CIBSE Lifts Group Annual Seminar 2023

CIBSE Guide D: Transportation systems in buildings Review and looking forward to Guide D 2025

Obituary and tributes in Lift Industry News

Dr Gina Barney, a remarkable engineer, researcher, and leader in the lift industry, passed away on Thursday, 6th July 2023, at age 87. She leaves behind a legacy of groundbreaking contributions to the field of vertical transportation and a lifetime of dedication to the lift industry.

Over her career she published over 23 books and 117 papers, as well as making regular contributions to *Elevatori*, *Elevation* and *Lift Industry News*. She was a member of BSI's lift committee MHE/4, Events Organiser of CIBSE Lifts Group and Principal of Gina Barney Associates. Gina's extraordinary commitment and hard work within the industry will be strongly missed.

Gina was born in Maidenhead in 1935 and grew up during the Second World War. From a young age, Gina's engineering brilliance as well as her confident and strong-willed personality, were clear. After completing her schooling at Slough Grammar School, Gina joined and undertook a five-year apprenticeship in EMI Engineering Development. Alongside her practical training, she pursued part-time day-release studies at Slough College of Further Education. This led her to obtain an Ordinary National Certificate (ONC) in Electrical Engineering. Undeterred by the challenges of her training, Gina excelled and received a Higher National Certificate (HNC) with distinction, a testament to her determination and work ethic.

Recognising her potential, Gina decided to continue her academic studies and gained admission to King's College, Newcastle in 1956 to study Electrical Engineering. Her time at King's College provided her with a solid foundation in the field and allowed her to explore her research interests further. For her dissertation, she explored the realm of radiation monitors, designing and developing a novel approach to measuring radiation exposure.

Gina then went on to complete a master's degree at Sunderland Technical College, affiliated with the University of Durham. Her MSc research focused on the divergent stability criteria in control systems, delving into highly theoretical concepts such as describing functions. The rigorous two-and-a-half-year endeavour showcased her dedication to pushing the boundaries of knowledge and understanding.

Following the completion of her MSc, Gina's excellence in research and knowledge led her to become a Research Associate at the University of Birmingham. Her work involved controlling the magnetic field of an 800-tonne magnet, a crucial component of the Birmingham Proton Synchrotron. Gina's innovative thinking led her to develop a sophisticated thyristor rectifier system, replacing outdated equipment and enhancing the stability of the magnetic field. Her contributions to this project demonstrated her ability to bridge theory and practice and culminated in her achieving her PhD.

In 1967, Dr Barney became a lecturer at the University of Manchester, where she worked with Professor Rosenburg on hybrid simulation and interactive computing. Dr Barney's passion for research and teaching was exemplified through her mentorship of students and her commitment to academic excellence. With funding from UMIST and the World Bank, Dr Barney set up a research group, mentoring students and writing a simulation package.

She supervised numerous projects and dissertations, guiding students like David Closs and Sergio de Santos towards their MSc and PhD degrees. Their work, which focused on lift simulation and system design, further expanded the knowledge base in lift traffic analysis. She continued this research group, which helped over 30 students gain MScs and PhDs, until 1990, when she left the university.

In the April edition of LIN Gina's regular article from the Archives talked about Closs and Dos Santos. Read it again here: *https://www.liftindustrynews.com/2023q2issue4page17*

While at UMIST, Dr Barney was approached by Michael Godwin for her mathematical expertise and went on to collaborate with him for several decades. Dr Barney and Mr Godwin tackled the challenge of improving the levelling accuracy of Ward Leonard systems. They explored using digital simulation and analysing data to optimise lift performance. Their work led to groundbreaking recommendations, including placing destination buttons outside the lifts to provide additional information to the lift controller. This idea, initially considered unconventional, later proved to be a significant innovation in the field.

In 1974, Dr Barney and Mr Godwin established the Lift Design Partnership (LDP). Among their notable achievements was the development of the Lift System Design (LSD) program, lift simulation software that allowed for flexible input, graphical representations, and real-time analysis. They also programmed control systems for major companies such as Otis, Westinghouse, and Schindler, shaping the development of their algorithms. In doing this, they introduced concepts like dynamic sub-sectoring and adaptive call allocation, pushing the boundaries of lift efficiency.

In 1977, Dr Barney and her team published the influential book "Lift Traffic Analysis, Design and Control", which provided a comprehensive overview of the field. The book became a seminal resource for researchers, engineers, and lift professionals worldwide. Recognising its importance, the title was changed to "Elevator Traffic, Design and Control" in 1985, making it more accessible to an international audience. Dr Barney was instrumental in formulating the uppeak round trip calculation, a method used to establish handling capacity and quality of service for a lift system; her work in this area is applied globally and is the basis of most related industry guides and standards.

Dr Barney's contributions extended far beyond academia and research. For decades, she worked as a consultant for a wide variety of organisations before becoming Principal of Gina Barney Associates, an independent vertical transportation consultancy, in 2002. Due to her technical expertise, she expert witness, for which she was highly regarded. For several years, Gina was English editor of *Elevatori*, an Italian elevator magazine, as well as making extremely valuable contributions to *Elevation* and *Lift Industry News*.

Dr Barney also played a vital role in beginning the International Association of Elevator Engineers (IAEE) and running Elevcon. In collaboration with Mike Godwin and Joseph Steer, she helped to organise the first Elevcon Congress in 1986, which was held in Nice. She continued to collaborate successfully on Elevcon for 12 years.

Dr Barney continued to be a fantastic leader in the lift industry for the rest of her life. She joined BSI's lift committee MHE/4 in 1992 in her typical forthright style by challenging a long-standing committee member and asking, "If you can attend BSI MHE/4 meetings, why can't I?". Gina worked passionately on the committee and was always robust in advancing her views. She understood the greater good that standards could deliver, was a subject student, an exponent (chairing the drafting of BS 5900 and BS 6440) and acted as technical secretary on BS 9102 and BS 7255. She took a keen interest in the development of MHE/4 and in ensuring new members were trained correctly. This preparedness to do arduous work on so many projects meant that she was awarded BSI's Distinguished Service Award a remarkable three times – in 2007, 2012 and 2022. There was great mutual respect between Mr Ian Jones (Chair 2008-2020) and Gina, who was instrumental in Ian receiving the International Standards Maker award EN 81-50. Mr Jones later contributed the foreword to the second edition of the Elevator Traffic Handbook.

Latterly, Dr Barney took a tremendous burden on the drafting work on the current revision of BS 7255 and has provided a draft for the revision of BS 5655-11. She also represented the UK on ISO/TC178/WG6/SG5 on traffic design and ISO/TC178/WG10 on energy efficiency. In addition, Gina was a committee member of CIBSE Lifts Group and continued to publish research papers and presented regularly at the Lift and Escalator Symposium.

Dr Barney was the technical editor for the 2005, 2010, 2015 and 2020 versions of "CIBSE Guide D: Transportation systems in buildings". Under her leadership, Guide D has become the most significant industry guide worldwide. Knowing she was unlikely to be able to lead the 2025 edition, she made extensive succession plans; an entire team is now ready to start work on this next edition.

Dr Barney was also a highly valued local community member and dedicated much of her time to supporting local organisations and projects. She was treasurer at St. Mark's Church, Cautley, for over 20 years and was instrumental in redeveloping and managing Sedbergh People's Hall. Gina was the volunteer lead for the Cautley area of B4RN, Broadband for the Rural North. For fun, she enjoyed dancing with friends and expanding her network of dance partners while on cruise holidays. Local friends echoed her professional friends' feelings at her funeral: she was reliable, practical, and always willing to help. Under her bold exterior, there was a great sensitivity.

Dr Barney remained dedicated to advancing lift technology and enhancing passenger experience throughout her career. Gina's immense knowledge, passion, and dedication have left an indelible legacy in the lift industry. Her pioneering spirit and willingness to challenge conventions will continue to inspire future generations of engineers, and her legacy will endure as a testament to her brilliance and passion. May she rest in peace, knowing that her extraordinary accomplishments will continue to shape the engineering world for generations.

TRIBUTES FOR GINA

A world renowned authority on Elevator traffic design and Codes. The loss of such a remarkable individual leaves a void not only in our industry but also in the hearts of all those who had the privilege of knowing her and working with her. Though I was not fortunate enough to physically interact with her, it is her works and the inspiration I draw from them that have made me the person I am today. Few of my online interactions with her will be the most treasurable moments I will cherish for life.

Dr Gina Barney was an exceptional professional whose expertise and contributions have left an indelible mark on our field. Her immense knowledge, passion, and dedication were unparalleled, and she was a true inspiration to all of us. Her unwavering commitment to excellence and tireless efforts to push the boundaries of our industry have set new standards and paved the way for future generations.

She was always willing to share her wisdom, mentor others, and lend a helping hand to anyone in need. Her warmth, humility, and generosity made her not just an expert in our field, but also a cherished friend.
Jagadish Kumar,
L'Avenir Lift Consultancy

A truly numbing loss of a guiding light who seems to have always been there, with solid advice on tap, sometimes delivered with a wicked sense of humour. Gina, thank you for everything, you will be profoundly missed.
Mike Pons, Graham McDonnell, and all at Swallow Lifts

Many industry colleagues will know Gina through her consultancy work, her work on the CIBSE Lifts Group and drafting CIBSE's Guide D. Through MHE/4, the BSI lifts, hoists and escalators committee, she has contributed to many of the British Standards developed under MHE/4 and has worked on international standards of importance to our sector. In particular, Gina was hugely valued at MHE/4 where she was passionately committed to improving our sector through this work.
LEIA

Dear Gina. You were the one who opened up the secrets of lift computer control systems. You initiated the establishment of the International Association of Elevator Engineers. Likewise, you brought lift traffic closer to the academic world by the Elevcon conference. You continued with the standardisation work until the very end, leaving us your legacy. Remembering your contribution with gratitude,
Marja-Liisa Siikonen,
MLS Lift Consulting

The team from KONE Plc had the pleasure of crossing paths with Gina numerous times throughout our careers. Each encounter left us thoroughly impressed by her boundless energy and unwavering passion. Gina's exceptional intelligence and self-assured demeanour consistently pushed the boundaries of the industry, inspiring everyone to strive for excellence. She played a pivotal role in guiding and leading technical groups, spearheading the creation of innovative standards, and influencing crucial legislation. Her impact extended beyond individual companies, leaving an indelible mark on businesses of all sizes. Through her tireless efforts, she propelled the industry forward, significantly improving its state due to her invaluable contributions.
KONE Plc

Over the last two decades, not a fortnight would have gone by without me referring to her and her handbook.
TAK Mathews,
Principal Consultant at TAK Consulting Pvt.

The most passionate, witty, candid speaker I've ever had the pleasure of hearing. Her legacy will live on in the careers her work has supported and the hearts she touched.
Sarah Barnett

Gina was one of the most brilliant minds I have ever met. She was a very good friend and it has been a real privilege to work and learn from her.
Fabio Liberali,
Co-Owner,
Member of the Board & CCO, LU-VE Group

A leader in the field lifts, I still use her Excel spread sheets on rope pressure as a cross reference.
Keith Vines,
Project Design Engineer at Amalgamated Lifts Ltd

The lift industry loses an engineer, who contributed in nearly all lift topics… raising strong discussions which brought us forward.
Joerg Mueller,
TK Elevator

She contributed immeasurably to the industry that I find myself working within. The author, contributor and influencer of much of how we do what we do.
Alan Cronin,
Director, Head of Vertical Transportation EUR UK+I, AECOM

The Traffic design and control book she wrote is an excellent piece of work. The elevator world owes a lot to her.
Manu Verhelst,
MDC Manager at Schindler Group

Her book with S.M. dos Santos "Elevator Traffic Design and Control, 2nd edition" was a constantly-referred to work as I was completing my thesis for my undergraduate studies in engineering. Our industry has lost an icon, especially in the field of dispatching.
Jason Armistead,
Software Engineering Manager at GAL Manufacturing

It was a pleasure to know Gina and to be part of her BSi work - her input to the BSi work was immense; we have a safer industry due to the efforts of Gina.
Pat Ahern,
Director - Head of Vertical Transportation, Ramboll (retired)

A very forthright and passionate lady. I shall miss that maverick spirit of hers. Your journey continues Gina and you leave behind a great legacy.
Karl Grey,
Lift Consultant, Ascent Lift Consultancy Ltd

Dr. Gina Barney was truly an inspiration to countless individuals in the Elevator industry. Her brilliance will continue to illuminate the path for generations to come.
Kasinadh Karra,
VT Design Consultant at VTI Global

A remarkable lady and a wonderful friend, sorely missed and never forgotten.
Lionel Hutt,
Director – DAC Prestige, Altus Controls Ltd

Her work and her books gave great insight in vertical transportation planning. It is a great loss to the elevator industry.
Ramesh Desai,
Head of Major Project - Middle East, East Europe and Central Asia at Otis Elevator Company

I had the pleasure of meeting Dr Barney a number of times and her knowledge and passion for her chosen field of expertise was world class.
Terry Blacker,
Head of Corporate Real Estate at Lloyd's

This is the end of an era in the elevator world
Shalabh Nagar,
Regional General Manager East, ECE Elevators

Such a huge loss to the engineering world. She was a true professional and great friend and mentor throughout these last few years. Although I have never met her I have spoken and laughed with her many times on the telephone as she chiveyed Phil along with his CEng. She was truly inspirational.
Johanne Turner,
Psychology PhD researcher, Staffordshire University

A big influence on our Industry for many years. The legacy will last.
Phil Mantey,
Director, TUV SUD
Dunbar Boardman

There is void in the universe today. Whilst your knowledge, encouragement and friendship will remembered by many of us, you will be greatly missed.
Barry K Vanderhoven,
Co Owner, Technical Director & Principal Engineer,
Abbacas Consulting

A legend and true and loyal friend to many. Your spirit lives on in the hearts and minds of those of us who were lucky enough to have known and worked with you.
Paul Britton,
Managing Director, Lift Design

I had the pleasure of crossing paths with Gina on multiple occasions during lift industry events. Each encounter left me thoroughly impressed by her boundless energy and unwavering passion.

Gina's exceptional intelligence and self-assured demeanor consistently pushed the boundaries of the industry, urging it to strive for excellence. She played a pivotal role in guiding and leading technical groups, spearheading the creation of innovative standards and influencing crucial legislation. Her impact extended beyond individual companies, leaving an indelible mark on businesses of all sizes. Through her efforts, she propelled the industry forward, leaving it in a significantly improved state in light of her invaluable contributions.
Jamie Hicks ,
Sales Director Kone
Posted on the Western Dales Mission Community Tribute page

Such sad news and tremendous loss to our industry. Was currently guiding us on BREEAM calcs for infrequently loaded but very large capacity hydraulic units. What a talent lost.
Dave Martin,
MD at DeSeM Lifts

Gina was a leading figure who brough so much innovation and insight that shaped the industry over many years to what it is now.
Dr Jonathan Adams,
Senior Lecturer (Lift Technology) at University of Northampton

We just lost such an inspirational leader in our industry. It is a very sad moment, but all her books and research papers will stay with us for a long time and future generations of VT planners will be able to learn from them as I did.
Zbyněk Šimčík,
Principal Vertical Transportation design consultant at Hilson Moran

Her work was inspiring! Her manuals on Dispatching shall always be the final say!
Susan Marcus,
Sales Head Key Accounts and Major Projects at Otis Elevator Co.

