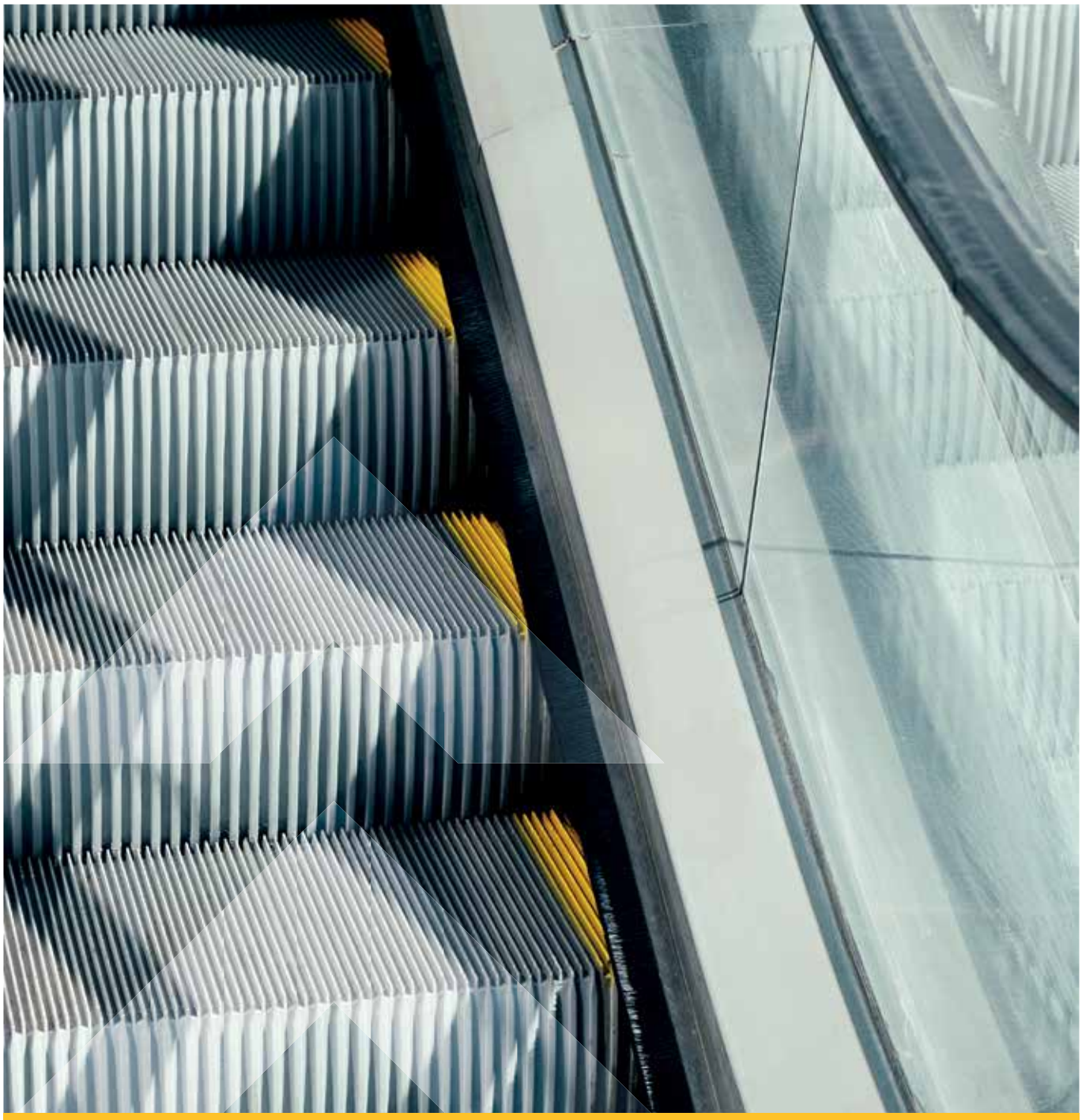
lift Industry News

A UK-BASED MAGAZINE WITH A GLOBAL OUTLOOK FOR THE LIFT AND ESCALATOR INDUSTRY



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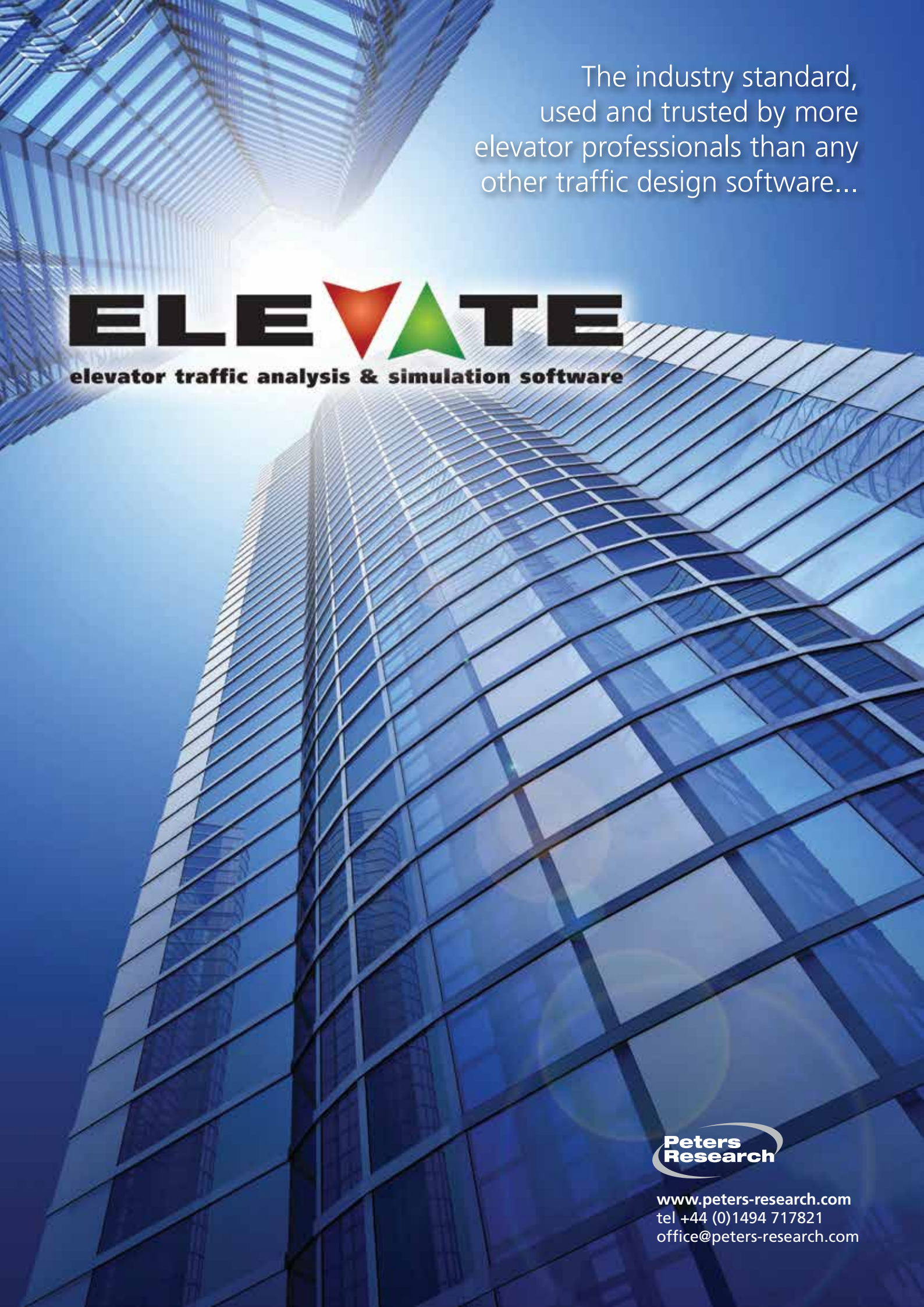
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UK-BASED MAGAZINE WITH A GLOBAL OUTLOOK FOR THE LIFT AND ESCALATOR INDUSTRY

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CAROLINE HAMILTON

OVERVIEW

Welcome to the autumn edition of Lift Industry News

It is with very great sadness that we mourn the passing of a true lift industry legend, Dr Gina Barney. A section of this edition of Lift Industry News is dedicated to Gina, you can read all about her pioneering life on page 37, some of the many tributes received from her friends and colleagues and an article on one of her great passions, her story of Lift Traffic Analysis, Design and Control 1960 – 2020. She was a huge supporter of Lift Industry News and I know the team will miss her greatly.

