method, depending on building type

Building type and traffic mix	Required handling capacity $\%C_{\mathrm{h,req}}$ % of population per 5 min	Required average waiting time $t_{\mathrm{aw,req}}$ s
Office:		
— uppeak traffic (100 % incoming); or	≥12 %	≤30
— mixed uppeak traffic (85 % incoming, 10 % outgoing, 5 % interfloor); and	≥12 %	≤35
— lunch traffic (40 % incoming, 40 % outgoing, 20 % interfloor); or	≥11 %	≤40
— lunch traffic (45 % incoming, 45 % outgoing, 10 % interfloor)	≥11 %	≤40
Hotel:		
— two-way traffic (50 % incoming, 50 %outgoing) NOTE Hotel chains can have their own design criteria.	≥12 %	≤40
Residential:		
— two-way traffic (50 % incoming, 50 % outgoing)	≥7 %	≤60

NOTE 1 For an example of use, see Annex E.

The values shown above accommodate standard designs.

NOTE 2 Other values can be used provided they are documented with reasons. The values given can change depending on national and cultural norms, building usage, etc. For example, for luxury residential buildings, the average waiting time should be less than 40 s.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

NOTE 3 Larger cars can be necessary to improve passenger comfort (see also 6.5.3).

For each selected traffic mix (set of traffic mixes for office buildings), the simulation method shall be applied independently.

For office buildings, at least one uppeak and at least one lunch traffic shall be analysed. For office buildings, the design criteria for uppeak and lunch traffic shall be fulfilled simultaneously. Other traffic mixes may be used provided they are documented with justification.

A selected lift configuration fulfils the design criteria if the values from the simulation method are equal to or better for each selected traffic mix than the required values.

5.4.4 Further criteria and considerations

In addition to the design criteria, which should be fulfilled, there may be other criteria. When a lift configuration fulfils the design criteria, the final selection may also consider the additional criteria. For example, consideration can be given to the situation where one lift is out of service, preferring a lift configuration with a higher potential capacity.

If a lift configuration fulfils all the design criteria by significantly exceeding some of them, a configuration with fewer (or smaller, or slower, etc.) lifts may be chosen for testing using the selected method against the design criteria. It may be selected provided it still fulfils all design criteria.

Excess capacity in one lift group shall not justify insufficient capacity in another lift group.

5.5 Initial lift configuration

An initial lift configuration is selected as a starting point for the traffic analysis.

Annex C can be used to determine a starting point with similar selection criteria and lift parameters to those used in Annex D and Annex E.

Some designers can prefer to select the initial configuration:

a) using the calculation method (uppeak round trip time formulae, etc.) to estimate the number, speed and capacity of lifts;

b) based on their experience, e.g. considering similar buildings in existence;

c) using a rule of thumb.

Lift parameters are selected according to 6.5. For the lift parameters related to the car size, an initial value of either P_{calc} or P_{sim} shall be selected. Then, this shall be the basis for the selection of the rated load and available car area according to 6.5.3.

6 Basic, derived and assumed data

6.1 Basic and derived data for calculation and simulation methods

There is a common set of input data for calculation and simulation methods. They include information about the building, such as number of floors, floor heights, estimation of the population and its distribution (6.2 and 6.3). The main lift and passenger-related parameters include the number of lifts, rated load, rated speed, acceleration, jerk, start delay time, door pre-opening time, door operating times, passenger transfer times, etc. (6.5)

The requirements for the lift quantity and quality design criteria in a building should be discussed with the client and relevant parties. It is recommended to use the criteria given in this document (5.4). Local standards, local practice or client design criteria (e.g. hotel standards) should be considered. For calculation, the criteria shall include uppeak handling capacity and interval. For simulation, the criteria shall include handling capacity and average waiting time for the selected traffic mix. Additional criteria

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

for simulation may be included, such as distribution of waiting times, percentage of long waiting times and further average values or distribution data for time to destination, transit time, intermediate stops per passenger or car loading.

6.2 Building data

The client's representative and the lift designer should agree on the basic building data at the earliest possible stage of a project and also indicate the lift service to be provided in the projected or target building. The basic building data required for a traffic analysis is shown in Annex F. It includes data such as the building type, number of served floors, entrance floors and their attraction, floor heights, utilization of floors and population.

The floor population in office buildings should be estimated preferably from the net internal floor area as described in 6.3 or by comparison with similar buildings and in accordance with local practice.

In a well-planned design, there should be sufficient circulation space for the passengers in the lobby (see ISO 8100-30) and the lift calling devices should be located in positions with easy and efficient access.

6.3 Determining the population

6.3.1 General

The maximum population to be served in the target building should be obtained from the client.

The population densities can depend on the culture, geographical area, and type and quality level of the building.

Stair usage is occasionally considered to be taken into account and results in reduced lift usage at the lower floors. However, for lift design purposes no allowance shall be made for absenteeism and/or stair factors, since the design criteria (5.4.1 and 5.4.2) are based on 100 % of the population of the building. In all buildings, consideration should be made to cater for persons with impaired mobility.

6.3.2 Office buildings

Where the client is unable to provide population figures, they can be estimated. A common approach is to assess the population from net internal area, considering a related workplace area and a suitable utilization factor (Table 4).

The non-utilized space accounts for circulation areas, cabinets, copy machines, meeting zones, etc. The utilization factor can vary on the same floor and depends on the floor usages and office type.

Table 4 gives guidance to typical workplace area and utilization factors. Other values may be used provided they are documented with justification. National and cultural norms can affect the values given.

Table 4 — Typical workplace area and utilization factor

Office type	Workplace area A_{wp} m² per person	Utilization factor F_u %
Prestige	12–14	80
Standard	10–12	80
Open plan	8–10	85
Trader floors	6–8	90

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

The floor population may be obtained from Formula (1):

$$U_i = A_{\mathrm{ni}_i} \times F_{\mathrm{u}_i} / A_{\mathrm{wp}_i} \quad (1)$$

where

U_i is the population of floor i;

A_{ni_i} is the net internal area of floor i;

F_{u_i} is the utilization factor of floor i;

A_{wp_i} is the workplace area of floor i.

It is necessary to indicate which estimations have been used. It is also necessary to indicate that a review of the initial assessment shall be made once the architectural drawings are developed to a point where usually sufficient net internal area calculation can be made.

6.3.3 Hotels

Hotel chains can have their own standards for estimating the number of hotel guests. Where such a standard exists, it should be used. Where such a standard does not exist, the number of hotel guests may be estimated from the number of rooms.

NOTE Typical values can range from one to two persons per guest room depending on hotel type (e.g. business, transit, holiday, etc.).

6.3.4 Residential buildings

Practices to define the population in residential buildings vary and, if available, local or specifically applicable methods should be used. The estimation of residential building populations may be based on the sum of the number of residents of each apartment. The number of residents per apartment can usually be estimated by correlating the number of bedrooms per apartment to the average number of residents per apartment. If there is not a local standard or other method of population estimation that applies to the situation, then a frequently used approach can be to assume two persons for the first bedroom of each residential unit and one person for each subsequent bedroom in the units. If information is known about the type of building (i.e. luxury, standard or basic) and the number of studios, 1-bedroom, 2-bedroom and 3-bedroom apartments occupying the building, then Table 5 may be used for guidance to population estimation.

Table 5 — Typical occupancy factors (persons) for residential buildings

Type	Prestige	Standard	Basic
Studio	1,0	1,5	2,0
1 bedroom	1,5	1,8	2,0
2 bedrooms	2,0	3,0	4,0
3 bedrooms	3,0	4,0	6,0

6.4 Passenger data

In traffic analysis, passenger movement in and out of the lifts is modelled usually with constant delays for both calculation and simulation analysis methods. Passenger transfer times can be affected by the lift door width, car size and shape. Also, the number of people entering or exiting at a floor can affect the transfer times. If the lift doors are narrow or the lift is crowded, the passenger transfer times can be longer than with wide doors or empty cars. For guidance, typical passenger transfer times for different door widths are shown in Table 6.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

Table 6 — Typical passenger transfer times according to door width

Door width mm	Passenger transfer time t_p s
900	1,1
1 000	1,0
1 100	1,0
1 200	0,9

The individual passenger transfer times can differ from the values in Table 6.