Whilst I never met her I have over the years always enjoyed reading and learning from the many articles, research papers and books she produced.
Andrew Renwick,
Managing Director at Caltech Lifts

She was such a big referral in the elevator world!
Gema Mediavilla Cesteros,
Director of Marketing & Communication, Fain Ascensores

A wealth of knowledge with a great wit! A very brave and progressive person indeed.
Kieran Ghosh,
Vertical Transportation Manager, Laing O'Rourke

She was one of the leading experts in vertical transport at an international level. Her technical contributions of the highest level have been fundamental for the culture of the world of lifts.
Anica

I knew Gina since I was a youngster when Gina joined up with my father Mike for their consultancy practice Lift Design Partnership and spent many years providing thoughtful advice and opening academic doors for Mike. Gina continued as Chairman Emeritus at Lerch Bates Europe until retiring for good. Her tireless work supporting the industry through CIBSE and the Lift Symposium up to the end speaks volumes for her love of lifts.
Jason Godwin,
Regional Sales Manager, 2N

I am forever grateful for her guidance and encouragement. She was working even in her last days. Her spirit will continue to shine and inspire.
Chuan Lim,
Partner, Foster + Partners

Be now at peace my friend and mentor God bless you!
Michael Bottomley,
VT Consult

A massive loss not only to our industry but as a friend to many. I, for one, will miss the incredible guidance she gave me. She saw me through many a low time in my life.
Prof Dave Cooper MBE,
Chief Executive Officer, LECS (UK) Ltd

She was a massive influence to the lift industry and many people in it including myself. She will be sadly missed.
Philip Pearson,
Director, Pearson Consult Ltd

I remember when I first started (1991) in the industry coming from a completely different engineering background you were one of my secret mentors as we hardly spoke apart from the odd hello during lift symposiums mainly.

However I was an avid follower of yours through your books, papers and seminars.

I can honestly say that most of my "health & safety" knowledge is based on what I have managed to grasp from your vast knowledge in the field.
Omar Marfoua,
Shorts Industries Ltd

She was a leader and expert in the lift industry who contributed so much with passion and commitment.
Technical Lift Services Ltd

A remarkable engineer, researcher, and leader in the lift industry, this space is extremely limited to summarise the enormous professional merits and contributions that Dr. Barney made to the lift industry. Perhaps a colloquial but very accurate way of describing her is to say that she was a celebrity and a true authority in the lift world.

In September 2022 we had the immense honour and privilege of having Dr. Barney attending our Santander International Lift City conference. We will never forget the way she supported our initiative, with absolute willingness and dedication, always ready to collaborate with any project that strengthens the knowledge within the lift industry. Apart from her overwhelming knowledge, we will always remember her enormous human value and courage as well as the beautiful moments she gave us.
IMEM Lifts

A true font of knowledge, a great loss to her family & the lift industry!
Nigel Simpkin,
Sales & Marketing Director, Drucegrove Ltd

A remarkable engineer, consultant and friend to the lift industry. She will be surely missed. Her pioneering spirit will continue to shine in the lift industry.
Lester Controls

Very few have contributed so much to improving our industry.
Stephen Fall,
Manging Director, International Lerch Bates Europe Ltd.

(The) elevator industry lost a true human being, researcher and scholar who really changed the way elevators should be planned and used in the buildings which not only save space but also saves energy in the buildings.

Dr. Gina Barney was great researcher in elevator industry - author of 23 books and over hundreds scientific papers- and in particular with traffic planning and optimisation of flow in the building which was all beautifully written in Elevator Traffic Handbook which is being used by all building planners and all in elevator industry.

She was great collaborator, friends of all influencer in elevator industry. She was not only great researcher but also great human being and very courageous .... had lots of high-level contacts around the world, she stayed with her true values as human being. I am sure she is ... planning People Flow optimisation in Heaven.
Shahram Heidari, Kone

A discussion topic for 2024

Should the Lifts Group become

The Society of Vertical Transportation Engineers?

CIBSE Guide D: 2025

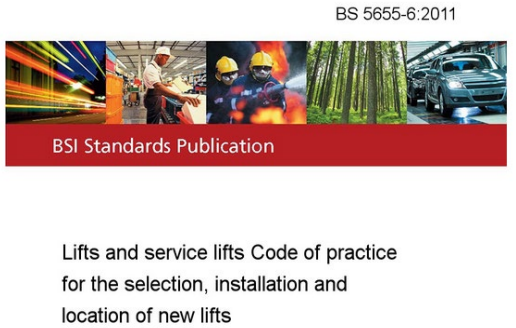
Chapter 3 – Lift traffic design using calculation

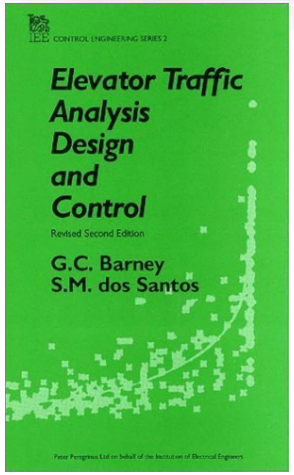
Dr Richard Peters

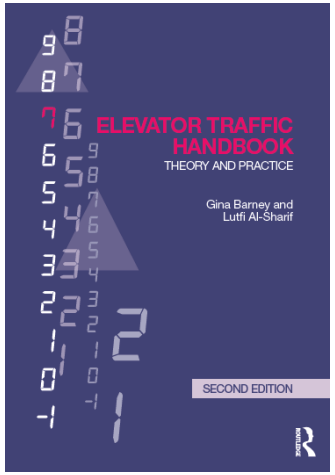
With acknowledgement to Dr Gina Barney

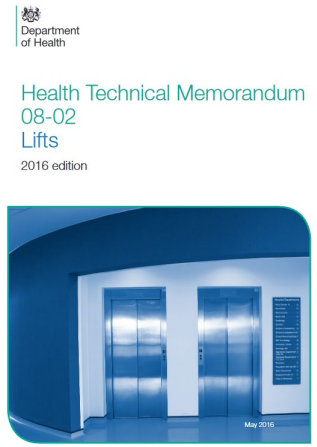
What does Chapter 3 do?

Introduction

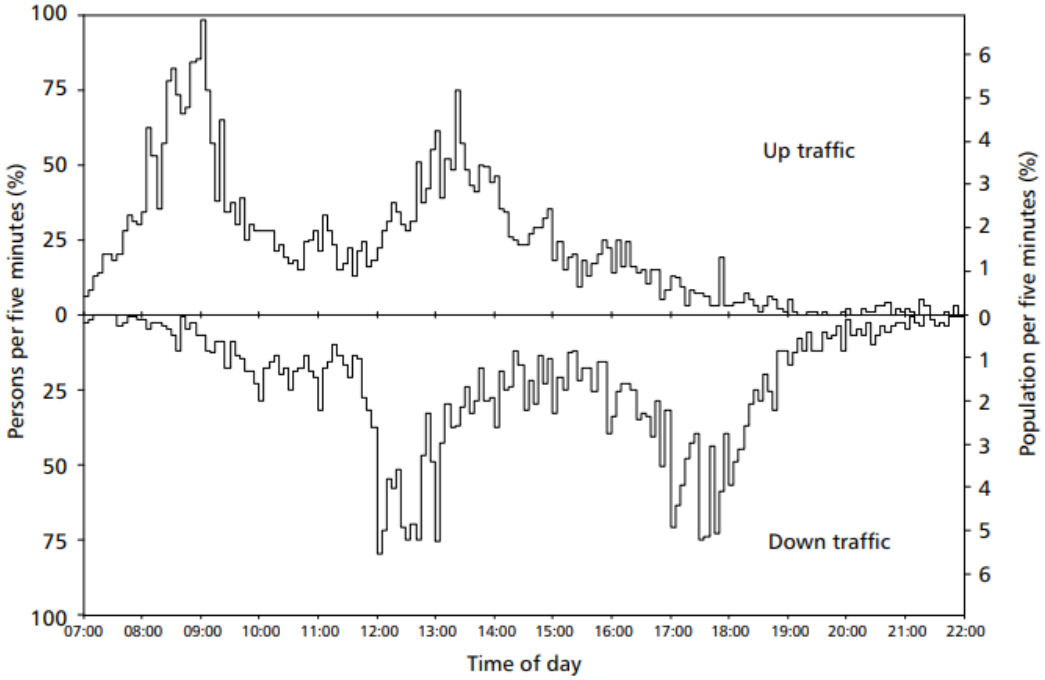








The design process



for the Quantity of Service: it is the required five-minute handling capacity (*UPPHC*)

NOTE: for an uppeak calculation this is usually defined for the worst five-minute demand

for the Quality of Service: it is the required lift system average interval (*UPPINT*)

NOTE: the average uppeak interval does not precisely reflect an individual passenger's experience.

The calculation method

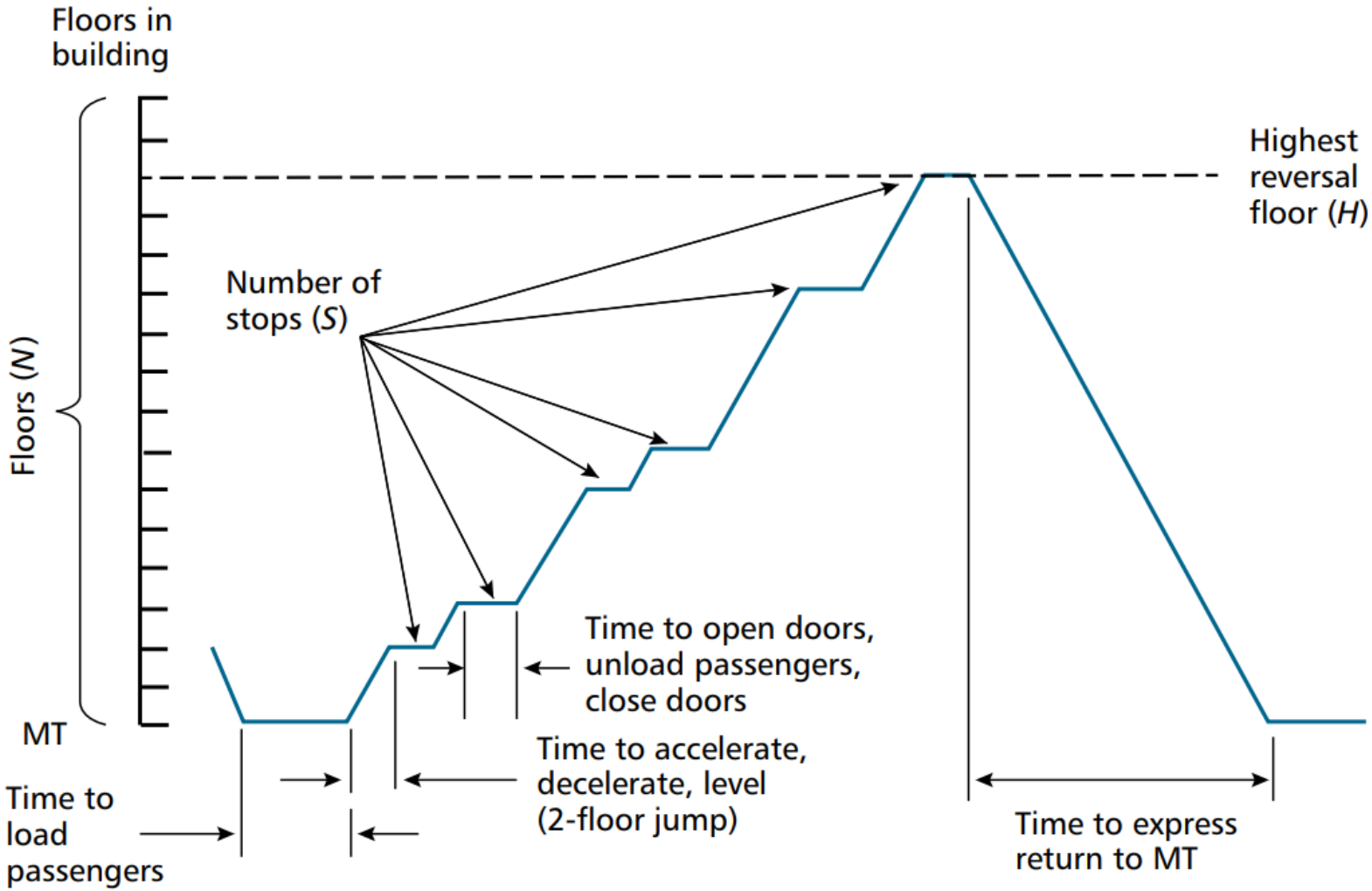


Figure 3.3 The elements of a round trip

The math

The classical *RTT* equation in seconds, of a single lift during uppeak traffic (Barney *et al.*, 1975) is shown in equation 3.6:

$$RTT = 2\,H\,t_v + (S + 1)\,t_s + 2\,P\,t_p$$

$$S = N\left[1 - \left(1 - \frac{1}{N}\right)^P\right]$$

$$H = N - \sum_{i=1}^{N-1}\left(\frac{i}{N}\right)^P$$

Lookup tables

Table 3.1 Values of *H* and *S* with respect to number of passengers carried in car (*P*) (it may be necessary to use interpolation between given values of *P*)