Gina would definitely want us all to be moving forward in this exciting industry we are involved in, and it is a great pleasure to be invited to give an overview of this 6th edition of Lift Industry News. As Chief Executive of the Safety Assessment Federation (SAFed) my team and I, along with our members and collaborative partners, work closely with the lift and escalator industry to fulfil our mission of Promoting Safety, Reducing Risk and Adding Value.

Lift Industry News is an excellent vehicle for keeping us all up to date with the industry – Behind the Scenes at LEIA on page 15 talks about the imminent digital switch, with links to very useful information.

As well as looking forward we can also learn from the past and we look back at a fascinating experiment in London's Holborn Tube station in 2015 where commuters were asked to stand on both sides of the escalator - Page 27 will tell us if it was a success!

SAFed provides a primary role in maintaining high standards of safety in the workplace so it is good to see two articles about routine maintenance and LOLER examinations, ensuring we can assist the industry in achieving a comprehensive level of understanding of the risks relating to operations - from Dave Cooper's Safety First article on page 21 about keeping bearings lubricated to John Bentleys challenging questions about LOLER inspections on Page 96. Additionally, Len Halsey in his popular Point of View column on page 12 asks if qualifications equal competence – a topic which surely will start some debate!

It is always good to learn about the people behind the company names we are all familiar with, Richard Jones the MD at Fujitec talks about his life in and out of the business on Page 59 and the lady behind some fantastic photos used in the magazine pages, Alice Black gives her Elevator Pitch on Page 94.

The 14th Lift & Escalator Symposium took place a couple of weeks ago in Northampton, attended by a record number of delegates. There will be a more detailed report in the January edition of the magazine but head to Page 62 to see a summary and some great photos of the key moments.

SAFed looks forward to continuing to work with you and supporting the vibrant lift and escalator industry.

I hope you enjoy this edition of Lift Industry News.

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lift Industry News

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THIS QUARTER

Missed any earlier editions?

TRIBUTE TO GINA BARNEY

We remember a true industry legend, Gina Barney with tributes from her many friends and colleagues.

THE KNOWLEDGE BANK

As Caroline Hamilton, the CEO of SAFed is our guest editor heading up the trade association that plays a key role in maintaining high standards of safety within the workplace we feature papers from the Lift & Escalator Symposium from 2018 and 2022 with a focus on safety.