6.5 Lift data

6.5.1 Special considerations for accessibility of persons with disabilities

In order to address the special needs, accessibility and full manoeuvrability of people with physical and other disabilities, it can be necessary to consider special measures. These measures can impact the traffic handling and can include:

a) larger lift cars and wider doors (see ISO 8100-30, EN 81-70:2018);

b) non-standard car platform sizes;

c) longer door operating times (particularly closing times);

d) longer walking times;

e) lifts taken out of their group for independent service.

6.5.2 Selection of rated speed

In order to select the rated speed, the nominal travel time in relation to the terminal to terminal travel may be used as an indication. Table 7 gives typical values for nominal travel time. Alternatively, Annex B can be used.

Table 7 — Typical ranges of nominal travel time, depending on building type

Building type	Typical nominal travel times, t_{nt} s
Office	20–30
Hotel	25–35
Residential	25–45

The rated speed can be calculated with Formula (2):

$$v_n = D / t_{nt} \tag{2}$$

NOTE 1 The value calculated using Formula (2) can be rounded up or down so that a value can be selected from the range given in ISO 8100-30:2019, 3.3.

NOTE 2 The selected rated speed can be lower or higher than the value calculated using Formula (2) depending on building height, design to cost, energy efficiency, typical standardized lift speed ranges from lift suppliers, national norms, cultural considerations and performance required.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

6.5.3 Selection of rated load and available car area

P_{calc} and P_{sim} describe how many passengers may be transported at the same time in a lift car. They are defined and used in the calculation and simulation methods (Clauses 7 and 8).

— Using the calculation method (Clause 7), P_{calc} is the average number of passengers in the car at departure from the main entrance floor. P_{calc} is a decimal number.

— Using the simulation method (Clause 8), P_{sim} is the maximum number of passengers allowed in the car during simulation. P_{sim} is an integer number.

The calculation and the simulation methods are used to verify that a lift configuration fulfils the design criteria. For the car to be capable to transport the mass required, the rated load, Q in kg, of a car shall be selected such that:

— for the calculation method, Formula (3) applies:

$$Q \geq \frac{P_{calc} \times m_p}{0,8} \tag{3}$$

— for the simulation method, Formula (4) applies:

$$Q \geq \frac{P_{sim} \times m_p}{F_l} \tag{4}$$

Choosing values of F_l greater than 0,8 can result in an underlifted configuration.

NOTE The 0,8 in Formula (3) is included for statistical reasons. In calculation, P_{calc} is an average value. In simulation, the car can load to more than the average, represented by P_{sim}.

The average mass per person depends on local norms and practices (see EN/TR 81-12:2014, Table 1). Accordingly, the value used in Formulae (3) and (4) may be adjusted.

In order to ensure that the car offers sufficient area (m^2) for the passengers, the car may be also selected such that:

— for the calculation method, Formula (5) applies:

$$A_{car} \geq \frac{P_{calc} \times A_p}{0,8} \tag{5}$$

— for the simulation method, Formula (6) applies:

$$A_{car} \geq P_{sim} \times A_p \tag{6}$$

The average area per person depends on local norms and practices. Accordingly, the value used in Formulae (5) and (6) may be adjusted (see Annex A).

To ensure that the rated load is sufficient to transport safely the number of passengers P_{calc} or P_{sim}, it shall be checked whether Formulae (3) and (4) are still valid after the calculations had been carried out in Formulae (5) and (6).

To ensure that the rated load is sufficient for the available car area, it shall be checked whether the selection is consistent with ISO 8100-30:2019, Table 6.

In order to allow more space for passengers in the car, the F_l factor in Formula (4) or the value of average area per person in Formulae (5) and (6) may be changed if it is declared.

In any case, the methods and criteria for the car selection shall be reported, including deviations from standard values in the equations.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

For more details and examples on how to select a suitable car, see Annex A as a basic guideline.

6.5.4 Other lift parameters

In traffic analysis, many parameters affect the lift handling capacity and lift performance. The basic lift parameters include rated load and available car area (6.5.3), and dynamic lift parameters that are mostly described by operating times. Lift movements can be modelled by characteristic drive curves and, in advanced simulators, curves of different drive systems may be modelled.

For lift doors, the opening and closing times and dwell times shall be defined. Dwell times with and without passenger transfers or when serving a landing call or a car call, can be different and shall be defined. Where door pre-opening time is provided, it shall be defined. The door pre-opening time can depend on the acceleration and jerk values of the lift drive system.

7 Calculation method

7.1 Uppeak equations

The calculation method is a method for designing and evaluating lift characteristics. It can be applied only to simple traffic situations. In the calculation method, the conventional control system (3.2) and a pure uppeak traffic situation is assumed.

If the range of results produced by the calculation method meets the design criteria selected from Table 2, with regard to the building type, then the lift system for the building can be considered to be sized properly. The calculation report includes authorship data, design criteria, building population, lift data and calculation output data (Clause 9).

The calculation method shall follow the following procedure.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

The design shall solve Formula (7):

$$C_h \geq \lambda \tag{7}$$

The uppeak handling capacity, C_h, in persons per 5 min, of a single lift shall be calculated using Formula (8):

$$C_h = \frac{300 \times P_{calc}}{t_{rt}} \tag{8}$$

Where there is a group of L lifts, the handing capacity shall be calculated using Formula (9):

$$C_h = \frac{300 \times P_{calc} \times L}{t_{rt}} = \frac{300 \times P_{calc}}{t_{int}} \tag{9}$$

The uppeak interval, t_{int}, shall be calculated using Formula (10):

$$t_{int} = \frac{t_{rt}}{L} \tag{10}$$

The handling capacity in percentage of the building population served in a 5-minute period ($\%C_h$) shall be calculated using Formula (11):

$$\%C_h = \frac{C_h}{U} \tag{11}$$

The RTT, in seconds, of a single lift during uppeak traffic shall be calculated using Formula (12):

$$t_{rt} = 2 \times H \times t_v + (S+1) \times t_s + 2 \times P_{calc} \times t_p \tag{12}$$

The value for t_p can only be estimated (see Table 6 for typical values).

NOTE 1 This time can be extended for the use of persons with disabilities (see 6.5.1).

The time to travel between two standard pitch adjacent floors at rated speed can be calculated using Formula (13):

$$t_v = \frac{d_f}{v_n} \tag{13}$$

The time consumed in stopping shall be calculated using Formula (14):

$$t_s = t_c + t_{sd} + t_f(1) - t_{pre} + t_o + t_{cd} - t_v \tag{14}$$

The time consumed when stopping can be expressed as Formula (15):

$$t_s = t_{perf} - t_v \tag{15}$$

where t_{perf} is the performance time.

The performance time, t_{perf} (3.23), shall be calculated using Formula (16):

$$t_{perf} = t_c + t_{sd} + t_f(1) - t_{pre} + t_o + t_{cd} \tag{16}$$

NOTE 2 Typical office building performance times for a floor height of 3,3 m are 8,0 s for an excellent system, 10,0 s for an average system and 12,0 s for a poor system.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

The above times shall be confirmed by the chosen supplier.

NOTE 3 For simplicity, door dwell times are not considered in this analysis.

Assuming even population distribution, a value for S shall be calculated using Formula (17):

$$S = N\left[1-\left(1-\frac{1}{N}\right)^{P_{\text{calc}}}\right] \tag{17}$$

where N is the number of landings served above entrance floor.

Assuming even population distribution, a value for H shall be calculated using Formula (18):

$$H = N - \sum_{i=1}^{N-1}\left(\frac{i}{N}\right)^{P_{\text{calc}}} \tag{18}$$

The calculated lift group handling capacity ($\%C_{\text{h}}$) should be in balance with the passenger traffic in the building and meet the given passenger demand ($\%\lambda$). An example calculation is shown in Annex D.