(*a*) For 5 to 12 passengers per trip

Number of served floors, *N*, above MT	*H* and *S* values for stated average number of passengers per trip (*P*)															
	5		6		7		8		9		10		11		12	
	H	S	H	S	H	S	H	S	H	S	H	S	H	S	H	S
5	4.6	3.4	4.7	3.7	4.8	4.0	4.8	4.2	4.9	4.3	4.9	4.5	4.9	4.6	4.9	4.7
6	5.4	3.6	5.6	4.0	5.7	4.3	5.7	4.6	5.8	4.8	5.8	5.0	5.9	5.2	5.9	5.3
7	6.3	3.8	6.4	4.2	6.5	4.6	6.6	5.0	6.7	5.3	6.7	5.5	6.8	5.7	6.8	5.9
8	7.1	3.9	7.3	4.4	7.4	4.9	7.5	5.3	7.6	5.6	7.7	5.9	7.7	6.2	7.8	6.4
9	8.0	4.0	8.2	4.6	8.3	5.1	8.4	5.5	8.5	5.9	8.6	6.2	8.7	6.5	8.7	6.8
10	8.8	4.1	9.0	4.7	9.2	5.2	9.3	5.7	9.4	6.1	9.5	6.5	9.6	6.9	9.6	7.2
11	9.6	4.2	9.9	4.8	10.1	5.4	10.2	5.9	10.3	6.3	10.4	6.8	10.5	7.1	10.6	7.5
12	10.5	4.2	10.7	4.9	11.0	5.5	11.1	6.0	11.2	6.5	11.3	7.0	11.4	7.4	11.5	7.8
13	11.3	4.3	11.6	5.0	11.8	5.6	12.0	6.1	12.1	6.7	12.3	7.2	12.3	7.6	12.4	8.0
14	12.1	4.3	12.5	5.0	12.7	5.7	12.9	6.3	13.0	6.8	13.2	7.3	13.3	7.8	13.4	8.2
15	13.0	4.4	13.3	5.1	13.6	5.7	13.8	6.4	14.0	6.9	14.1	7.5	14.2	8.0	14.3	8.4
16	13.8	4.4	14.2	5.1	14.5	5.8	14.7	6.5	14.9	7.0	15.0	7.6	15.1	8.1	15.2	8.6
17	14.6	4.4	15.0	5.2	15.3	5.9	15.6	6.5	15.8	7.1	15.9	7.7	16.0	8.3	16.1	8.8
18	15.5	4.5	15.9	5.2	16.2	5.9	16.5	6.6	16.7	7.2	16.8	7.8	16.9	8.4	17.1	8.9
19	16.3	4.5	16.8	5.3	17.1	6.0	17.4	6.7	17.6	7.3	17.7	7.9	17.9	8.5	18.0	9.1
20	17.1	4.5	17.6	5.3	18.0	6.0	18.2	6.7	18.5	7.4	18.6	8.0	18.8	8.6	18.9	9.2
21	18.0	4.5	18.5	5.3	18.8	6.1	19.1	6.8	19.4	7.5	19.6	8.1	19.7	8.7	19.8	9.3
22	18.8	4.6	19.3	5.4	19.7	6.1	20.0	6.8	20.3	7.5	20.5	8.2	20.6	8.8	20.8	9.4
23	19.6	4.6	20.2	5.4	20.6	6.2	20.9	6.9	21.2	7.6	21.4	8.3	21.5	8.9	21.7	9.5
24	20.5	4.6	21.1	5.4	21.5	6.2	21.8	6.9	22.1	7.6	22.3	8.3	22.5	9.0	22.6	9.6

Guidance on inputs

Population
Speed selection
Door times
Flight times
Passenger transfer times
Car selection

CIBSE Guide D 2020 uppeak recommendations

Table 3.5 Typical design criteria for calculation method, depending on building type

Building type and traffic mix	Passenger arrival rate, %*POP* (persons/5-minutes)	Recommended lift installation interval, *UPPINT* (s)
Office uppeak	12	≤ 30
Hotel uppeak	12	≤ 60
Residential uppeak	6	≤ 60

Example calculation and spreadsheet

	INPUT DATA	Value
11	Body Area Index (BAI)	0.21
12	Number of floors	13
13	Rated load	1600
14	Actual car capacity	17
15	Number of passengers	13.1
16	Number of lifts	6
17	Rated speed	2.5
18	Building population	1092
19	Interfloor distance	4.0
20	Express jump	0
21	Express additional time	0
22	Single floor flight time	6.3
23	Door close time	3.0
24	Door open time	2.2
25	Door pre-opening	0
26	Start delay	0.6
27	Passenger transfer time	1.0
28		
29	RESULTS	Value
30	Number of passengers	13.1
31	Highest reversal floor	12.5
32	Number of stops	8.4
33	Performance time	12.1
34	Round trip time	165.4
35	Interval	27.6
36	Handling capacity	143
37	Percentage population	13.1
38	Capacity factor (%)	77
39	Uppeak average waiting time	22
40	Down peak handling capacity	232
41	Midday peak handling capacity	175
42		

(a)

Using equation 3.16 to calculate the round trip time:

$$RTT = 2 \times 12.5\ (4/2.5) + (8.44 + 1)\ [3.0 + 0.6 + 6.3 - 0 + 2.2 - (4/2.5)] + 2 \times 13.1 \times 1.0 = 165.4\ s$$

Further design considerations

Resilience
Accessibility
Offices
Non-equal floor populations
Entrances below main terminal
Destination control
Mixed group specifications

Selection with respect to lift function

Double deck
Firefighting
Goods lifts
Observation lifts
Shuttle lifts
Lift sharing a common shaft
Bike lifts
Batches

Selection with respect to building function

Airports
Car parks
Department stores
Entertainment centres, cinemas, theatres, sports centres, stadia and concert halls
Hospitals
Hotels
Offices
Railway stations

Selection with respect to building function

Residential buildings
Residential care & nursing homes
Shopping centres
Universities and other residential buildings

Selection with respect to building form

Floors served by part of group
Entrance bias
Stairs
Magnet floors
Large lobbies
Tall buildings
Traffic other than uppeak

Advanced techniques

Extending the uppeak

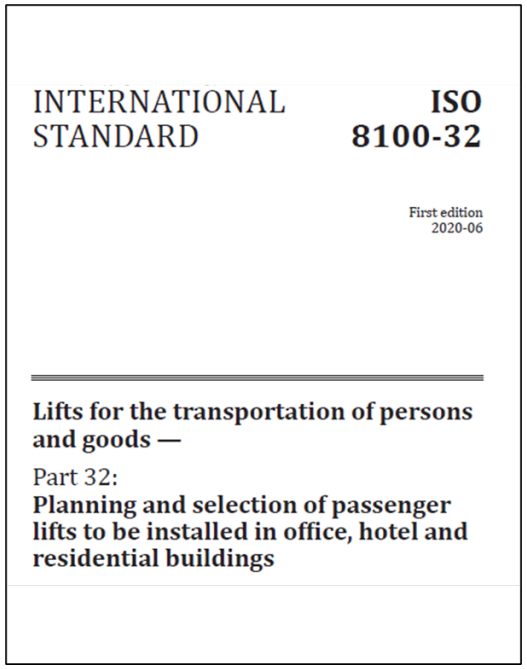
General analysis

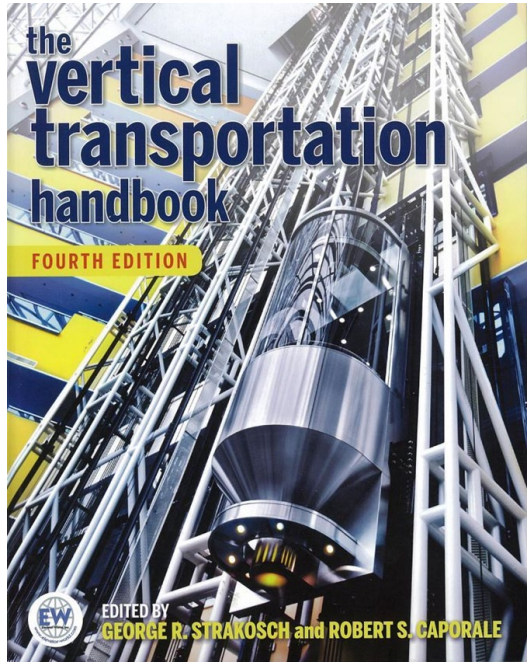
Monte Carlo simulation

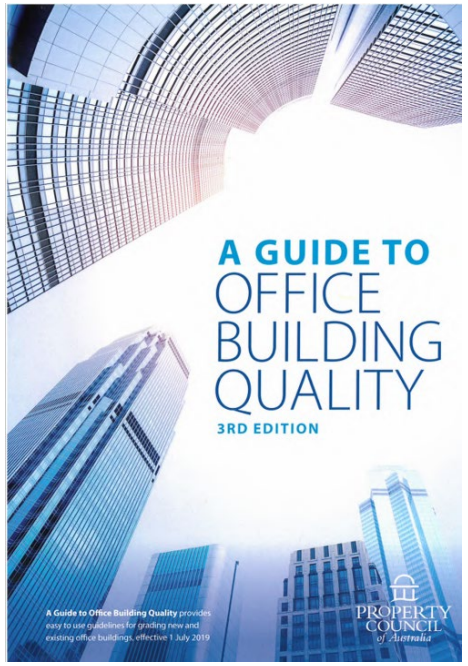
Magnet floors

How can section 3 be improved?

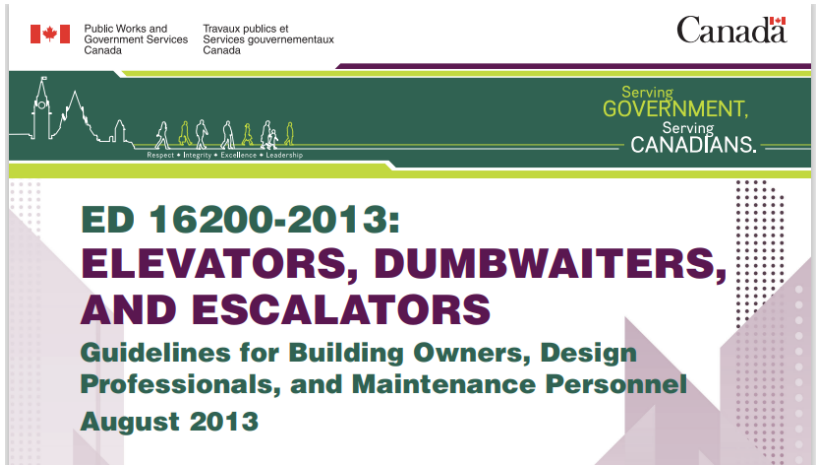
Reference to wider range of documents



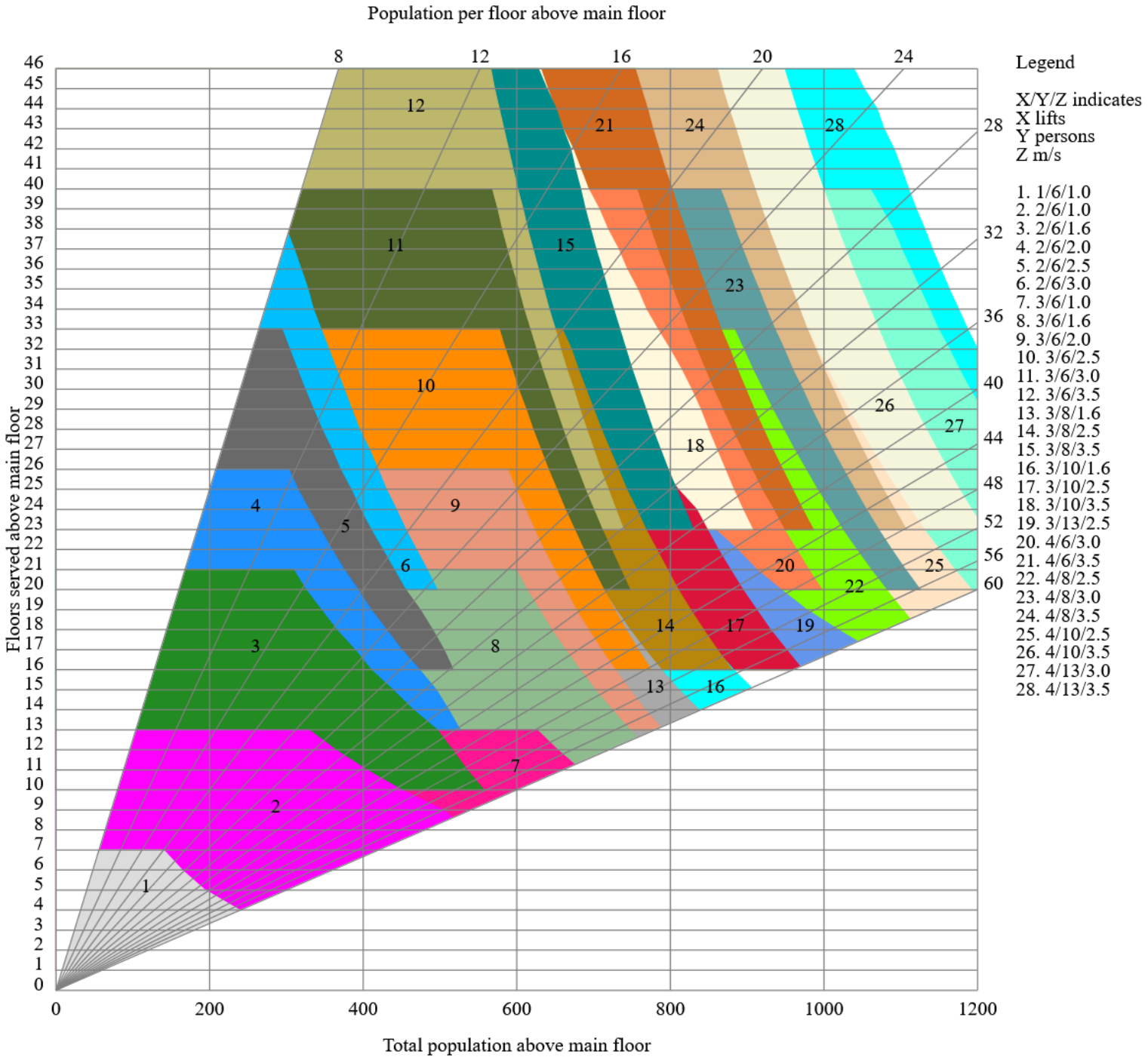




Recognise international use?



Add first look plots



Include basic calculation Spreadsheet CIBSE Lifts Group website

Review and improve if possible

	INPUT DATA	Value
11	Body Area Index (BAI)	0.21
12	Number of floors	13
13	Rated load	1600
14	Actual car capacity	17
15	Number of passengers	13.1
16	Number of lifts	6
17	Rated speed	2.5
18	Building population	1092
19	Interfloor distance	4.0
20	Express jump	0
21	Express additional time	0
22	Single floor flight time	6.3
23	Door close time	3.0
24	Door open time	2.2
25	Door pre-opening	0
26	Start delay	0.6
27	Passenger transfer time	1.0
28		
29	RESULTS	Value
30	Number of passengers	13.1
31	Highest reversal floor	12.5
32	Number of stops	8.4
33	Performance time	12.1
34	Round trip time	165.4
35	Interval	27.6
36	Handling capacity	143
37	Percentage population	13.1
38	Capacity factor (%)	77
39	Uppeak average waiting time	22
40	Down peak handling capacity	232
41	Midday peak handling capacity	175
42		

(a)

Delete H&S tables

Does anyone now use?