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lift Industry News

CALENDAR 2023

October 16 - 20 Mon to Fri

CTBUH International Conference 2023
October 16-20

SINGAPORE

November 15 - 17 Weds to Fri

Global Elevator Exhibition
November 15-17

MILAN, ITALY

December 07 - 09 Thurs to Sat

Vietnam Elevator Expo
December 7-9

HO CHI MINH CITY, VIETNAM

October 17 - 20 Tues to Fri

Interlift
October 17-20

AUGSBURG, GERMANY

November 21 - 22 Tues to Weds

LiftEx 2023
November 21-22

LIVERPOOL, UK

2024

November 02 Thurs

CIBSE Lifts Group Annual Seminar
November 2

LONDON, UK

December 05 - 06 Tues to Weds

Build2Perform
December 5-6

LONDON, UK

February 01 - 03 Thurs to Sat

Lift City Expo 2024
February 1-3

CAIRO, EGYPT

November 08 - 10 Weds to Fri

International Lift Expo Korea
December 8-10

GYEONGGI-DO, KOREA

December 05 - 06 Tues to Weds

International Elevator & Escalator Symposium
December 5-6

EDINBURGH, SCOTLAND, UK

February 21 Weds

CIBSE Lifts Group AGM & Evening Seminar 2024
February 21

LONDON, UK

01 - 03 Fri to Sun
March

Smart Lift & Mobility World 2024

March 1-3

BANGALORE, INDIA

02 - 04 Sat to Mon
March

Cairo Liftech Show

March 2-4

CAIRO, EGYPT

09 - 11 Thurs to Sat
May

Inelex

May 9-11

IZMIR, TURKEY

16 - 18 Mon to Weds
September

The Elevator Show

September 16-18

DUBAI, UAE

01 - 02 Tues to Weds
October

E2 Forum

October 1-2

FRANKFURT, GERMANY

12 Tues
November

Nordic Lift Expo

November 12

STOCKHOLM, SWEDEN

04 - 06 Mon to Weds
December

Lift Expo Italia

December 4-6

MILAN, ITALY

05 - 07 Thurs to Sat
December

International Sourcing Exposition for Elevators and Escalators

December 5-7

MUMBAI, INDIA

LIFTEX 2025

The dates for LIFTEX have been announced so get it in your diaries – 11 & 12th June 2025, once again at ExCel, London. More details are coming soon but if you want a reminder of the 2022 show:

https://bit.ly/3rEiXPM

BUILD TO PERFORM

The eighth CIBSE Build2Perform Live event will take place on 5 - 6 December 2023.

It is the meeting place for forward-thinking industry professionals, visionary speakers, leading industry exhibitors and young talent and is attended by key decision-makers in the industry alongside, Government officials, senior management, facility managers, consultants, property development companies and experts across the spectrum of the building service sector.

Themes this year include Implementing the Building Safety Reform Programme, Delivering Net Zero and Adapting to Climate Change and Adopting Digital Tools and Smart and Secure Technologies.

Register to attend here: ***https://bit.ly/3sJu5eg***

Do qualifications equal competence?

POINT OF VIEW

This edition of Lift Industry News is examining the questions of competence, consistency and regulatory compliance. All topics that are much debated in our industry and ones that have a significant impact on our approach to what we do.

Edited by Caroline Hamilton of SAFed the key focus is no doubt looking at inspection bodies and the need to provide competent people who look at regulatory compliance in a consistent manner. While SAFed affiliated bodies cover a wide range of services, my focus is on competence and the criteria being applied to recruiting and training those who will be responsible for undertaking LOLER and thorough inspections.

I'm sure we are all aware that when it comes to regulation and its application a number of factors come into play. Interpretation of the codes and standards is perhaps the most significant. Ambiguous wording, national norms and local regulation all contribute to how codes and standards are viewed and applied. Add to this the fact that almost every lift and escalator installation is unique in some way and we can have a difficult time seeking to align requirements consistently.

From experience, there are two key elements that need to be considered when examining lift and escalator equipment. The lift or escalator itself, and its compliance to the relative standards, and the environment in which it operates, inclusive of access to the equipment for maintenance and inspection purposes.

When it comes to code/standard compliance there are many examples where interpretation and locally applied standards can become points of discussion, and sometimes disagreement, with inspecting bodies. I'm sure many will recall the question of compliance to the previous edition of EN81-70 and handrails on the 'rear side wall' of the car, not to mention EN81-72 and the question of self rescue from fire fighting lifts and the provision of escape ladders.

Notwithstanding the discussion on standards, when it comes to the working environment of lifts and escalators this can present something of a minefield, especially where architectural consideration takes precedence over practical application. Scenic wall climbing lifts and escalators in atria are just two examples where consistency of approach by inspection bodies can be something of a challenge, especially where there has been little or no consultation beforehand and a risk based approach has to be taken. Here opinions become a major factor, especially where there is no regulation reference point or guidance.

A further point of contention can come from 'recommendations' made by the inspecting body. While many are no doubt worthy of consideration, others may be a wish list of items the individual inspector sees as a 'nice to have', rather than a compliance requirement. The question of how the client responds to the recommendations needs to be considered and could be a key factor should there be an incident. It almost compels the client to explain why they decided not to accept the recommendation, not always an easy area to navigate.

Finally, we have the question of maintenance provision and its effectiveness in retaining safe and compliant operating equipment. Here we encounter the type of maintenance agreement the owner has, the competence for the service provider and the possible changing environment in which the equipment operates.