7.2 Lift selection graphs

Passenger lift selection graphs for residential buildings, hotels and office buildings are shown in Annex C. The charts have been created using Formulae (7) to (18). The numbers of goods lifts as well as service lifts in hotels need to be estimated separately.

If there are more floors or a higher population in the building than defined in the chart, the lift selection charts cannot be used to find a lift configuration. Instead, the calculation method (7.1) or the simulation method (Clause 8) may be used.

8 Simulation method

8.1 Basis of the method

The simulation method is used for designing and evaluating lift characteristics. It can be applied to simple and complex traffic situations. The input and output data required by simulation are described below. A lift traffic simulation models the passengers transported by a selected lift installation, the dynamical movements of the lifts and the lift traffic control system for call allocation.

NOTE This clause describes a simulation method. The results of different methods may not be comparable. The simulator programs and the traffic control algorithms are outside the scope of this document. They can give different results.

The simulation method requires that building data has been collected and a lift configuration has been chosen (Clauses 5 and 6). Depending on the building type (office, hotel, residential), each traffic situation shall be represented by a corresponding traffic mix (3.34), a set of related design criteria (5.4.2) and a range of passenger demands (3.21). The passenger demand should reflect typical design criteria (Table 3). The simulation report includes authorship data, design criteria, building population, lift data and simulation output data (Clause 9).

The simulation method uses a series of simulations with constant passenger demand to assess each individual traffic situation for corresponding design criteria (Table 3). Furthermore, the handling capacity of the system can be determined.

8.2 Series of simulations

The simulation method considers the selected traffic mix for a range of passenger demands from a minimum to a maximum for a selected lift configuration. Every passenger demand is represented by a constant level of demand throughout the simulation.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

The range of passenger demands should be chosen such that the required handling capacity, $\%C_{h,req}$, is within the range of demands. This is to provide an insight into the sensitivity of the lift configuration for situations where the passenger demand is different from the required handling capacity (Annex E).

The simulation method should include at least three passenger demands, using the following procedure.

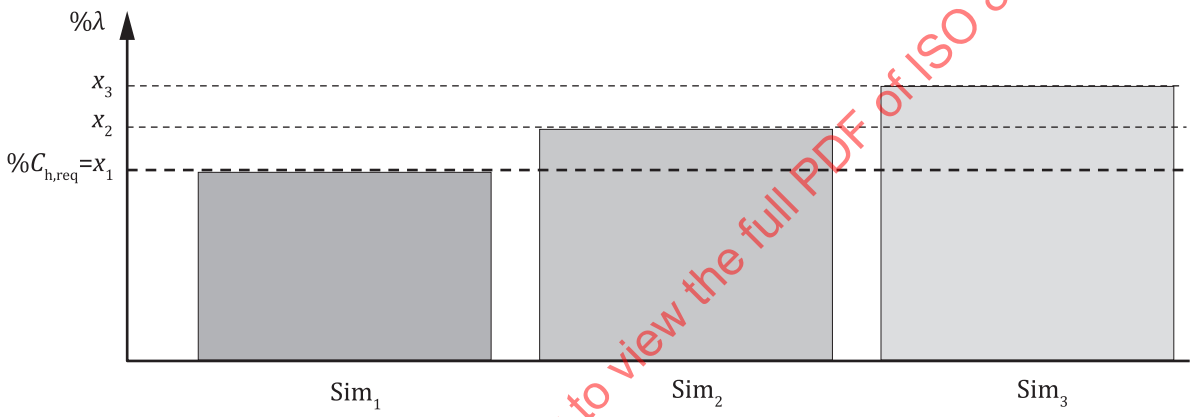
a) Select passenger demand x_1 equal to the required handling capacity $\%C_{h,req}$ (5.4.2) and two higher demands x_2 and x_3.

NOTE 1 The increase from one passenger demand to another can be, for example, 0,5 or 1 percent points, i.e. if x_1 is 12 % then x_2 can be 13 % and x_3 can be 14 % (Figure 1).

NOTE 2 The demand range can vary from values smaller than $\%C_{h,req}$ for light traffic to values greater than $\%C_{h,req}$ for heavy traffic. In this case, more demand levels x_i can be selected, for example separated by 1 or 2 percent points.

b) For each selected passenger demand, run a simulation, satisfying the simulation requirements (8.3).

c) Evaluate the results of all simulations (8.4).



Key

$\%C_{h,req}$ required handling capacity (see Table 3)
$\%\lambda$ percentage passenger demand (% of population per 5 min)
Sim_1 simulation executed with passenger generation of at least 2 h for passenger demand x_1
Sim_2 simulation executed with passenger generation of at least 2 hours for passenger demand x_2
Sim_3 simulation executed with passenger generation of at least 2 hours for passenger demand x_3
x_1 passenger demand equal to the required handling capacity $\%C_{h,req}$, e.g. 12 %
x_2 passenger demand higher than x_1, e.g. 13 %
x_3 passenger demand higher than x_2, e.g. 14 %

Figure 1 — Example of simulation method: one series of simulations per traffic mix, each simulation with passenger generation of at least 2 h

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

8.3 Simulation requirements

Each simulation, which is executed for a defined traffic mix and a defined passenger demand, shall fulfil the following conditions:

a) each individual simulation starts from the same initial conditions (e.g. all cars empty, starting from main entrance floor); each simulation ends when all passengers have reached their destinations;

b) passengers are generated independently from each other;

NOTE 1 The passenger arrival times can follow a Poisson process or other probability distribution function where passenger arrivals are randomly distributed in time.

 © ISO 2020 – All rights reserved

c) passengers' origin and destination floors are selected following the specified floor population data, entrance floors and entrance bias;

d) a lift car can be filled with passengers up to the declared value of P_{sim}, but not further;

passenger generation shall last at least 120 min in order to reduce the variance of the results to a level that makes multiple simulation runs unnecessary;

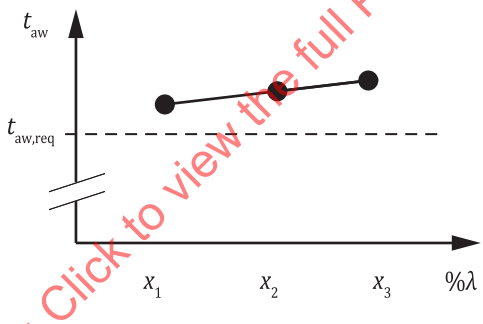
NOTE 2 In the context of low population and low demand, a passenger generation of 120 min can be insufficient to achieve statistically significant results. In this case, a longer simulation period or multiple simulations can be used.

e) the passengers arriving in the first 15 min and the last 5 min of passenger generation shall be excluded from the results to avoid the influences of start and end effects.

8.4 Evaluation and review of simulation results

The evaluation of results always depends on the individual requirements of a specific building (5.4.3). The set of all simulation results can be used to determine if the lift configuration is properly sized for the building as follows.

a) If the results for demand x_1 (i.e. at the required handling capacity $\%C_{h,req}$, see 8.2) do not meet the design criteria (see Figure 2 for an example), change the lift configuration (5.2) to meet the design criteria.