Table 3.1 Values of *H* and *S* with respect to number of passengers carried in car (*P*) (it may be necessary to use interpolation between given values of *P*)

(*a*) For 5 to 12 passengers per trip

Number of served floors, *N*, above MT	*H* and *S* values for stated average number of passengers per trip (*P*)															
	5		6		7		8		9		10		11		12	
	H	S	H	S	H	S	H	S	H	S	H	S	H	S	H	S
5	4.6	3.4	4.7	3.7	4.8	4.0	4.8	4.2	4.9	4.3	4.9	4.5	4.9	4.6	4.9	4.7
6	5.4	3.6	5.6	4.0	5.7	4.3	5.7	4.6	5.8	4.8	5.8	5.0	5.9	5.2	5.9	5.3
7	6.3	3.8	6.4	4.2	6.5	4.6	6.6	5.0	6.7	5.3	6.7	5.5	6.8	5.7	6.8	5.9
8	7.1	3.9	7.3	4.4	7.4	4.9	7.5	5.3	7.6	5.6	7.7	5.9	7.7	6.2	7.8	6.4
9	8.0	4.0	8.2	4.6	8.3	5.1	8.4	5.5	8.5	5.9	8.6	6.2	8.7	6.5	8.7	6.8
10	8.8	4.1	9.0	4.7	9.2	5.2	9.3	5.7	9.4	6.1	9.5	6.5	9.6	6.9	9.6	7.2
11	9.6	4.2	9.9	4.8	10.1	5.4	10.2	5.9	10.3	6.3	10.4	6.8	10.5	7.1	10.6	7.5
12	10.5	4.2	10.7	4.9	11.0	5.5	11.1	6.0	11.2	6.5	11.3	7.0	11.4	7.4	11.5	7.8
13	11.3	4.3	11.6	5.0	11.8	5.6	12.0	6.1	12.1	6.7	12.3	7.2	12.3	7.6	12.4	8.0
14	12.1	4.3	12.5	5.0	12.7	5.7	12.9	6.3	13.0	6.8	13.2	7.3	13.3	7.8	13.4	8.2
15	13.0	4.4	13.3	5.1	13.6	5.7	13.8	6.4	14.0	6.9	14.1	7.5	14.2	8.0	14.3	8.4
16	13.8	4.4	14.2	5.1	14.5	5.8	14.7	6.5	14.9	7.0	15.0	7.6	15.1	8.1	15.2	8.6
17	14.6	4.4	15.0	5.2	15.3	5.9	15.6	6.5	15.8	7.1	15.9	7.7	16.0	8.3	16.1	8.8
18	15.5	4.5	15.9	5.2	16.2	5.9	16.5	6.6	16.7	7.2	16.8	7.8	16.9	8.4	17.1	8.9
19	16.3	4.5	16.8	5.3	17.1	6.0	17.4	6.7	17.6	7.3	17.7	7.9	17.9	8.5	18.0	9.1
20	17.1	4.5	17.6	5.3	18.0	6.0	18.2	6.7	18.5	7.4	18.6	8.0	18.8	8.6	18.9	9.2
21	18.0	4.5	18.5	5.3	18.8	6.1	19.1	6.8	19.4	7.5	19.6	8.1	19.7	8.7	19.8	9.3
22	18.8	4.6	19.3	5.4	19.7	6.1	20.0	6.8	20.3	7.5	20.5	8.2	20.6	8.8	20.8	9.4
23	19.6	4.6	20.2	5.4	20.6	6.2	20.9	6.9	21.2	7.6	21.4	8.3	21.5	8.9	21.7	9.5
24	20.5	4.6	21.1	5.4	21.5	6.2	21.8	6.9	22.1	7.6	22.3	8.3	22.5	9.0	22.6	9.6

Updates on population estimates

Coordinate BCO update and ISO 8100-32 work

Comments on implications pandemics

Address confusion with absenteeism and utilisation factor

Table 3.2 Typical workplace densities and utilization factor

Office type	Workplace density (area per person) (m^2 per person)	Utilization factor (%)
Prestige (cellular)	12 – 14	80
Standard (cellular)	10 – 12	80
Prestige (open plan)	10 – 12	85
Speculative (open plan)	8 – 10	85
Trader floors	6 – 8	90

DESIGN TIP: Various studies have shown that in many office buildings it is unlikely that all the total population is present on any one day. Where this is known to be the case the building population to be used in a design can be reduced by 10–20% (i.e. utilisation of 80–90%) to account for persons working at home; on holiday; sickness; persons away on company business; vacant posts; hot-desking, etc.

Research design guidance hotel chains. Critique ambiguity

Research door times table, consistent with components section

Table 3.7 Door times

Door type	Door width (mm)					
	800	900	1100	800	900	1100
	Closing time, t_c (s)			Opening time, t_o (s)		
Side	3.0	3.3	4.0	2.5	2.7	3.0
Centre	2.0	2.3	3.0	2.0	2.2	2.5

Table 7.1 Door operating times

Operator	Door type	Opening size* (mm)	Opening time (s)	Closing time (s)
Low speed	Two-panel opening	800	4.8	4.8
		900	5.1	5.1
	Two-panel centre-opening	800	4.1	4.1
		900	4.7	4.7
Medium speed	Two-panel side opening	800	2.9	3.3
		900	3.1	3.5
		1000	3.3	3.7
		1100	3.5	4.2
	Two-panel centre-opening	800	2.3	2.5
		900	2.4	2.6
		1000	2.5	2.7
		1100	2.7	3.0
High speed	Two-panel side opening	800	1.8	2.8
		900	1.9	3.4
		1000	2.0	3.6
		1100	2.2	3.8
	Two-panel centre-opening	800	1.5	2.0
		900	1.6	2.2
		1000	1.7	2.5
		1100	1.8	2.9

* Door height taken as 2100 mm in all cases

Remove ambiguities

- Expert system gaps
- Min car sizes for certain applications
- Min number of lifts for certain building types/rises

Evacuation calculations

4	**Building data**	
5	Population of two evacuation floors to be evacuated (persons)	747
6	People with physical mobility impairment (%)	3
7	Wheelchair users (%)	1
8	Attendants required in lift during evacuation (persons)	1
9	Travel distance from ground to upper evacuation floor (m)	9.6
10	Travel distance from upper evacuation floor to lower evacuation floor (m)	2.4
11	Travel distance from lower evacuation floor to ground (m)	7.2
12		
13	**Elevator data**	
14	Number of cars	2
15	Speed (m/s)	2
16	Acceleration (m/s^2)	0.6
17	Jerk (m/s^3)	0.4
18	Start delay (s)	0.5
19	Door dwell time (s)	2
20	Door opening time (s)	1.8
21	Door closing time (s)	2.9
22	Car area (m^2)	5.13
23		
24	**Passenger data**	
25	Capacity factor by area (%)	53
26	Loading and unloading time wheelchair users (s)	5.2
27	Loading and unloading time other PRMs (s)	2.6
28	Wheelchair users area (m^2)	0.84
29	Lift attendant/PRM without aids area (m^2)	0.21
30	PRM with frame area (m^2)	0.48
31	PRM with crutches area (m^2)	0.46
32		
33	**Calculations**	
34	Average PRM area (m^2)	0.38
35	Effective car area per round trip (m^2)	2.52
36	Effective area allocated to wheelchair users per round trip (m^2)	0.63
37	Effective area allocated to PRM users per round trip (m^2)	1.89
38	Number of wheelchair users per round trip	0.75
39	Number of PRM users per round trip	4.94
40	Total number of users per round trip	5.69
41	Number of wheelchair users to be evacuated	7.47
42	Number of PRM users to be evacuated	22.41
43	Total number of users to be evacuated	29.88
44	Number of lift round trips required	5.25
45	Door times per stop (s)	6.70

CIBSE Guide D: 2025

Chapter 3 – Lift traffic design using calculation

Dr Richard Peters

With acknowledgement to Dr Gina Barney

CIBSE Guide D: 2025

Chapter 4 – Lift traffic design using simulation

Richard Peters

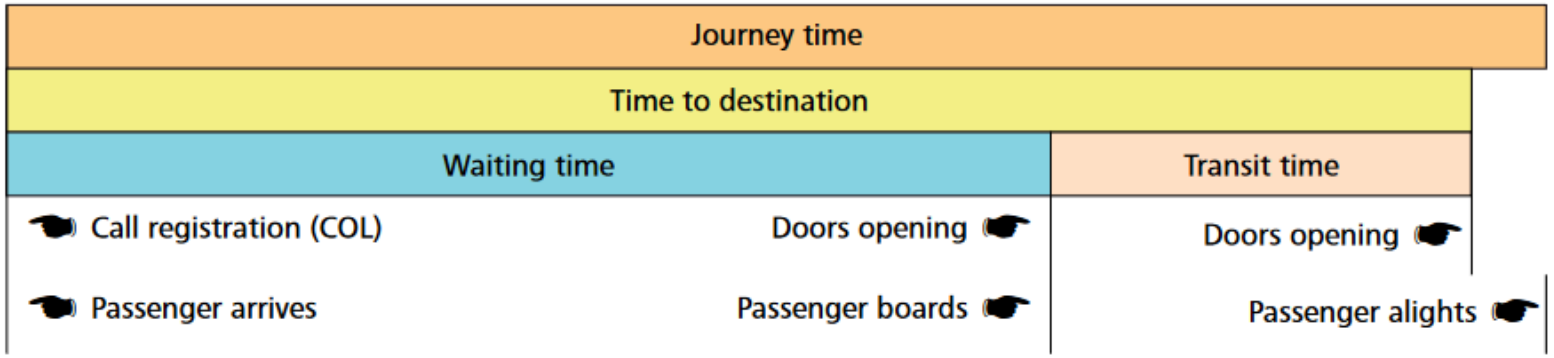
What does Chapter 4 do?

Introduction

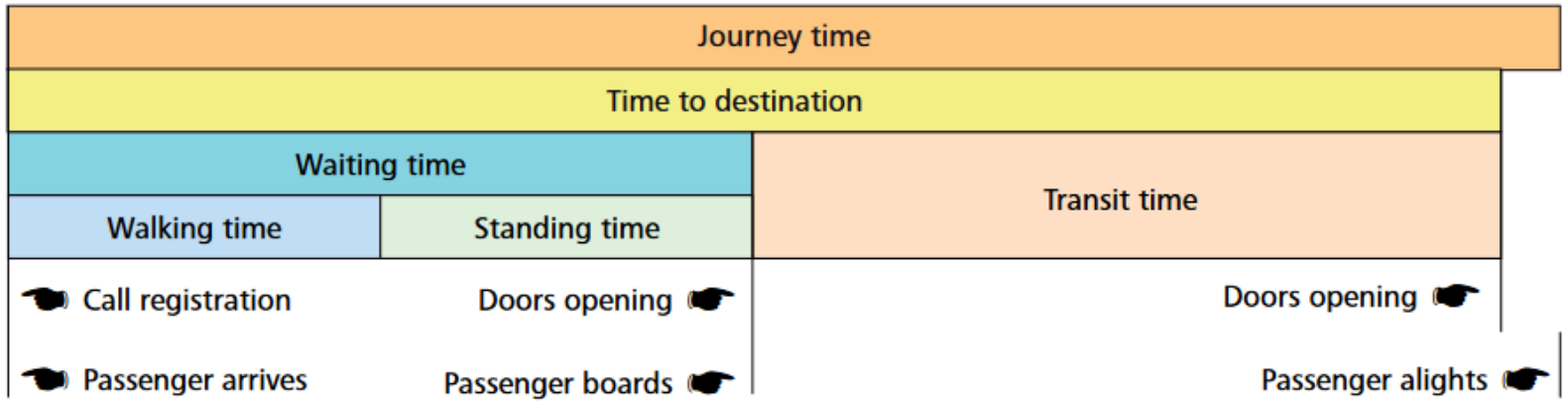
Simulation is a very powerful tool. However, it is good practice to start all design exercises with a round trip time calculation. This is because:

WARNING: It is common to find that lifts do not achieve the performance time criteria that the calculation or simulation results suggest. This is because calculations and simulations are often carried out using parameters which have been provided by suppliers, but which are then not being achieved, in practice. Examples include speed and acceleration values, door timings,

Quality of service



(a) **Conventional collective control**



(b) **Destination control**

Figure 4.1 Illustration of passenger time relationships

When to use simulation

Describing traffic

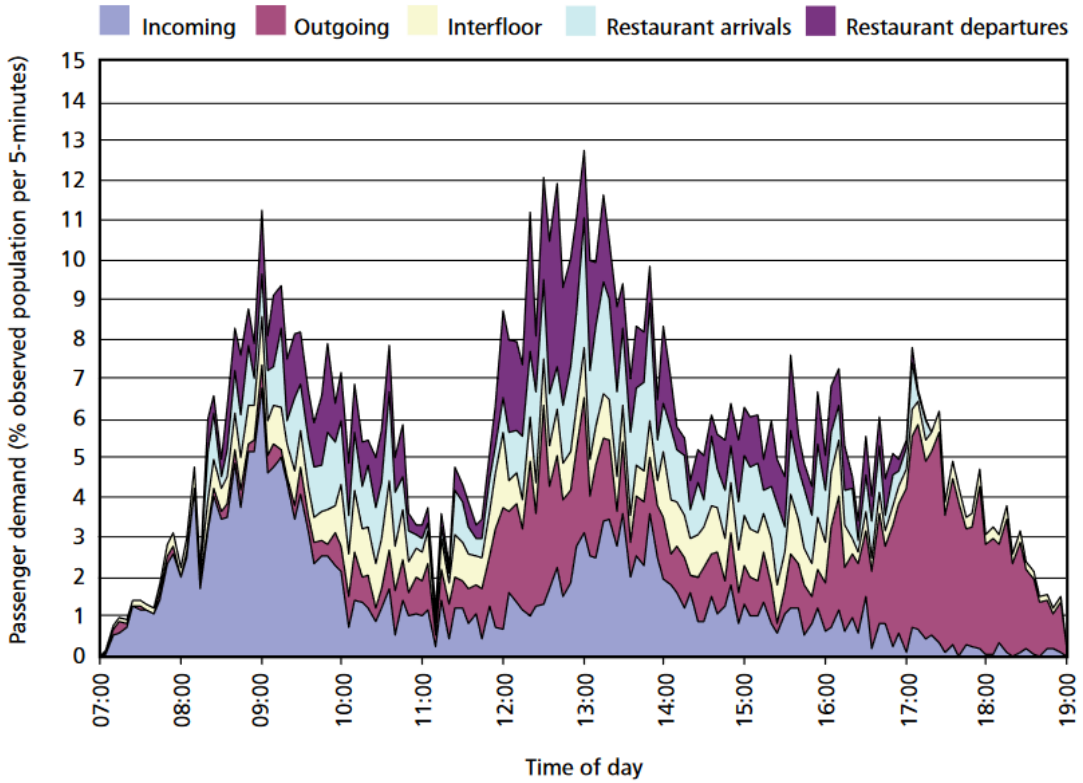


Figure 4.2 Example passenger demand for office building with a restaurant at an upper level