With the many variables forming part of the whole, it appears very difficult to set clear and unambiguous criteria. At what point does the inspector deem that wear and tear has reached a point necessitating adjustment, repair or supplementary inspection? Some may be obvious and have a direct impact on the safety, performance or reliability of the equipment. Others may be more nuanced where a judgement call is made based on the inspector's experience and knowledge. Achieving consistency in these circumstances isn't always easy.

With all these factors at play, how do inspection bodies set about ensuring a consistent approach is being taken? In my view, the first step is to ensure the inspectors are competent and properly trained; and it is here we meet the first hurdle. Like many organisations, the inspection bodies are trying to recruit experienced people. Speak to any organisation and you will get a similar response, "We just cannot find the people we need". For me, a key element in the recruitment challenge is the insistence on higher levels of academic qualifications. Seeking candidates with HNCs or degrees to undertake insurance inspections misses a valuable resource already available, and the one that carries the levels of experience and knowledge needed to undertake the task - the existing industry workforce.

A qualification led approach to recruitment gives the impression that the organisation values qualifications over experience and takes a position that with the right training candidates with no previous VT experience can gain the competencies needed to fulfill the role. While this approach has the benefit of introducing new people to the industry, it raises the question of competence and how it is defined.

Different dictionaries define competence as, 'the ability to do something well', 'the ability to perform to a specified standard'. The HSE describe it as, 'the combination of training, skills, experience and knowledge that a person has and their ability to apply them to perform a task safely'. Looking at the various definitions I think we could summarise competence along the lines of, 'having the relative skill, experience and knowledge to safely undertake the task'.

Given what has been discussed, and the approach of many organisations in seeking higher levels of academic qualification, we reach the question; do qualifications equal competence?

I'm sure many of you will have a similar opinion to myself in saying the answer to the question is, 'no'. In giving this response there is a need to recognise that many in our industry are very competent, highly skilled people who may not have particularly high levels of academic qualifications. However, many are exceptional at what they do and have the abilities, knowledge and experience necessary to meet the competence criteria above.

For many years I have felt that inspection bodies are focusing on the wrong group of people when it comes to recruitment, something I know is shared by many who serve in the inspection industry. An experienced maintenance or test engineer not only comes with a high level of competence but also has knowledge of a wide range of equipment and its application, although perhaps not accompanied by the level of qualification being sought.

From experience I have met many highly competent people who may not be particularly articulate but have the skill and ability to resolve complex problems and a natural aptitude for the work they do. I'm sure we have all seen this at different times and to ignore this group of experienced people is a mistake.

So, if we can establish that qualifications do not equal competence, is there a place for those with higher academic qualifications in our industry? The answer, of course, is yes. We need younger people with fresh ideas and a willingness to learn, however they need to be supported by those with the experience and knowledge to move not only inspection bodies, but our whole industry into a new and exciting future.

For me the question of regulatory compliance and consistency is best addressed through competent people being properly trained and having the knowledge to understand the aims and objectives of the regulations and how these are applied. Training, as we know, is essential, and it is here that we encounter further hurdles. The training provided needs to be aligned and consistent across the inspection industry and while in house training, and that provided by third parties, is necessary, it is not always consistent. In this respect a clear scope of inspection criteria, universally applied, would be a significant help. As an example, I have long wondered why door closing forces have not been measured as part of the LOLER inspection, and as seen from the presentation at last year's Lift Symposium it is a source of many incidents related to passenger use.

With insurance inspections aimed at examining safety and not necessarily performance there are areas where things can fall between the gaps. How far do examinations take account of the requirements of say, landing indicators and compliance to EN81-70? Or a full check of the fire recall and firefighting operation as detailed in EN81-72? These are areas in my experience where the inspection bodies have varying views when it comes to differentiating between compliance and what is perceived to be a functional or maintenance problem. What is the scope of the compliance examination, have the boundaries become blurred?

Many of the inconsistencies I have witnessed come about due to the interpretation of regulations by the individual inspector or where poor quality workmanship clouds a compliant installation. It is here that experience plays a key part in determining what constitutes a possible problem.

I'm sure for many of those responsible for VT equipment the insurance inspector is viewed as their 'eyes and ears', someone who verifies that proper maintenance is being undertaken and that the service providers are doing their job properly. As a consequence, they place significant emphasis on the inspection process and in this respect, consistency and competence are major factors.