Key

t_{aw} average waiting time (s)

$t_{aw,req}$ required average waiting time (see Table 3), e.g. 30 s

$\%\lambda$ percentage passenger demand (% of population per 5 min)

x_1 passenger demand equal to the required handling capacity $\%C_{h,req}$ (see Table 3), e.g. 12 %

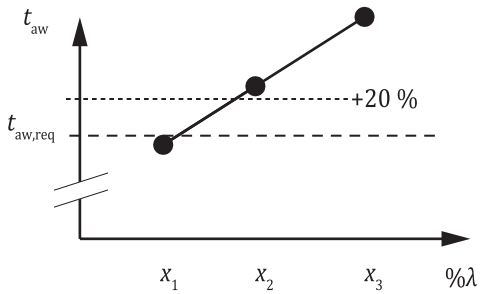
x_2 passenger demand higher than x_1, e.g. 13 %

x_3 passenger demand higher than x_2, e.g. 14 %

Figure 2 — Example for simulation results that do not meet design criteria

b) If the results for demand x_1 meet the design criteria, consider the results for demand x_2. For example, if the average waiting times for the demand x_2 are more than 20 % higher than required (Figure 3), the designer may change the lift configuration (5.2) to improve service level at x_2.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020



Key

t_{aw} average waiting time (s)

$t_{aw,req}$ required average waiting time (see Table 3), e.g. 30 s

%λ percentage passenger demand (% of population per 5 min)

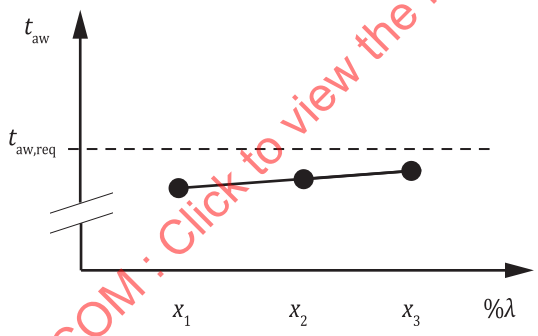
x_1 passenger demand equal to the required handling capacity $\%C_{h,req}$ (see Table 3), e.g. 12 %

x_2 passenger demand higher than x_1, e.g. 13 %

x_3 passenger demand higher than x_2, e.g. 14 %

Figure 3 — Example for simulation results that do meet design, however near to performance limits

c) If all results including those for the highest demand x_3 meet the design criteria (Figure 4), the designer may change the lift configuration (5.2) to avoid an excessive design.



Key

t_{aw} average waiting time (s)

$t_{aw,req}$ required average waiting time (see Table 3), e.g. 30 s

%λ percentage passenger demand (% of population per 5 min)

x_1 passenger demand equal to the required handling capacity $\%C_{h,req}$ (see Table 3), e.g. 12 %

x_2 passenger demand higher than x_1, e.g. 13 %

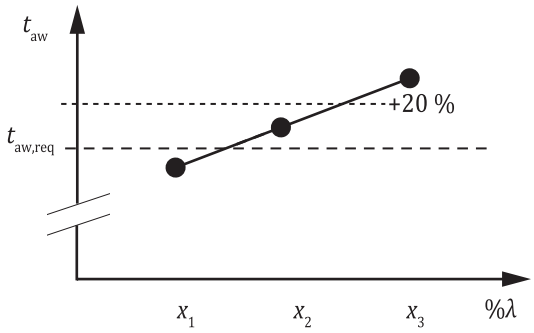
x_3 passenger demand higher than x_2, e.g. 14 %

Figure 4 — Example for simulation results that excess design criteria significantly

d) If none of the three previous cases occurs (see Figure 5 for an example), then the lift system for the building can be considered to be sized properly.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved



Key

t_{aw}	average waiting time (s)
$t_{aw,req}$	required waiting time (see Table 3), e.g. 30 s
%λ	percentage passenger demand (% of population per 5 min)
x_1	passenger demand equal to the required handling capacity $\%C_{h,req}$ (see Table 3), e.g. 12 %
x_2	passenger demand higher than x_1, e.g. 13 %
x_3	passenger demand higher than x_2, e.g. 14 %

Figure 5 — Example for simulation results that indicate a properly sized lift configuration

The simulation output result shall be reported (Clause 9).

9 Reporting

9.1 General

A report of the calculation and simulation results shall be provided. The report should focus on the design criteria. The report can be extended to other criteria. Sample reports are given in Annex D and Annex E.

The relevant information of the report shall include, but not be limited to, the items in 9.2 to 9.7.

9.2 Authorship data

a) Company;

b) author of report;

c) calculator, simulator, version;

d) date and time or version of report.

9.3 Information related to the building

a) Name and address of building/project;

b) client/consultant;

c) building type;

d) number of floors in the building;

e) floor markings/designations;

f) floor to floor heights;

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

g) floor utilization (entrance, office, hotel, restaurant, parking, etc.);

h) area per person or workplace area;

i) floor population (incl. source respectively basis of calculation);

j) entrance bias;

k) lift group arrangements of a multiple lift installation;

l) served and non-served floors, express zone(s);

m) population of the floors served by the lift group.

For an example building data form, see Annex F.

9.4 Design criteria

a) Required uppeak handling capacity (to be used in calculation);

b) required uppeak interval (to be used in calculation);

c) traffic mix (to be used in simulation);

d) required handling capacity for each traffic mix (to be used in simulation);

e) required average waiting time for each traffic mix (to be used in simulation);

f) other possible design criteria;

g) average mass per person used in Formulae (3) and (4) (6.5.3);

h) value of F_l used in Formula (4) (6.5.3);

i) average area per person used in Formulae (5) and (6) (6.5.3).

9.5 Data related to lift installation

a) Lift group arrangement;

b) number of lifts in group;

c) terminal to terminal travel;

d) available car area;

e) rated passenger capacity;

f) rated load;

g) passenger capacity (P_{calc} for calculation, and P_{sim} for simulation);

h) rated speed;

i) acceleration and deceleration;

j) jerk;

k) passenger transfer time;

l) door type (e.g. 1 speed, centre/side opening);

m) door width;

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

n) door opening time and how it is measured, e.g. up to fully open or up to 800 mm;

o) door closing time;

p) door pre-opening time;

q) door closing delay time after passenger detection;

r) start delay time;

s) time consumed in stopping;

t) performance time.

9.6 Calculated lift performance output data

Output parameters are valid for conventional control system.

a) Highest reversal floor;

b) probable number of stops;

c) performance time;

d) round trip time;

e) uppeak interval;

f) uppeak handling capacity;

g) passengers transported in 5 min in uppeak;

h) car loading;

i) indication if calculation results meet the design criteria.

For an example reporting format, see Annex D.

9.7 Simulated output data

Output parameters to be reported for uppeak and mixed traffic.

a) Group (traffic) control system;

b) traffic mix;

c) table of simulation results including passenger demand and related average waiting time;

d) indication if simulation results meet the design criteria at required handling capacity.

For an example reporting format, see Annex E.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

Annex A
(informative)

Selection of rated load and available car area

A.1 Selection table

This annex provides guidance for simple cases to choose an appropriate car size (6.5.3) in terms of rated load and available car area to satisfy the required P_{calc} or P_{sim} from a specific traffic analysis (Clauses 7 or 8) for a defined lift configuration.

The following assumptions are made for Table A.1:

a) for given P_{calc} or P_{sim}, the selection satisfies Formulae (3) to (6) with an average mass per person of 75 kg and a loading limit, F_l, of 0,8, and also with an average area per person of 0,21 m^2;

b) for car area in Formulae (5) and (6), the maximum available car area for the indicated rated load is considered, i.e. the raw car without decorative or protective panels. Such panels reduce the car area available for passengers, which should be taken into consideration when selecting a car size if the thickness of panels exceeds 15 mm or if inner car dimensions are specified by clients. It can then be required to choose a larger car to allow for the panels.

Furthermore, it shall be taken into consideration that the rated load shall be sufficient for the available car area (ISO 8100-1:2019, Table 6).

For typical car dimensions, see ISO 8100-30.

Table A.1 — Example selection of car dimension and rated load in correlation to P_{calc} or P_{sim}

P_{calc} minimum ... maximum persons	P_{sim} minimum ... maximum persons	Minimum rated load (rated passenger capacity)	Maximum available area (m^2) measured without decorative panels (from ISO 8100-1)
1,0... 6,3	1 ... 6	630 kg (8 persons)[a]	1,66
6,4 ... 7,6	7 ... 8	800 kg (10 persons)[a]	2,00
7,7 ... 9,1	9 ... 10	1 000 kg (13 persons)	2,40
9,2 ... 11,2	11 ... 13	1 275 kg (17 persons)	2,95
11,3 ... 11,8	14	1 350 kg (18 persons)	3,10
11,9 ... 13,6	15 ... 16	1 600 kg (21 persons)	3,56
13,7 ... 14,8	17 ... 18	1 800 kg (24 persons)	3,88
14,9 ... 16,0	19 ... 20	2 000 kg (26 persons)	4,20
16,1 ... 19,0	21 ... 23	2 500 kg (33 persons)	5,00

[a] Small cars may not be suitable for persons with disabilities. See 6.5.1 for considerations for accessibility of persons with disabilities.