Table 4.2 Example arrival rate and destination probability table

From/to	Arrival rate (persons per 5-minutes)	Destination probability / %							
		Ground	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Ground	25.2	0.0	14.3	14.3	14.3	14.3	14.3	14.3	14.3
Level 1	2.4	50.0	0.0	8.3	8.3	8.3	8.3	8.3	8.3
Level 2	2.4	50.0	8.3	0.0	8.3	8.3	8.3	8.3	8.3
Level 3	2.4	50.0	8.3	8.3	0.0	8.3	8.3	8.3	8.3
Level 4	2.4	50.0	8.3	8.3	8.3	0.0	8.3	8.3	8.3
Level 5	2.4	50.0	8.3	8.3	8.3	8.3	0.0	8.3	8.3
Level 6	2.4	50.0	8.3	8.3	8.3	8.3	8.3	0.0	8.3
Level 7	2.4	50.0	8.3	8.3	8.3	8.3	8.3	8.3	0.0
Total:	42.0								

Table 4.1 Example entrance level bias

Floor	Entrance level bias (%)
Car park 3	10
Car park 2	20
Car park 1	20
Ground	50

Car loading

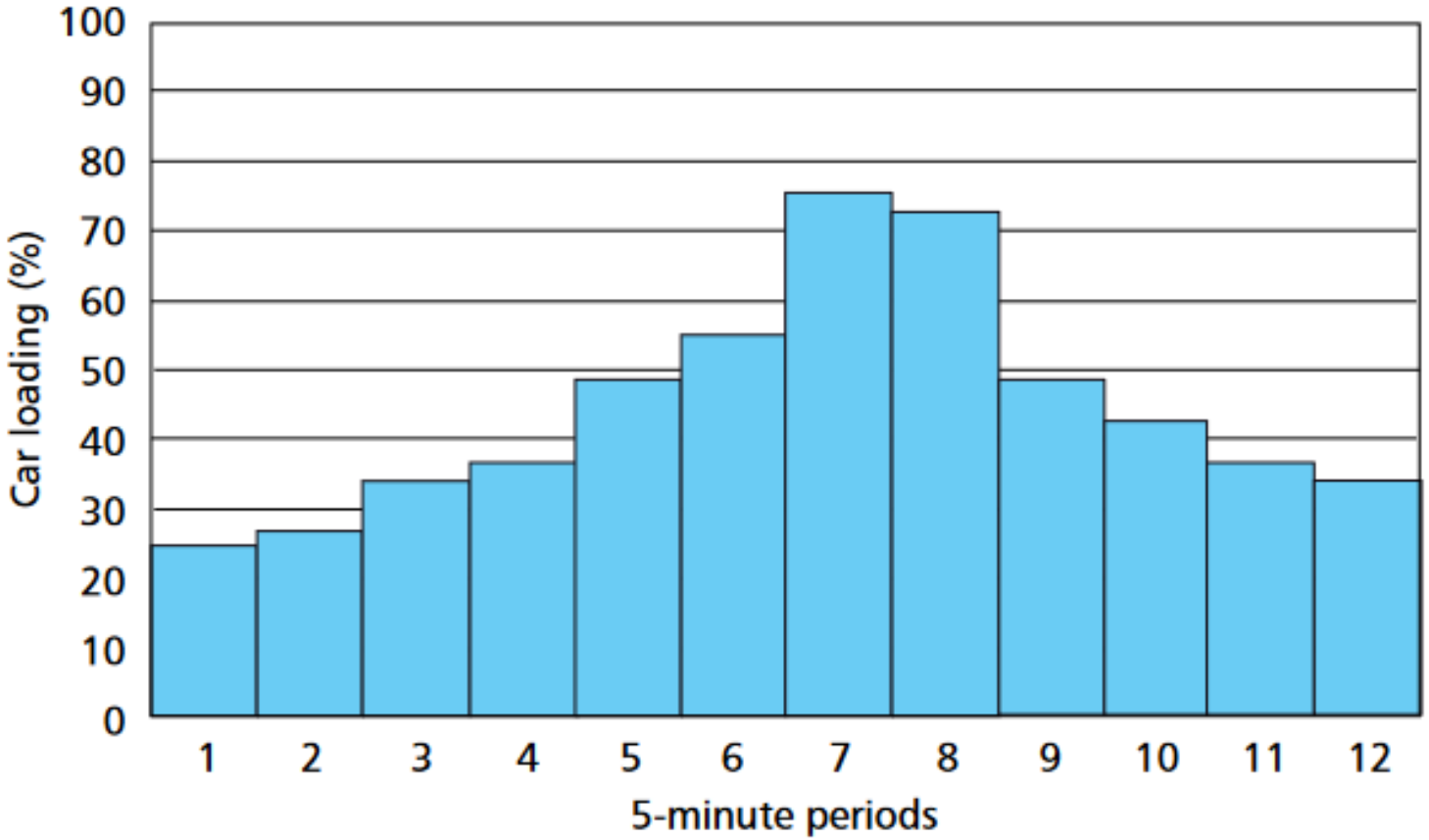


Figure 4.3 Average car loading in simulation

Simulation with ISO templates

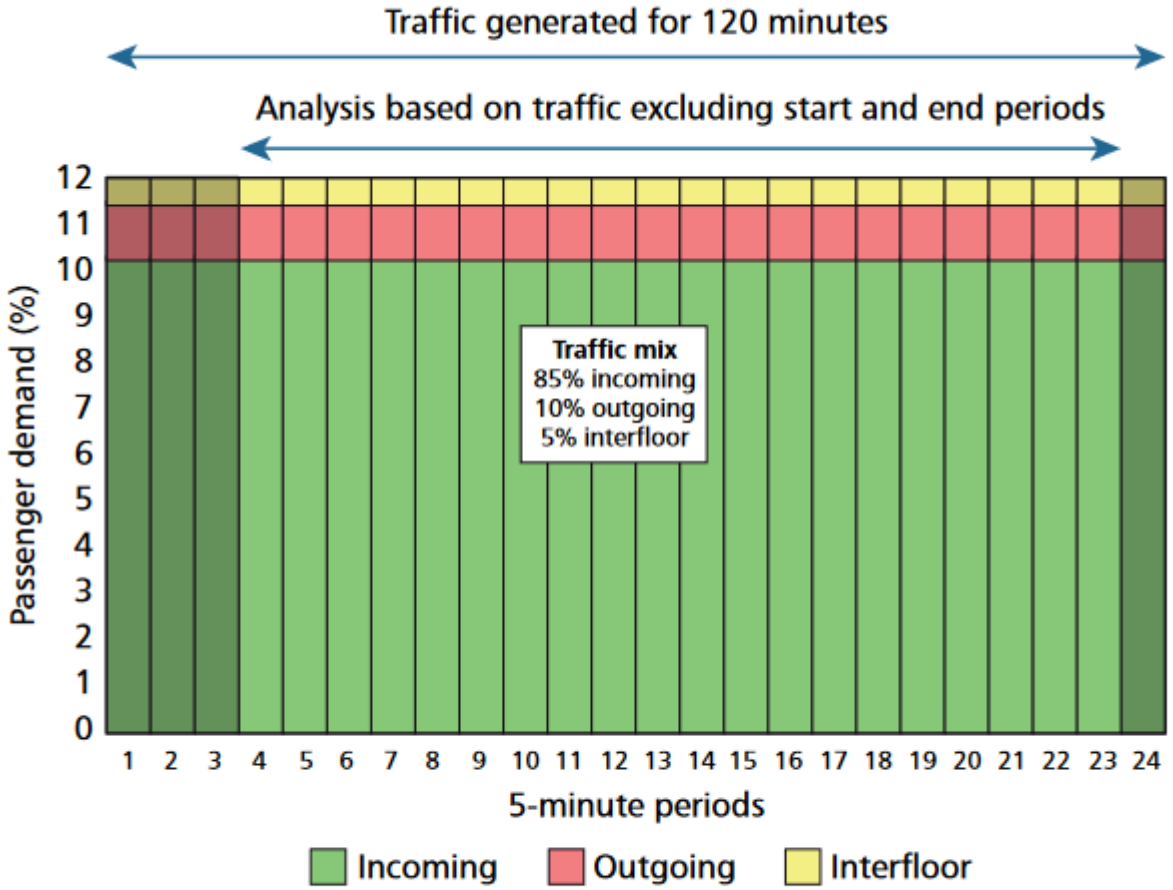


Figure 4.4 Example office mixed uppeak template with passenger demand 12% and traffic mix 85% incoming, 10% outgoing, 5% interfloor

Office Design

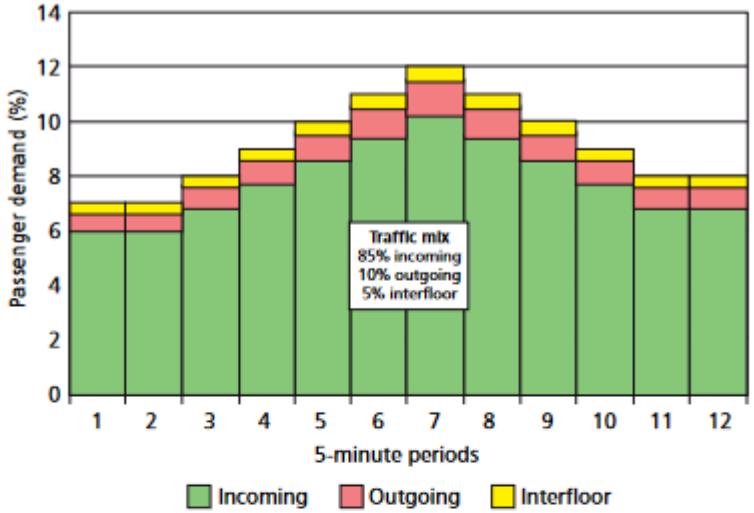
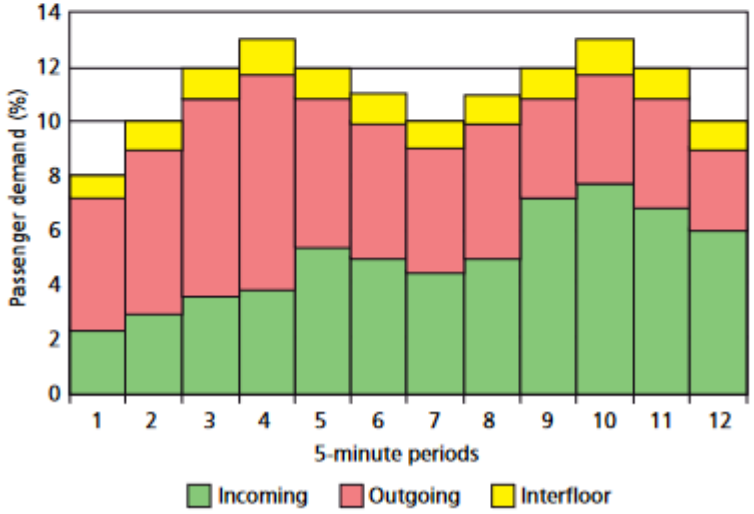


Figure 4.8 CIBSE office uppeak traffic template



Hotel Design

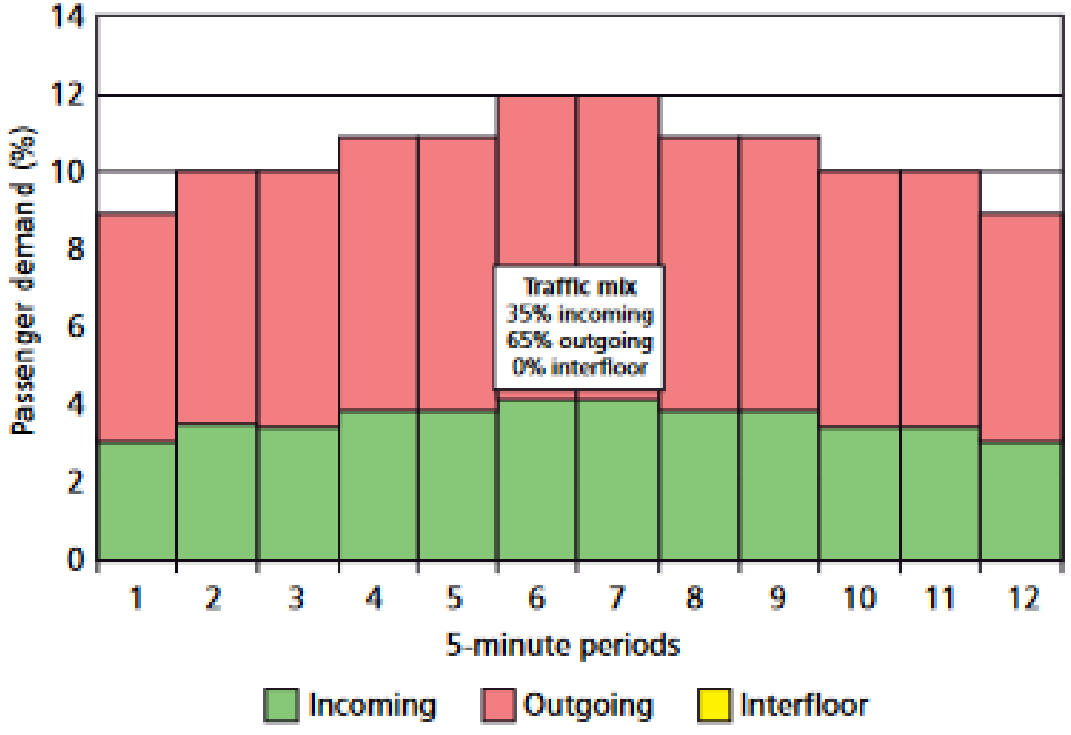


Figure 4.11 CIBSE hotel morning peak traffic template

Residential Design

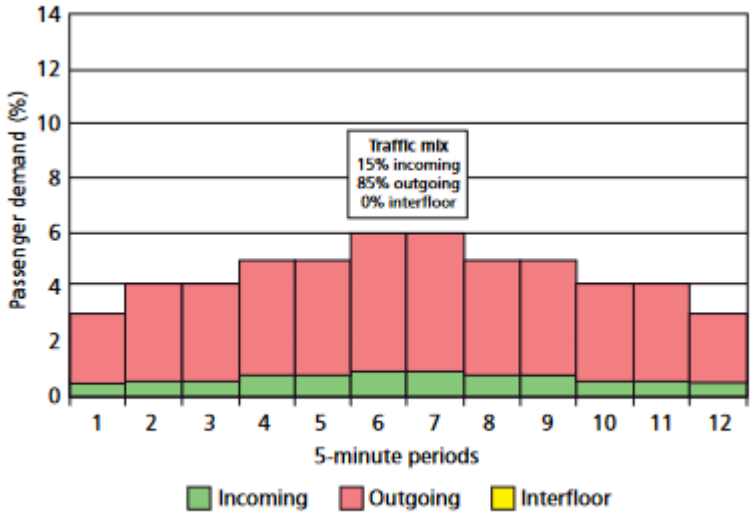


Figure 4.13 CIBSE residential morning peak traffic template

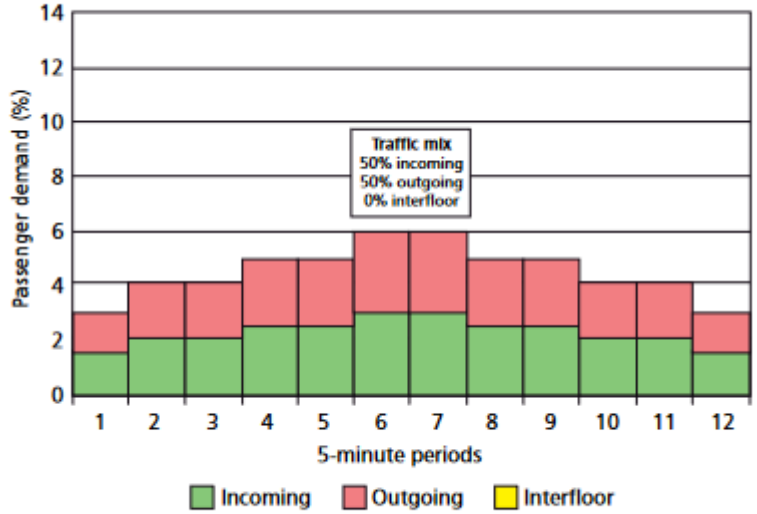


Figure 4.14 CIBSE residential evening peak traffic template

Other considerations

- Sample size and running multiple simulations
- Where all lifts do not service all floors
- Batch size