We have seen many debates about the role and scope of inspection bodies' responsibilities over the years, especially in relation to the notification of serious defects, but I'm sure we all support the ongoing need for a strong and highly competent inspection industry that provides both owners and the public with the confidence that the lifts and escalators they use are safe and reliable. I would like to think a major contribution can be made by taking recognition of the expertise, experience and knowledge we have within our industry and not led by the thought that qualifications equal competence.

BIOGRAPHY

Len Halsey spent a major part of his career with Otis, holding senior technical and managerial positions, before joining Canary Wharf Contractors in 1998. He was appointed Project Executive for Vertical Transportation Systems in 2002 responsible for VT design across the range of developments undertaken by Canary Wharf including, office, residential, retail and infrastructure projects. He retired from Canary Wharf Contractors in 2019 and is now retained by the company as a consultant. He is a member of CIBSE and a former chair of the CIBSE Lift Group.

BEHIND THE SCENES AT LEIA

NEWS ROUND-UP

Welcome to Emma

Emma Randall joined the LEIA team this summer as EPA Co-ordinator working alongside Karen Slade, Head of End-Point Assessment for LEIA Assessment. Emma has a sound background in apprenticeship administration and compliance having previously worked for a major apprenticeship training provider where she prepared all documentation in advance of End-Point Assessment.

CSCS card accreditation reminder

A reminder that all cards renewed under Industry Accreditation will now expire on 31st December 2024. If you have an Industry Accreditation card, the rear of your physical CSCS card will state 'Industry Accreditation'. To find out what to do next, we recommend visiting ***https://bit.ly/3PIcvix***. You can also find details of LEIA NVQs under education and training on the LEIA website.

LIFTEX 2025 dates announced

LIFTEX will return from 11 & 12 June 2025 at ExCeL London.

LIFTEX 2023 was the biggest and most successful yet in the show's 34-year history, with a 22% increase in attendance. Check ***https://www.liftexshow.com/*** or the LEIA social media channels for updates.

LIFTEX 2023

Two new members join LEIA

Established in 1988, Lift Craft Ltd provides a complete design and manufacturing facility for all forms of vertical equipment and ancillary equipment. The family-run business is based in the West Midlands but serves all areas of England and Wales.
https://liftcraft.co.uk/

Based in Clevedon, Elserv Limited specialises in installation, modernisation, repair and maintenance, the company offers a complete one-stop vertical transportation service with standard and bespoke lift designs.
https://www.elserv.co.uk/

LEIA seminar series

We have two seminars taking place this month, our annual Technical Seminar (4th October) and Safety Seminar (10th October). On 7th November we're hosting our Contracts & Legal seminar in Northampton. This is a project management masterclass and is open to LEIA members only. Log in to the member zone on the LEIA website to book.

See us at CIBSE Build2Perform Live

Nick Mellor, MD at LEIA will be speaking on the conference programme on reforms in building safety and the implications for building owners and the lift industry.

Now in its eighth year, Build2Perform Live is the meeting place for forward-thinking industry professionals, visionary speakers, leading industry exhibitors and young talent.

The event takes place from 5 – 6 December 2023 at ExCeL, London. It's free to attend, register here:
https://www.build2perform.co.uk/

UK Government announces extension of CE mark recognition for businesses

The Department for Business and Trade (DBT) has announced an indefinite extension to the use of CE marking for businesses. Upon the announcement Nick Mellor, LEIA MD, said, "Excellent news that the Government intends to extend recognition of CE marking for placing goods on the GB market indefinitely beyond December 2024 including for lifts, machinery and the other regulations under the DBT. We have had some excellent engagement with DBT and this is very welcome relief for the industry, especially for safety components for lifts." UKCA marking is still required where Approved Bodies are used as part of conformity assessment and so the vast majority of new lifts placed on the market in Great Britain will be UKCA-marked (which may be on accompanying documentation).