A.2 Selection examples

In the following examples, the average mass per person is 75 kg, and F_l is 0,8.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

In EXAMPLE 2, which also considers area, the average area per person is 0,21 m^2. It is assumed that the car design is based on the maximum available area, and that thickness of the finishes are below 15 mm (see A.1).

EXAMPLE 1 Considering mass only.

In calculation, a lift car is needed to accommodate 13,1 persons (P_{calc}). Using Formula (3):

$$Q \geq (13{,}1 \times 75) / 0{,}8 \ (= 1\,228)$$

A lift with a rated load of 1 275 kg meets the requirements.

For simulation using Formula (4):

$$P_{sim} \leq 1275 \times 0{,}8 / 75 \ (= 13{,}60)$$

Simulation requires whole passengers, so the lift cars should not load to more than 13 persons.

F_l may be lowered to 0,5 in buildings such as hotels where additional space per person can be required due to luggage.

EXAMPLE 2 Considering area and mass.

Using Formula (5):

$$A_{car} \geq (13{,}1 \times 0{,}21) / 0{,}8 \ (= 3{,}44)$$

A 1 600 kg car can have an area of up to 3,56 m^2. This is sufficient to satisfy both Formulae (3) and (5).

Using Formula (6):

$$P_{sim} \leq 3{,}56 / 0{,}21 \ (= 16{,}95)$$

Simulation requires whole people, so to satisfy Formula (6), the lift cars should not load to more than 16 persons. This is one person less than would be required to satisfy Formula (4). To satisfy both formulae, cars should not load to more 16 persons in simulation.

The area per person may be increased to 0,30 m^2 in buildings such as hotels where additional space per person can be required due to luggage. If the area per person is increased, it is not necessary to lower F_l in Formula (4).

Where consistency with mass only car selection is required, the area per person can need to be reduced, especially for larger lift cars, e.g. from 0,21 m^2 per person (non-touch) to 0,17 m^2 (tightly packed).

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

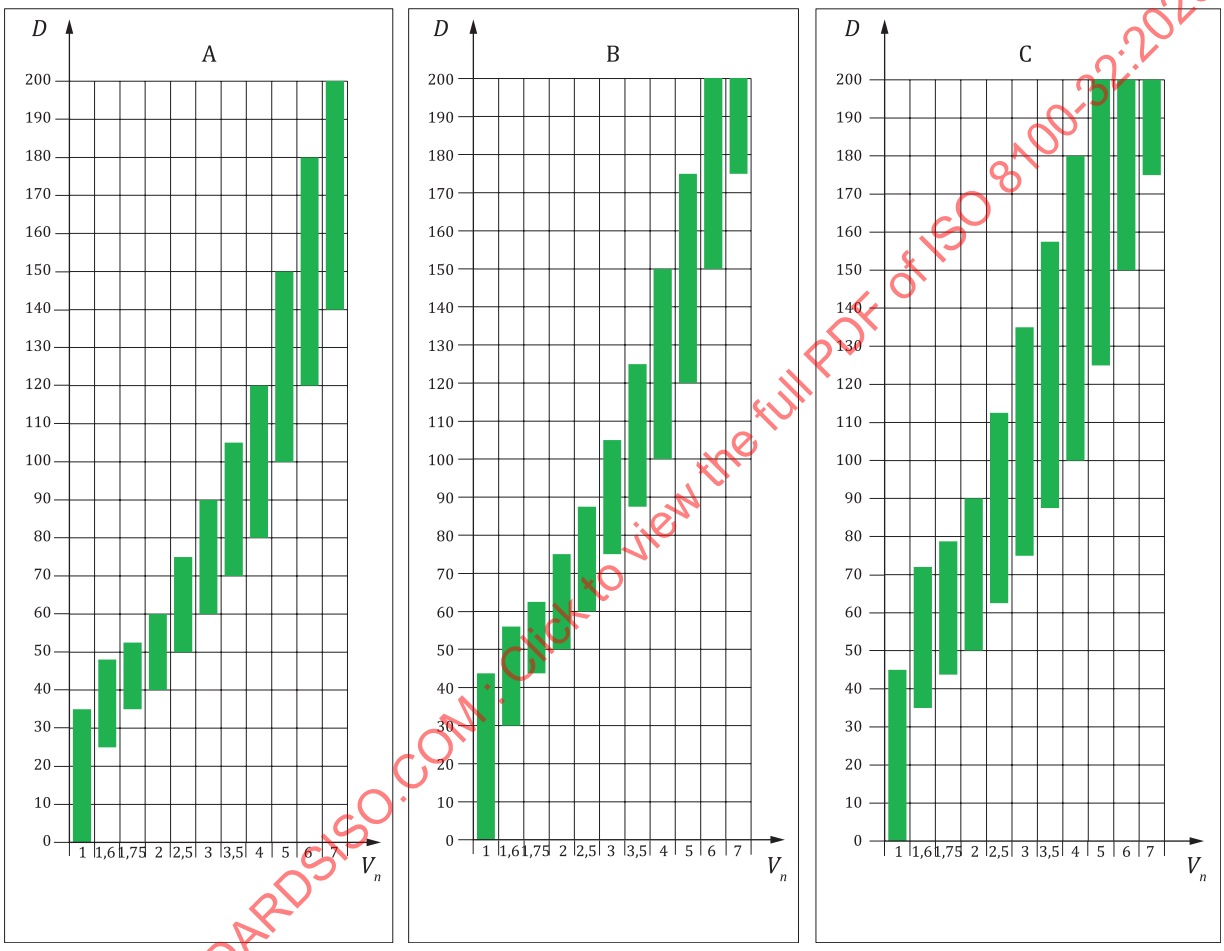
© ISO 2020 – All rights reserved

Annex B
(informative)

Speed selection

EXAMPLE

In an office building with 95 m terminal to terminal travel, the selected speed is 3,5 m/s or 4 m/s.



Key

v_n rated speed (m/s)

D terminal to terminal travel (m)

A office

B hotel

C residential

Figure B.1 — Typical selection of rated speed for different building types (6.5.2)

NOTE In Figure B.1, we consider a set of example speeds. Speeds below 1,0 m/s and above 7,0 m/s are available, in which case the methods in Clauses 7 and 8 can be applied.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

Annex C
(informative)

Lift selection charts

C.1 Assumptions made in selection charts

In this annex, the lift selection charts for a selection of an initial passenger lift configuration including number of lifts, their sizes and their speed are introduced. For further investigation and final verification, use the calculation method (Clause 7) or simulation method (Clause 8). The lift selection charts are formed using the methods described in 6.5.3 and 7.1. To find the minimum lift arrangement, the value of P shown in Tables C.4 to C.7 is an integer value of P_{calc} rounded down. The rated loads should be selected for the given P_{calc} according to 6.5.3, Formulae (3) and (5), and the rated passenger capacity (3.26) according to ISO 8100-1:2019, Table 6, and EN 81-20:2014, Table 6.

The following assumptions are made in the selection graphs:

a) conventional control system;

b) one entrance floor;

c) all cars have identical size;

d) thickness of decorative panels is less or equal than 15 mm;

e) even population distribution on the served floors;

f) floor-to-floor height in residential buildings 3,0 m, in hotels 3,3 m, in office buildings 3,3 m and 4,0 m;

g) in forming the selection charts, the selection criteria are taken from Table 2 and the lift speed is selected as the mid value from the range given in Table 7 (i.e. nominal travel time is 25 s for office buildings, 30 s for hotels, 35 s for residential buildings);

h) passenger transfer times are according to Table 6;

i) start delay time 0,6 s, door closing delay time 2,0 s, door pre-opening time 0,0 s;

j) door widths and time consumed in stopping [Formula (16)] used in calculations follow Tables C.1 to C.3, assuming side opening (SO) doors for residential buildings and centre opening (CO) doors for hotels and office buildings; door times indicate the sum of opening and closing times. Door opening times are measured until doors are fully open (3.6);

k) for floors and population where several lift arrangements are possible, one arrangement is presented in the chart, where the order of priority for selection is:

   1) minimum number of lifts;

   2) minimum speed;

   3) minimum rated load.