Example simulations

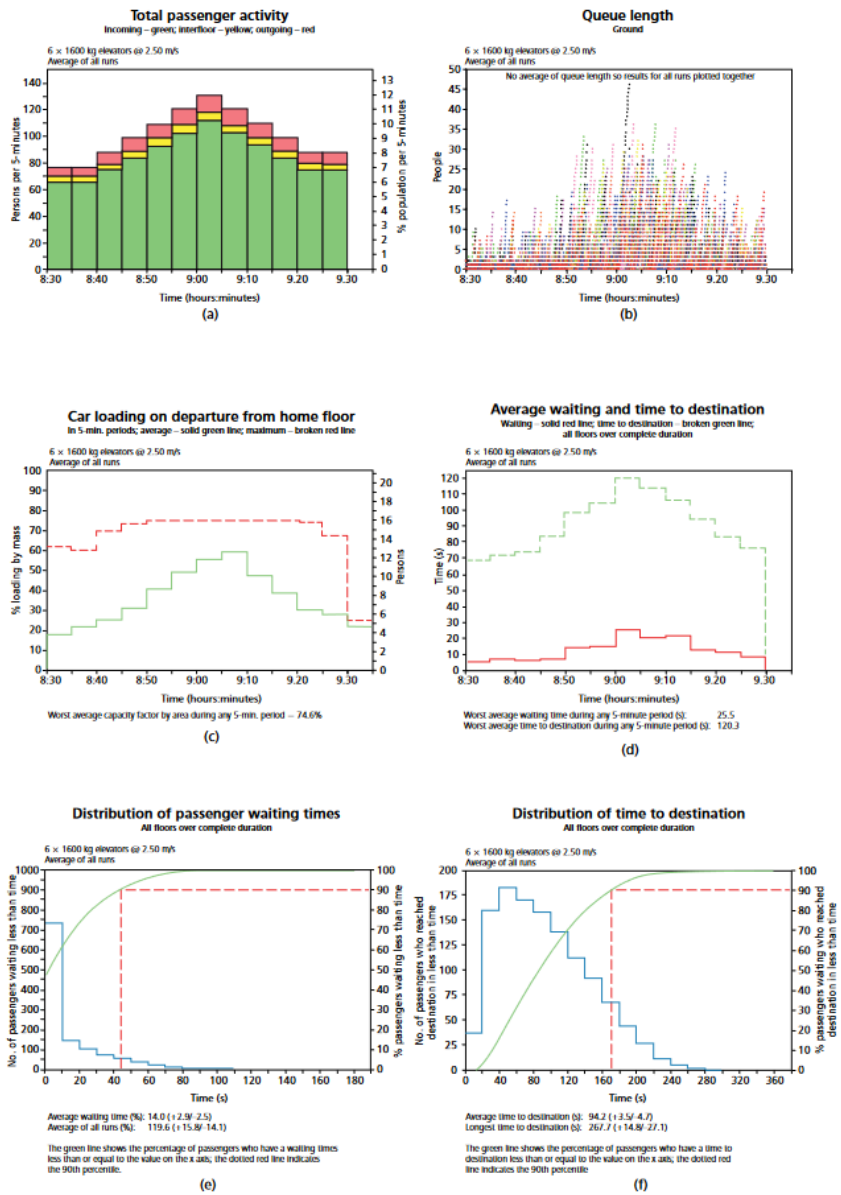


Figure 4.16 Simulation results for six 1600 kg lifts during uppeak with collective control

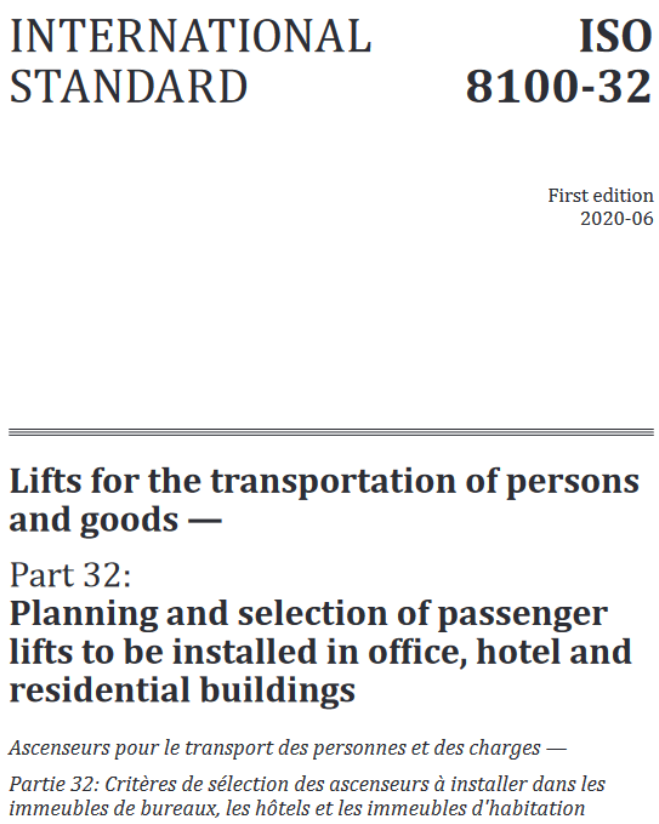
Other topics

- Simulation applied to modernization
- Comparing simulation with round trip time calculations
- Traffic analysis and simulation software
  - Comparing results between different programs
  - Comparing simulation results with the real world

How can section 4 be improved?

Update ISO 8100-32:2020 commentary

- Technical report being prepared



INTERNATIONAL STANDARD

ISO 8100-32

First edition
2020-06

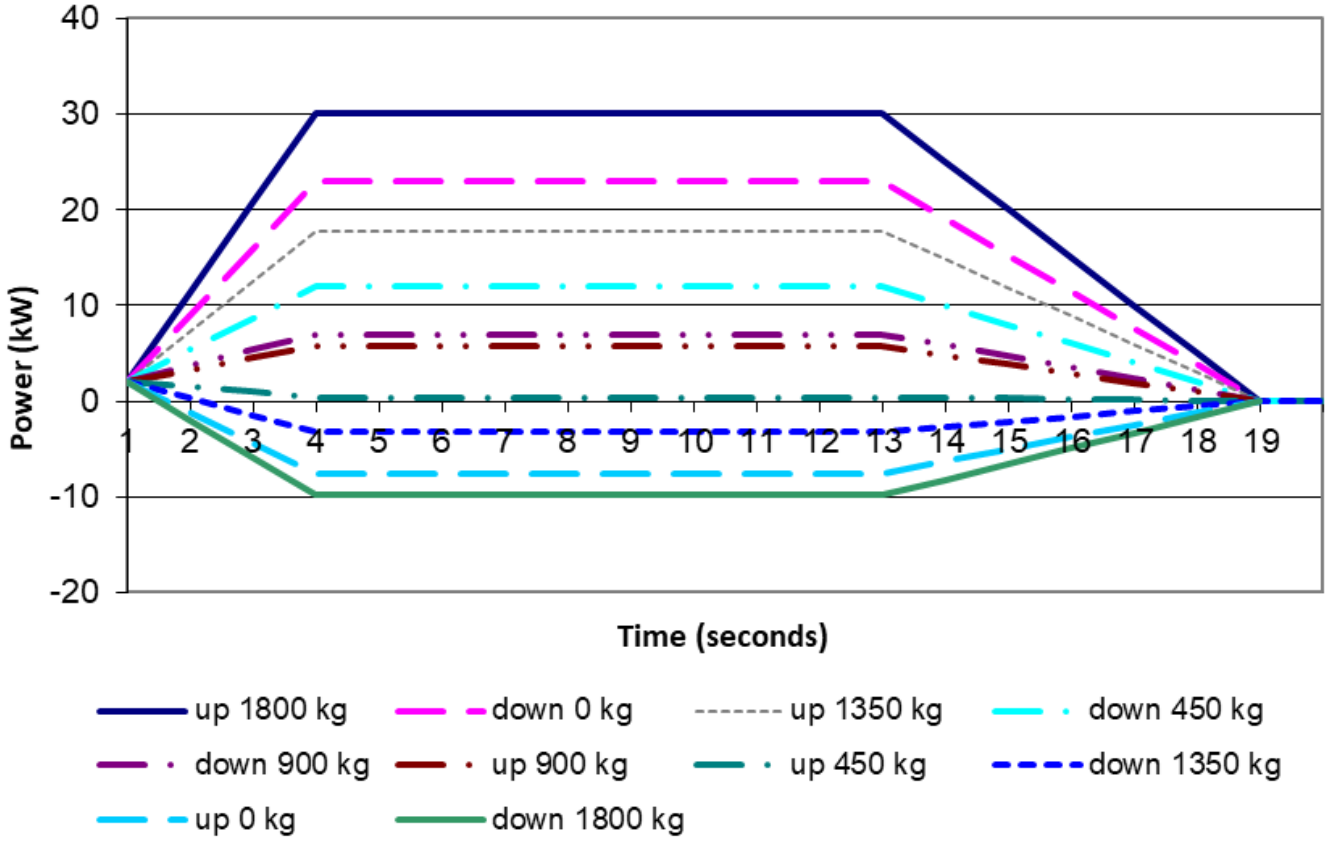
Lifts for the transportation of persons and goods —

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

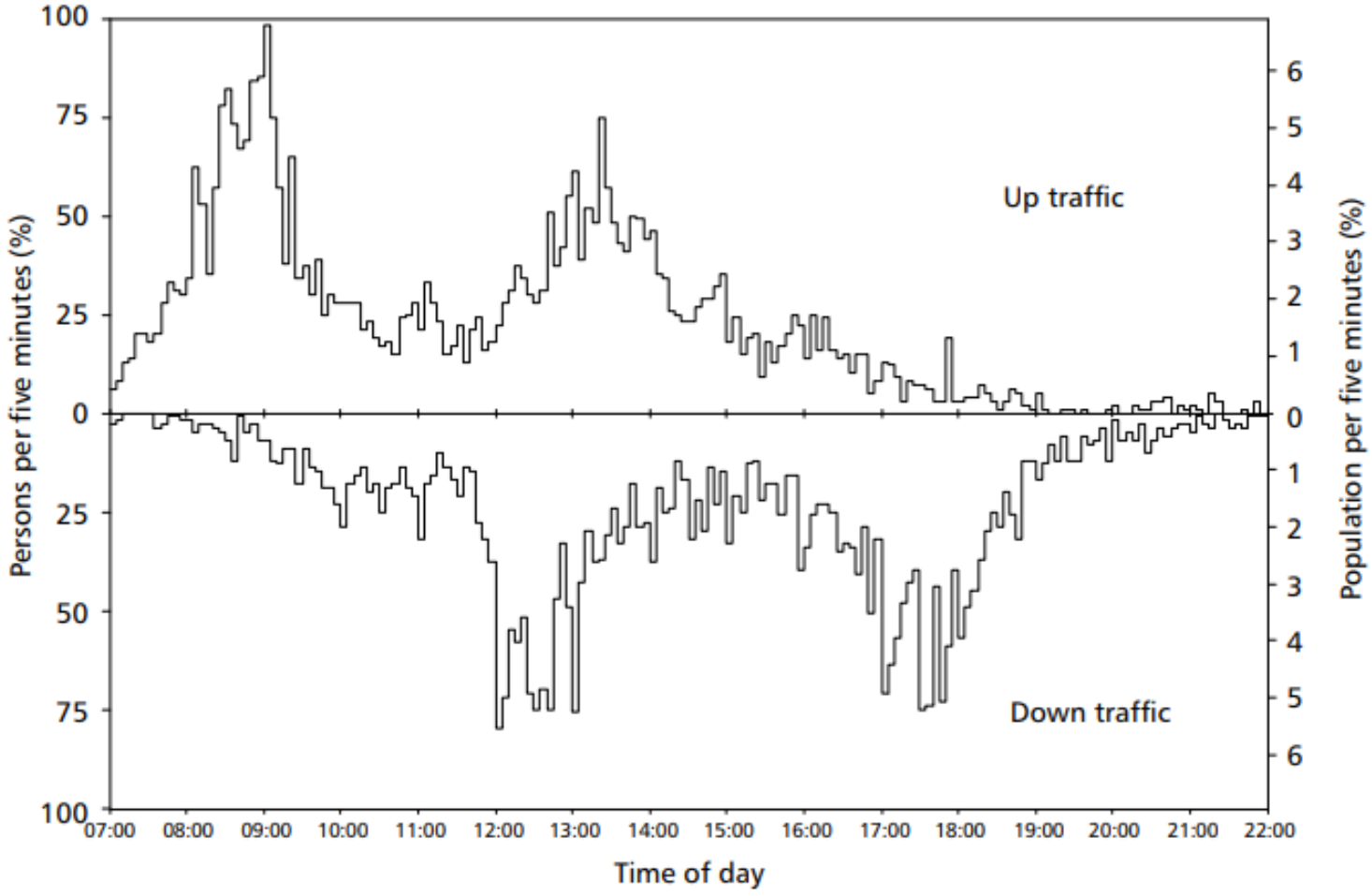
Ascenseurs pour le transport des personnes et des charges —