If there are more floors in the building or more cars in the group than defined in the charts, building zoning is needed (Annexes D and E).

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

Table C.1 — Time consumed in stopping (s) for 3,0 m floor-to-floor height in residential buildings

SO door width mm	Door times s	Time consumed in stopping, t_s s					
		Rated speed (rated acceleration, jerk)					
		1,0 m/s (0,6 m/s^2, 0,8 m/s^3)	1,6 m/s (0,8 m/s^2, 1,0 m/s^3)	2,0 m/s (0,8 m/s^2, 1,0 m/s^3)	2,5 m/s (1,0 m/s^2, 1,0 m/s^3)	3,0 m/s (1,0 m/s^2, 1,0 m/s^3)	3,5 m/s (1,0 m/s^2, 1,0 m/s^3)
900	5,6	10,6	11,1	11,5	11,6	11,8	12,0
1 100	6,7	11,7	12,2	12,6	12,7	12,9	13,1

Table C.2 — Time consumed in stopping (s) for 3,3 m floor-to-floor height in hotels and office buildings

CO door width mm	Door times s	Time consumed in stopping, t_s s			
		Rated speed (rated acceleration, jerk)			
		1,0 m/s (0,6 m/s^2, 0,8 m/s^3)	1,6 m/s (0,8 m/s^2, 1,0 m/s^3)	2,0 m/s (0,8 m/s^2, 1,0 m/s^3)	2,5 m/s (1,0 m/s^2, 1,0 m/s^3)
1 100	4,4	9,4	9,9	10,3	10,5
1 200	4,8	9,8	10,3	10,7	10,9

Table C.3 — Time consumed in stopping (s) for 4,0 m floor-to-floor height in office buildings

CO door width mm	Door times s	Time consumed in stopping, t_s s				
		Rated speed (rated acceleration, jerk)				
		1,0 m/s (0,6 m/s^2, 0,8 m/s^3)	1,6 m/s (0,8 m/s^2, 1,0 m/s^3)	2,0 m/s (0,8 m/s^2, 1,0 m/s^3)	2,5 m/s (1,0 m/s^2, 1,0 m/s^3)	3,0 m/s (1,0 m/s^2, 1,0 m/s^3)
1 100	4,4	9,4	9,8	10,3	10,5	10,8
1 200	4,8	9,8	10,2	10,7	10,9	11,2

NOTE The values for acceleration and jerk (Tables C.1 to C.3) are examples. Where those values are specified differently, use methods of Clauses 7 and 8.

C.2 Examples using Figures C.1 to C.4 for the selection of rated load

Interpretation of how to use Figures C.1 to C.4 to select rated load is shown through an example using Figure C.1. In the example, average mass per person is 75 kg, and area per person is 0,21 m^2. Other values may be selected according to cultural and/or local norms.

According to Figure C.1, a residential building with 23 floors above main entrance floor and with a population of 1 000 residents can be served with four lifts allowing the average number of 10 persons (P_{calc}) in cars, and rated speed (3.27) of 2,0 m/s.

EXAMPLE 1 Considering mass only.

According to Figure C.1, four cars with the average number of 10 passengers and Formula (3):

$$Q \geq (10 \times 75 / 0{,}8)\ (= 938)$$

A lift with a rated load of 1 000 kg meets the requirements.

EXAMPLE 2 Considering area and mass.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

Using 10 persons as the maximum number of passengers accommodated and Formula (5):

$A_{car} \geq (10 \times 0{,}21 / 0{,}8)$ (= 2,63)

A 1 275 kg car can have an area of up to 2,95 m^2 and is sufficient to satisfy both Formulae (3) and (5). Alternatively, the same rated load results by using a P_{calc} value of 10 in Table A.1.

NOTE 1 The diagonal lines in the chart show the average population per floor

NOTE 2 The charts apply only to the parameters defined above. For example, if the floor-to-floor height changes or the time consumed in stopping changes, a different set of charts is required. See the calculation method (Clause 7) and Annex D.

NOTE 3 In the selection charts of Annex C, the minimum lift arrangement is shown. Local norms or preferences can require larger cars.

NOTE 4 When using the values of P_{calc} in Figures C.1 to C.4, car selection can be based on both mass and area. See 5.4.1 and 6.5.3 to avoid overcrowding. If only mass is considered for car selection, the graphs can give a minimal lift configuration.

NOTE 5 The selected lift speed is shown in Figures C.1 to C.4.

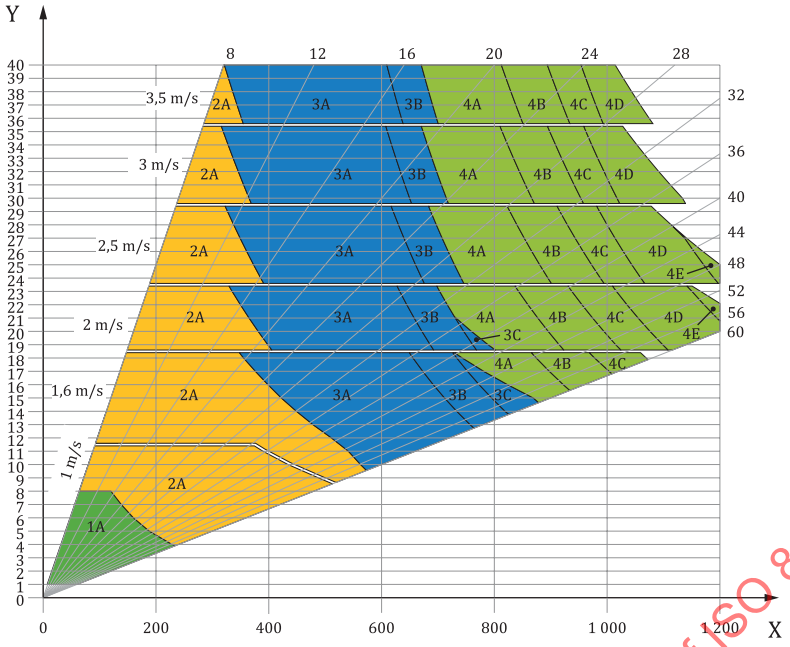
C.3 Passenger lift selection for residential buildings

Table C.4 — Example selection of rated load with 75 kg average mass per person and 0,21 m^2 average area per person

Selection of rated load	**A**	**B**	**C**	**D**	**E**
P_{calc} (persons)	**6**	**8**	**10**	**13**	**14**
Considering area and mass [Formula (6), Table A.1]	630 kg	1 000 kg	1 275 kg	1 600 kg	1 800 kg
Considering mass only [Formula (4), see C.2, NOTE 4]	630 kg	800 kg	1 000 kg	1 275 kg	1 350 kg

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved



Key

Y floors served above main floor

X total population above main floor

1A one lift with 630 kg rated load (see Table C.4)

2A a group of two lifts with 630 kg rated load (see Table C.4)

…

*n*A a group of *n* lifts with 630 kg rated load (see Table C.4)

*n*B a group of *n* lifts with 800 to 1 000 kg rated load (see Table C.4)

*n*C a group of *n* lifts with 1 000 to 1 275 kg rated load (see Table C.4)

*n*D a group of *n* lifts with 1 275 to 1 600 kg rated load (see Table C.4)

*n*E a group of *n* lifts with 1 350 to 1 800 kg rated load (see Table C.4)

Figure C.1 — Selection chart for passenger lifts in residential buildings (floor-to-floor height 3,0 m)

NOTE 1 Required uppeak handling capacity $\%C_{h,req} \geq 6$ % of population per 5 min, required uppeak interval $t_{int,req} \leq 60$ s and nominal travel time $t_{nt} \leq 35$ s.

NOTE 2 It is necessary to provide at least one lift in the group with 1 000 kg rated load or bigger to accommodate accessibility requirements, the movement of furniture, wheelchairs, etc.

NOTE 3 Based on local practices in some regions, the minimum car size for all lifts can be greater than 630 kg. When the selected car size is too small for local practices or is not available, use the next larger car size available. When using this chart, selecting the next larger car size gives a feasible solution but may not be optimal.

NOTE 4 In residential buildings with more than seven floors, a minimum of two lifts has been assumed based on local practices in some regions.

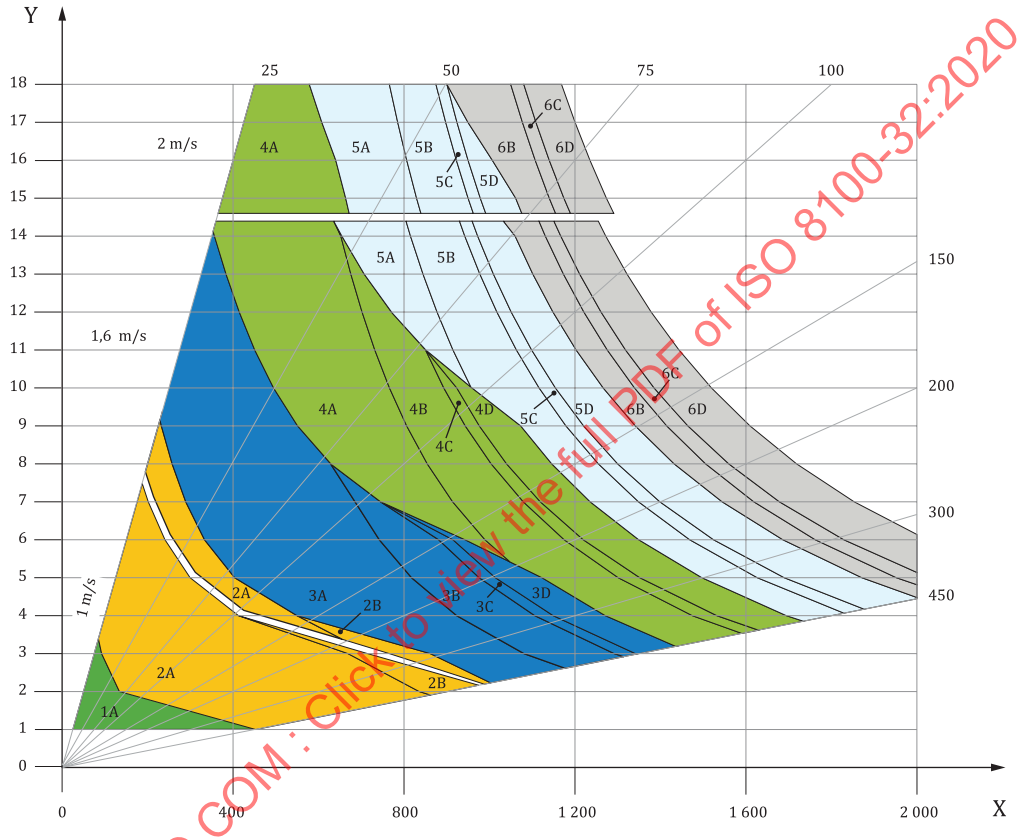
STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved

C.4 Passenger lift selection for hotels

Table C.5 — Example selection of rated load with 75 kg average mass per person and 0,21 m² average area per person

Selection of rated load	A	B	C	D
P_{calc} (persons)	**10**	**13**	**14**	**16**
Considering area and mass [Formula (6), Table A.1]	1 275 kg	1 600 kg	1 800 kg	2 000 kg
Considering mass only [Formula (4), see C.2, NOTE 4]	1 000 kg	1 275 kg	1 350 kg	1 600 kg



Key

Y floors served above main floor

X total population above main floor

1A one lift with 1 000 to 1 275 kg rated load (see Table C.5)

2A a group of two lifts with 1 000 to 1 275 kg rated load (see Table C.5)

2B a group of two lifts with 1 275 to 1 600 kg rated load (see Table C.5)

…

*n*A a group of *n* lifts with 1 000 to 1 275 kg rated load (see Table C.5)

*n*B a group of *n* lifts with 1 275 to 1 600 kg rated load (see Table C.5)

*n*C a group of *n* lifts with 1 350 to 1 800 kg rated load (see Table C.5)

*n*D a group of *n* lifts with 1 600 to 2 000 kg rated load (see Table C.5)

Figure C.2 — Selection chart for passenger lifts in hotels (floor-to-floor height 3,3 m)

NOTE 1 Required uppeak handling capacity $\%C_{h,req} \geq 12$ % of population per 5 min, required uppeak interval $t_{int,req} \leq 40$ s and nominal travel time $t_{nt} \leq 30$ s.

NOTE 2 Service lifts need to be considered separately.

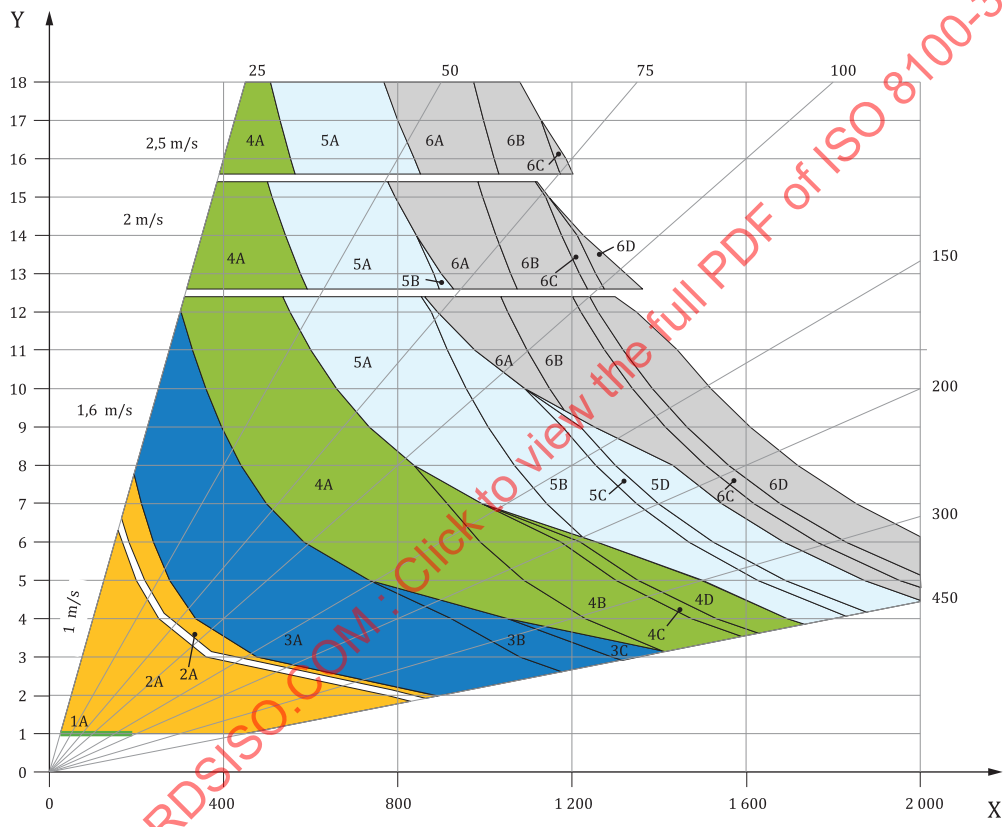
STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

NOTE 3 For small hotels with light traffic, lifts with a rated load of 630 kg or 800 kg can be selected after consideration of service lift requirements. In this case, refer to Clause 7 or 8 to confirm the configuration meets the requirements.