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

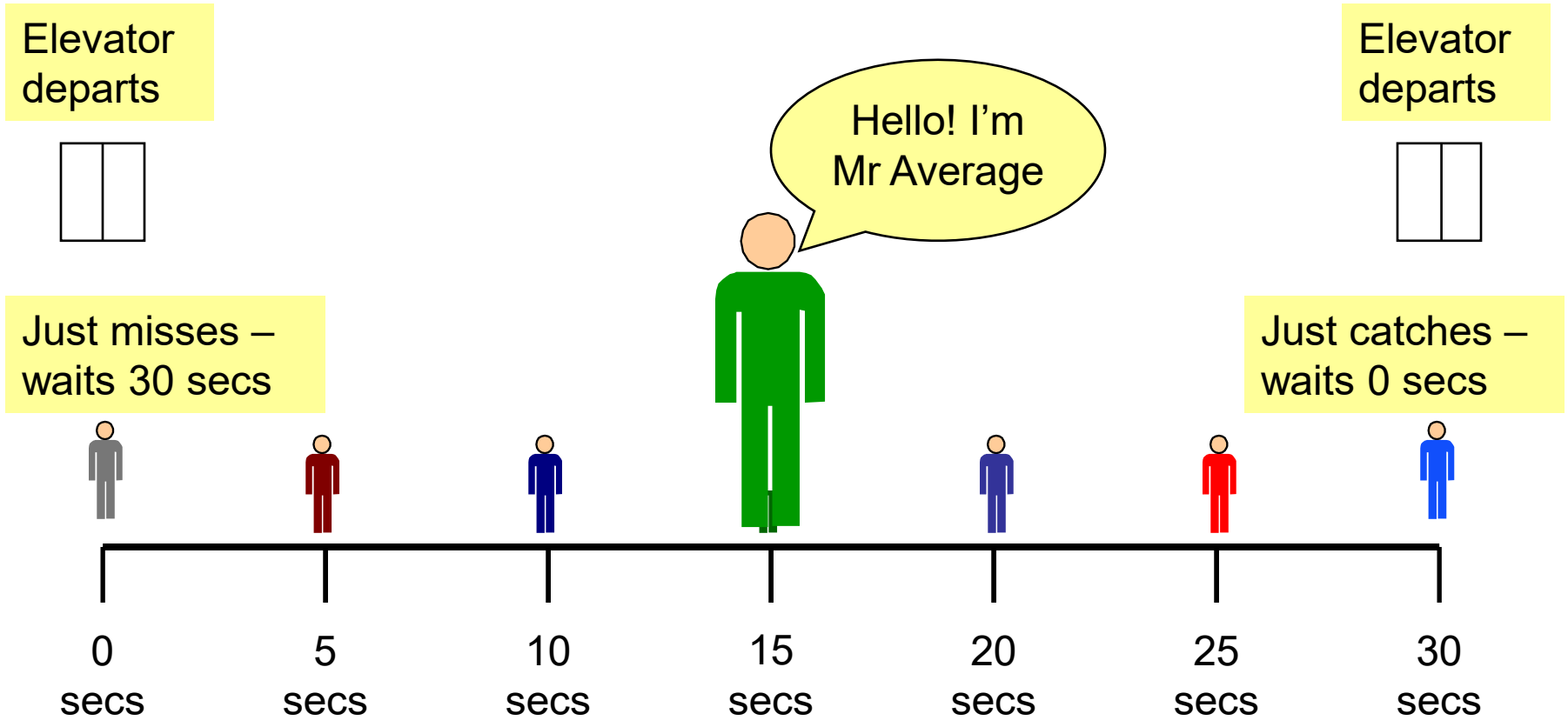
Energy simulation



All day profiles for energy simulation



Relationship between waiting time and interval



On average people wait 15 seconds

In a perfect system:
Average Waiting Time = Interval/2

Relationship between waiting time and interval

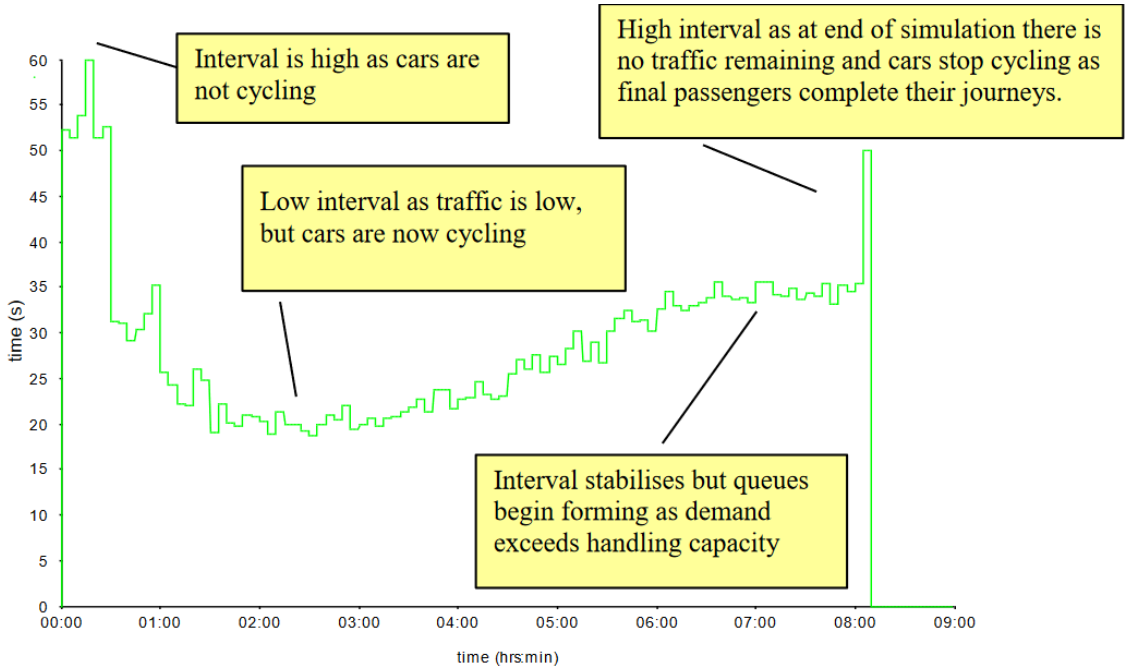


Figure 8 Interval for increasing traffic demand

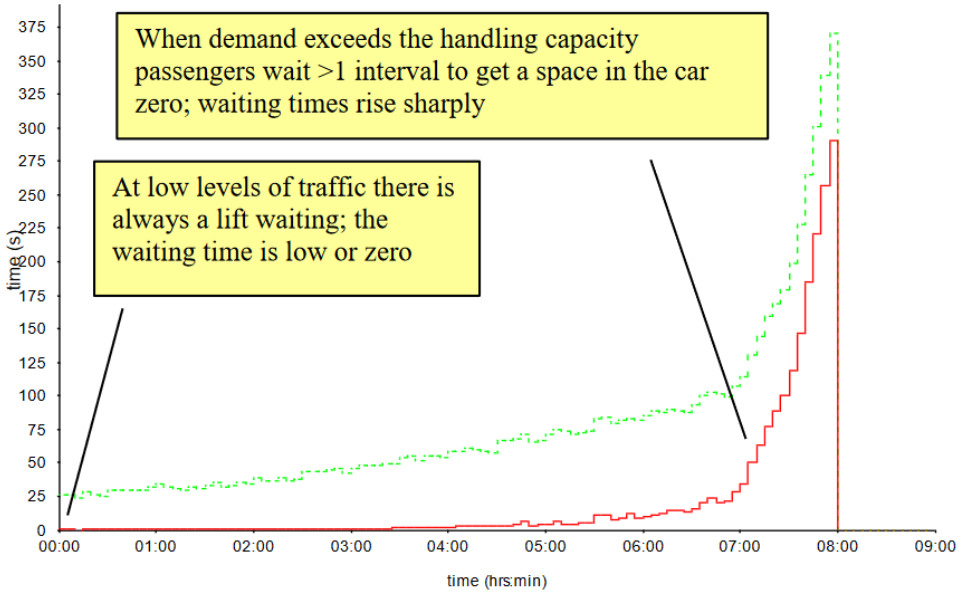
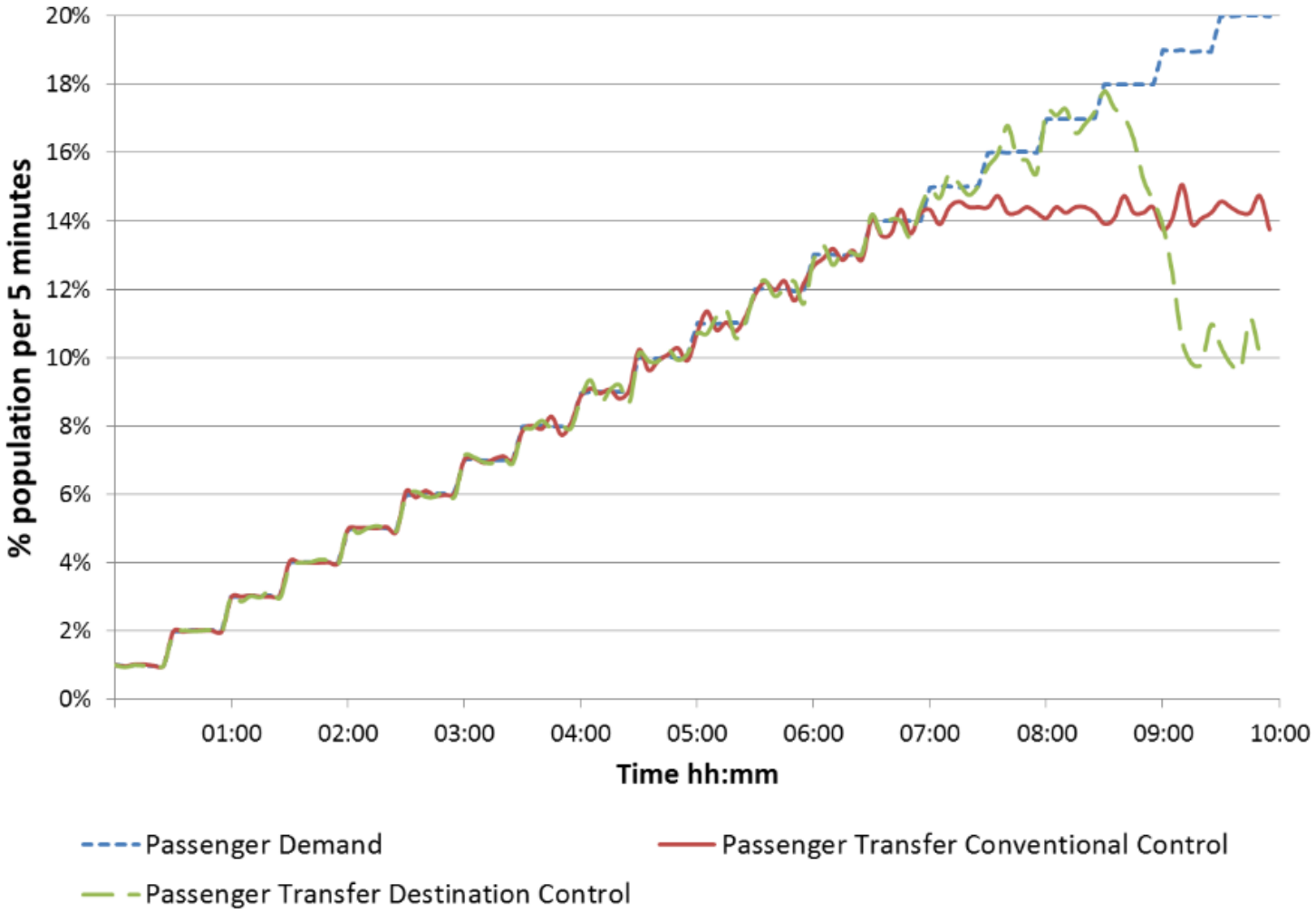


Figure 9 Average waiting time (solid) and time to destination (dotted) for increasing traffic demand

Establishing handling capacity with simulation



High rise examples

	rise 1	rise 2	rise 3	rise 4
60				X
59				X
58				X
57				X
56				X
55				X
54				X
53				X
52				X
51				X
50				X
49				X
48				X
47				X
46				X
45			X	I
44			X	I
43			X	I
42			X	I
41			X	I
40			X	I
39			X	I
38			X	I
37			X	I
36			X	I
35			X	I
34			X	I
33			X	I
32			X	I
31			X	I
30		X	I	I
29		X	I	I
28		X	I	I
27		X	I	I
26		X	I	I
25		X	I	I
24		X	I	I
23		X	I	I
22		X	I	I
21		X	I	I
20		X	I	I
19		X	I	I
18		X	I	I
17		X	I	I
16		X	I	I
15	X	I	I	I
14	X	I	I	I
13	X	I	I	I
12	X	I	I	I
11	X	I	I	I
10	X	I	I	I
9	X	I	I	I
8	X	I	I	I
7	X	I	I	I
6	X	I	I	I
5	X	I	I	I
4	X	I	I	I
3	X	I	I	I
2	X	I	I	I
1	X	I	I	I
ground	X	X	X	X

X represents served floor

I represents express zone

	rise 1	shuttle	rise 2
60			X
59			X
58			X
57			X
56			X
55			X
54			X
53			X
52			X
51			X
50			X
49			X
48			X
47			X
46			X
45			X
44			X
43			X
42			X
41			X
40			X
39			X
38			X
37			X
36			X
35			X
34			X
33			X
32		X	X
31		X	X
30	X	I	
29	X	I	
28	X	I	
27	X	I	
26	X	I	
25	X	I	
24	X	I	
23	X	I	
22	X	I	
21	X	I	
20	X	I	
19	X	I	
18	X	I	
17	X	I	
16	X	I	
15	X	I	
14	X	I	
13	X	I	
12	X	I	
11	X	I	
10	X	I	
9	X	I	
8	X	I	
7	X	I	
6	X	I	
5	X	I	
4	X	I	
3	X	I	
2	X	I	
1	X	I	
upper ground	X	X	
lower ground	X	X	

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Chapter 4 – Lift traffic design using simulation

Richard Peters

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Chapter 9 – Lift traffic control

Dr Richard Peters

With acknowledgement to Dr Gina Barney

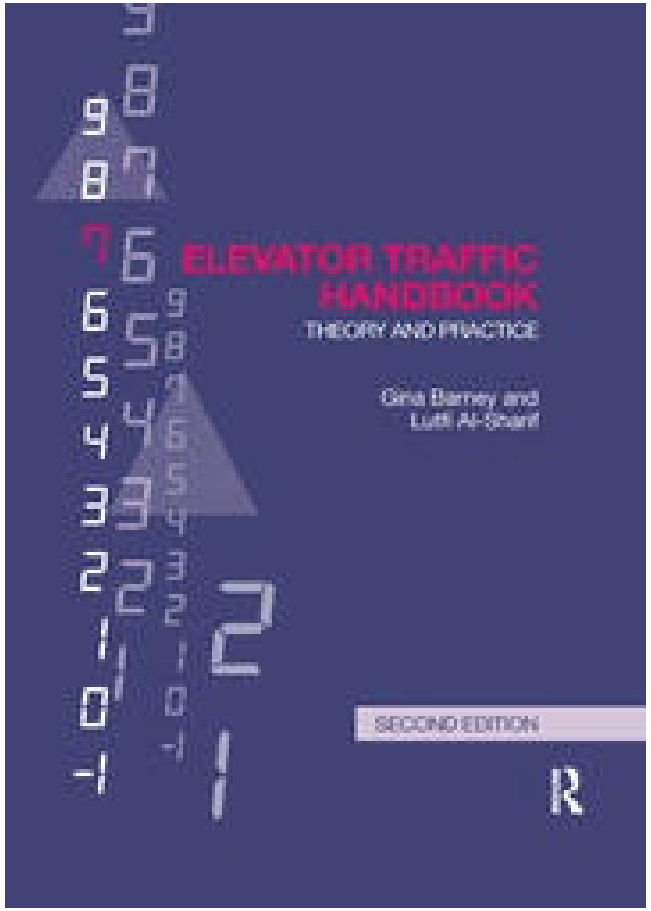
What does Chapter 9 do?