C.5 Passenger lift selection for office buildings (floor-to-floor height 3,3 m)

Table C.6 — Example selection of rated load with 75 kg average mass per person and 0,21 m² average area per person

Selection of rated load	A	B	C	D
P_{calc} (persons)	**10**	**13**	**14**	**16**
Considering area and mass [Formula (6), Table A.1]	1 275 kg	1 600 kg	1 800 kg	2 000 kg
Considering mass only [Formula (4), see C.2, NOTE 4]	1 000 kg	1 275 kg	1 350 kg	1 600 kg



STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

Key

Y floors served above main floor

X total population above main floor

1A one lift with 1 000 to 1 275 kg rated load (see Table C.6)

2A a group of two lifts with 1 000 to 1 275 kg rated load (see Table C.6)

…

*n*A a group of *n* lifts with 1 000 to 1 275 kg rated load (see Table C.6)

*n*B a group of *n* lifts with 1 275 to 1 600 kg rated load (see Table C.6)

*n*C a group of *n* lifts with 1 350 to 1 800 kg rated load (see Table C.6)

*n*D a group of *n* lifts with 1 600 to 2 000 kg rated load (see Table C.6)

Figure C.3 — Selection chart for passenger lifts in office buildings (floor-to-floor height 3,3 m)

© ISO 2020 – All rights reserved

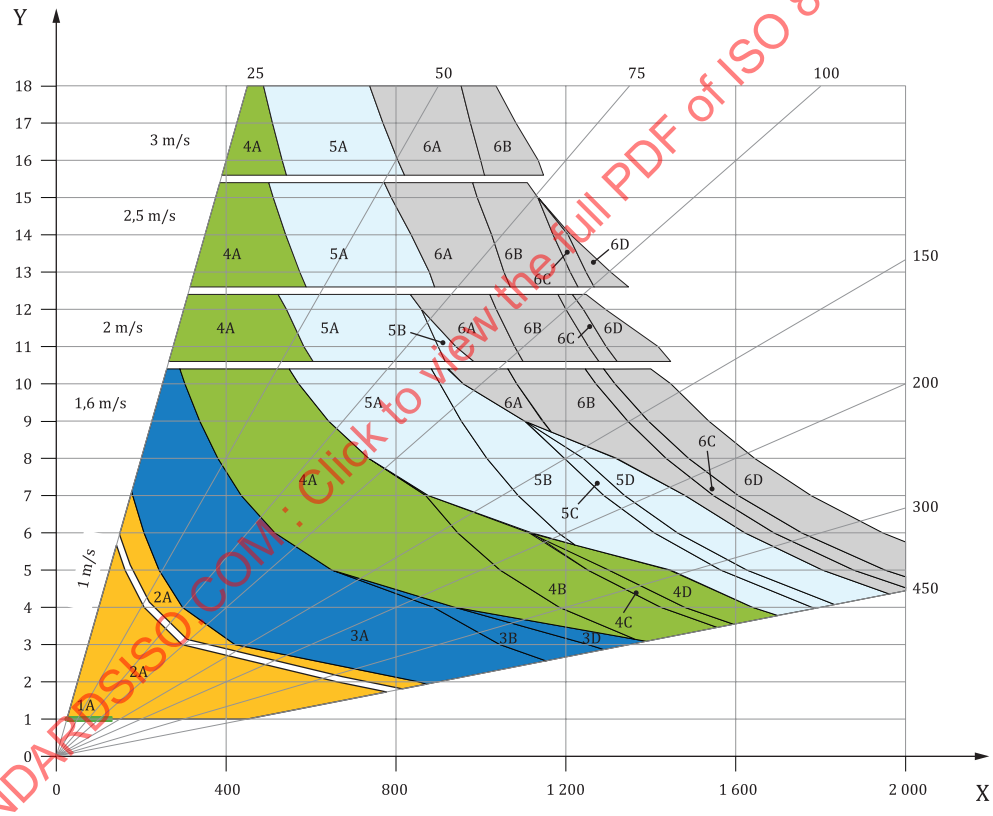
NOTE 1 Required uppeak handling capacity $\%C_{h,req} \geq 12$ % of population per 5 min, required uppeak interval $t_{int,req} \leq 30$ s and nominal travel time $t_{nt} \leq 25$ s.

NOTE 2 Where local practices allow, for small offices with light traffic, lifts with rated load of 630 kg or 800 kg can be selected after consideration of goods lift requirements. In this case, refer to Clause 7 or 8 to confirm the configuration meets the requirements.

C.6 Passenger lift selection for office buildings (floor-to-floor height 4,0 m)

Table C.7 — Example selection of rated load with 75 kg average mass per person and 0,21 m² average area per person

Selection of rated load	A	B	C	D
P_{calc} (persons)	**10**	**13**	**14**	**16**
Considering area and mass [Formula (6), Table A.1]	1 275 kg	1 600 kg	1 800 kg	2 000 kg
Considering mass only [Formula (4), see C.2, NOTE 4]	1 000 kg	1 275 kg	1 350 kg	1 600 kg



Key

Y floors served above main floor

X total population above main floor

1A one lift with 1 000 to 1 275 kg rated load (see Table C.7)

2A a group of two lifts with 1 000 to 1 275 kg rated load (see Table C.7)

…

*n*A a group of *n* lifts with 1 000 to 1 275 kg rated load (see Table C.7)

*n*B a group of *n* lifts with 1 275 to 1 600 kg rated load (see Table C.7)

*n*C a group of *n* lifts with 1 350 to 1 800 kg rated load (see Table C.7)

*n*D a group of *n* lifts with 1 600 to 2 000 kg rated load (see Table C.7)

Figure C.4 — Selection chart for passenger lifts in office buildings (floor-to-floor height 4,0 m)

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

NOTE 1 Required uppeak handling capacity $\%C_{h,req} \geq 12$ % of population per 5 min, required uppeak interval $t_{int,req} \leq 30$ s and nominal travel time $t_{nt} \leq 25$ s.

NOTE 2 Where local practices allow, for small offices with light traffic, lifts with rated load of 630 kg or 800 kg can be selected after consideration of goods lift requirements. In this case, refer to Clause 7 or 8 to confirm the configuration meets the requirements.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

 © ISO 2020 – All rights reserved

Annex D
(informative)

Example of calculation method and report

D.1 Method

Consider an example building comprising two rises: a low rise of 13 floors and a high rise of 13 served floors above the main floor. Other data are given as the example progresses and in the sample report.

To solve Formula (7), the number of passengers in the car at departure from the main entrance floor (P_{calc}) should be obtained as P_{calc} determines the value for Formulae (9), (12), (17) and (18).

If C_h and t_{int} of a target system are known, they can be used to estimate P_{calc}. For office buildings according to Table 2, the required uppeak interval $t_{int,req}$ is 30 s and the required uppeak handling capacity $\%C_{h,req}$ is 12 % of the served population, the requirements in the following example are as follows.

D.2 Given data (see the building form in D.6)

Required uppeak interval, $t_{int,req}$:	≤30 s
Required uppeak handling capacity, $\%C_{h,req}$:	≥12 %
Population per building rise, U:	1 092 persons

This means that on average 131 persons need be transported every 5 min (1 092 × 0,12 = 131,0 persons per 5 min, rounded down) in both rises.

As the interval is 30 s there would be 10 round trips in 5 min (300/30).

Thus, P_{calc} is 13,1 persons (131/10) which are to be transported on each round trip.

Number of floors to be served, N:	13	(both low rise and high rise)
Travel distance to highest served floor, D:	52 m	(low rise)
	104 m	(high rise)
Average interfloor height, d_f:	4,0 m	(both low rise and high rise)

D.3 Further data and assumptions

Using Formula (14) for time consumed in stopping (7.1), assume t_{cd} = 2,0 s, t_c = 2,4 s, t_{sd} = 0,6 s, t_{pre} = 0 s, t_o =2,0 s, and $t_f(1)$ = 5,1 s.

A standard rated speed, v_n, for a terminal to terminal travel of 52 m would be 2,5 m/s for low rise and 5,0 m/s for high rise terminal to terminal travel of 104 m (see Table 7 and Annex B).

NOTE This is based on a nominal travel time (3.19) of 20 s.

Thus, for this selection, the value of $t_v = d_f / v_n$ is for low rise 1,6 s and for high rise 0,8 s.

According to Table C.3, time consumed in stopping is 10,5 s for low rise and can be calculated to be 11,3 s for high rise.

STANDARDSISO.COM : Click to view the full PDF of ISO 8100-32:2020

© ISO 2020 – All rights reserved