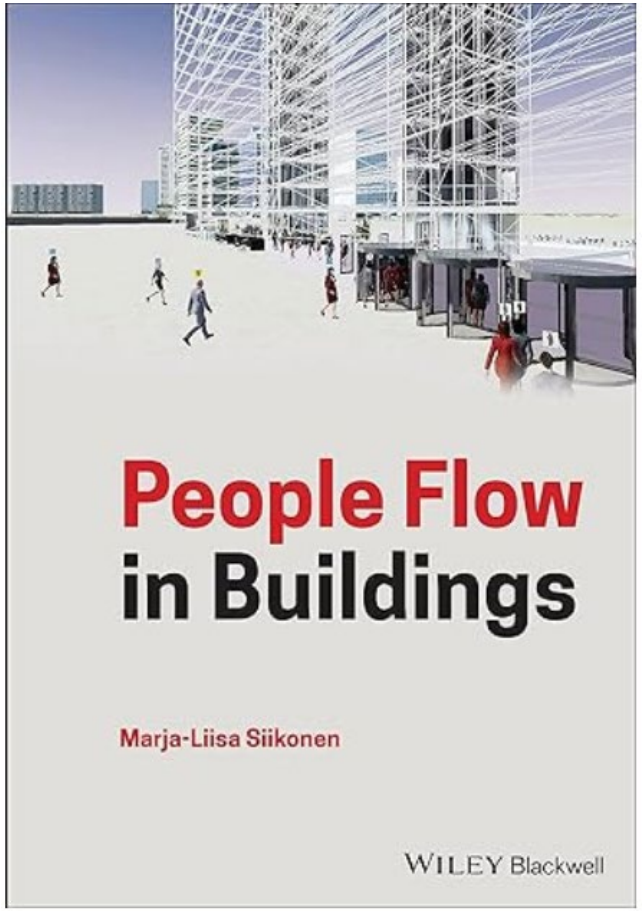
Sections

- The need for lift traffic control
- Single lift traffic control
- Purpose of group traffic control
- Legacy traffic control systems
- Traffic control algorithms with conventional signalling
- Traffic control algorithms with call allocation registration stations
- Other features of group traffic control systems
- Uppeak boosters
- Principles of the call allocation traffic algorithm

How can section 9 be improved?

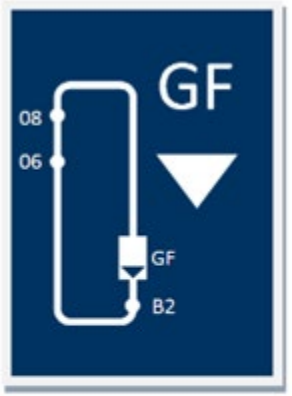
Literature review





LIFT & ESCALATOR
SYMPOSIUM

User interfaces



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Chapter 9 – Lift traffic control

Dr Richard Peters

With acknowledgement to Dr Gina Barney

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Appendix 2– Lift Kinematics

Richard Peters

What does Appendix 2 do?

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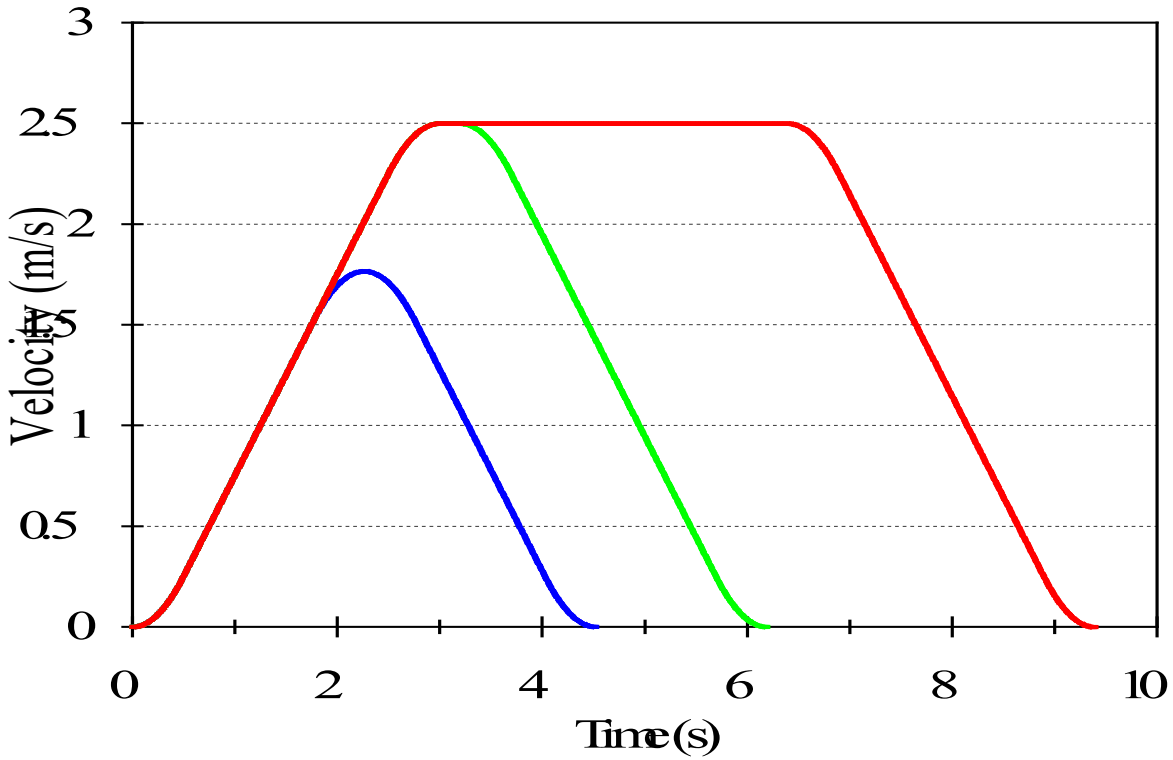
Appendix 2– Lift Kinematics

Richard Peters

… how long does it take a lift to travel between floors



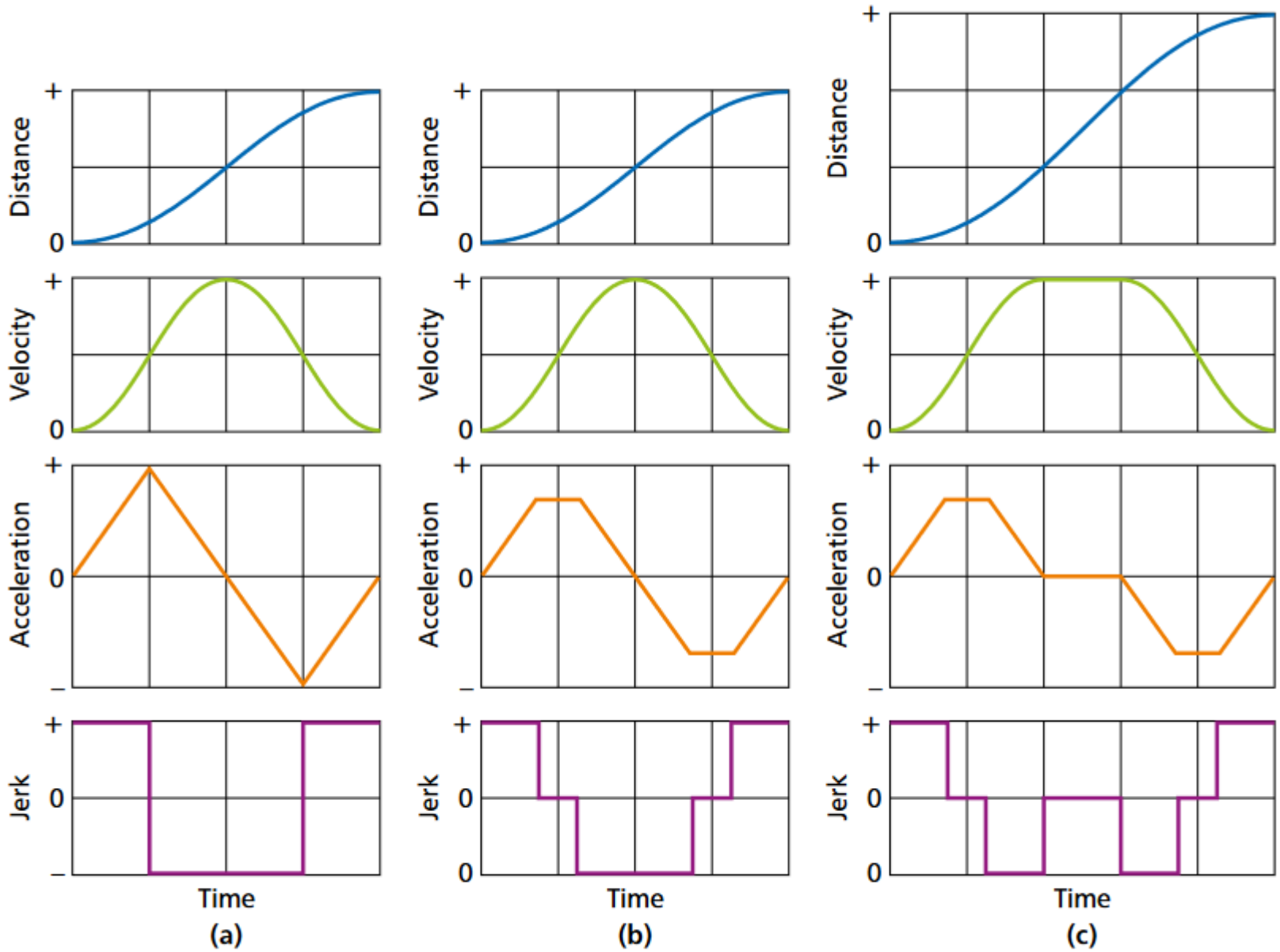


Figure A2.2 Lift kinematics; (a) rated speed reached before rated acceleration, (b) rated acceleration reached, rated speed not reached, (c) both rated acceleration and rated speed reached

Measurement

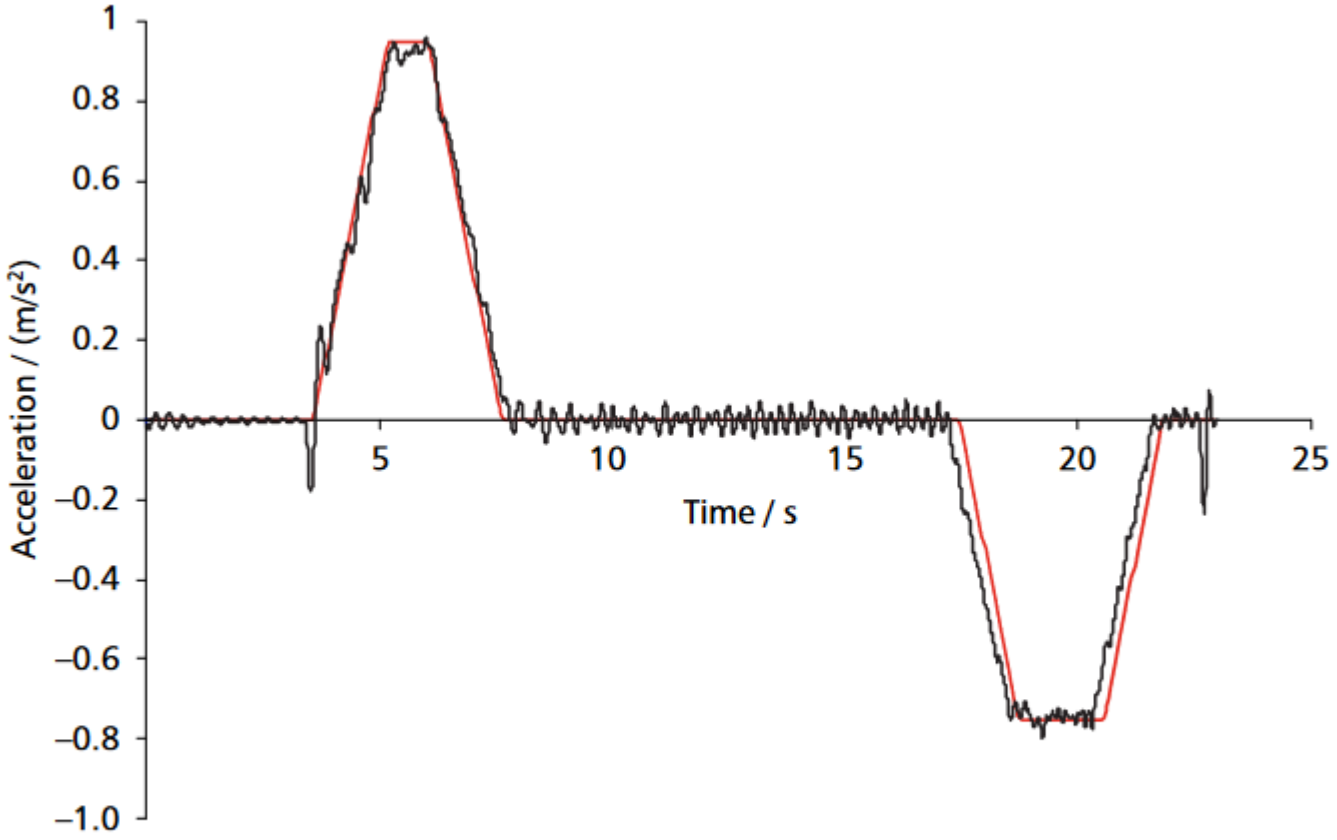


Figure A2.3 Plot of idealised acceleration curve with superimposed measured acceleration for a given rated velocity, rated acceleration/deceleration and rated jerk

Typical measurements

Table A2.2 Typical measurements of acceleration and jerk

Rated speed (m/s)	Acceleration (m/s^2)	Jerk (m/s^3)
1.0	0.6	0.4
1.6	0.6	0.4
2.5	0.8	0.5
3.0	0.9	0.6
5.0	0.9	0.6
6.0	0.9	0.6

How can Appendix 2 be improved?

- Some parts may be moved to sections 3 & 4 where applied
- Extend discussion on measurement
- Sensitivity analysis demonstrating impact on quantity and quality of service
- Spreadsheet for calculations on Lifts Group web site

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Appendix 2– Lift Kinematics

Richard Peters