LIFT & ESCALATOR OWNER NEWS

Digital Switch - Warning about lift alarm calls

In recent months there has been an increase in technical support requests, related to lift alarms, across our industry, implying that many issues are still present related to the digital switch. Information to lift owners remains limited from BT Openreach meaning that lift owners may be at risk of not knowing if, or when, their analogue telephone lines (with copper conductors) will be replaced by fibre connections. Many lift maintenance providers are already installing GSM systems to cover any loss in telephone coverage, but with over 10 million analogue lines still to be replaced, an increased rate of work by BT Openreach may impact where any GSM system has not yet been installed.

BT Openreach has used Salisbury as its trial first "Full Fibre City", however the up-take of changing from analogue to digital lines has been far slower than anticipated leading to a change in approach. We have heard reports of 'reducing internet speed' over analogue lines to promote users changing fibre lines. ***https://www.openreach.com/news***. We have also heard of other measures to discourage the use of analogue lines, with some calls made over analogue lines having "root credit control", read the report from the All-IP Steering Group here ***https://bit.ly/3LM29Nu***.

These billing teams are unlikely to have the knowledge or understanding to be able to answer or deal with an alarm call where persons may be trapped within a lift car.

Communication providers, such as BT, Virgin Media and others, face a continued challenge to raising the awareness of building owners and to ensure that sufficient information is given to all parties where analogue lines are still installed.

What do building/lift owners need to do?

The telephone line is typically the responsibility of the building/lift owner (not the lift maintenance company) but it is urged that lift maintenance providers advise building owners that there may be a risk to the lift alarm system where analogue lines remain installed. Those responsible for buildings need to take action:

1. Talk to your communication provider to understand the changes to your line and when it will happen.

2. Check with your lift maintenance company for advice on equipment that can be fitted. At present, this will typically be a GSM solution incorporating a battery-backup. Since 2G and 3G are also due to be withdrawn in the coming years, we recommend a 4G solution, including SIM card.

Further information

BT Openreach factsheet: ***https://bit.ly/48Ee8Xl***

LEIA article: ***https://bit.ly/3PNVLXc***

LEIA article: ***https://bit.ly/3PGmMvP***

LEIA article: ***https://bit.ly/3LM4S9G***

Lift Industry News has published two excellent papers on the topic of the digital switch. In **Issue 2, October 2022**, Matt Davies of Avire wrote on Making sure your lifts are ready for the Digital Switch

https://bit.ly/3KWmBuv

and in **Issue 3, January 2023** Jason Godwin from 2N wrote about An elephant in the (Machine) Room.

https://bit.ly/44ueGM0

DEDICATED EXPERTISE FOR THE UK'S ELEVATOR MARKET

CP Automation expands partnership with Control Techniques to include elevator drives

To expand its product and service support offering, elevator control specialist *CP Automation* has signed a semi-exclusive partnership with Control Techniques in the UK and Ireland. The new agreement with the elevator drive original equipment manufacturer (OEM) began on July 1. As a semi-exclusive partner, CP Automation will use its experience of the elevator market to support customers with new product supplies, retrofits and the replacement of legacy drives and components.

Based in Newtown, UK, Control Techniques is a global manufacturer of AC and DC variable speed drives (VSDs) and offers products designed specifically for the elevator market. Globally, over three million elevators use Control Techniques drives to improve efficiency, operation and ride comfort. The company provides dedicated solutions for applications including packaging machinery, cranes and printing, and elevators are another key vertical sector.

Control Techniques is a longstanding partner of CP Automation's, having first established a partnership nearly 20 years ago. By becoming a semi-exclusive partner for its elevator products, CP Automation will become a stockist of Control Techniques drives and associated peripheral components such as RFI filters, braking resistors and UPS solutions. All products will be backed up by the industry leading technical support and product selection tools already enjoyed by its highly specialist elevator customers.

"Control Techniques offers an extensive range of drives and regen solutions to improve lift ride quality and energy efficiency, but the company needed a way of reaching out to the whole elevator market and delivering reactive technical support for customers and next day deliveries," explained Brian Preston, general manager at CP Automation. "With the new partnership, we can now offer an unrivalled turnkey solution — this includes assistance with product selection, through to on-time delivery and then on to full technical support, whether that be by phone or on site.

"Initially, we will focus on developing the service and support side of the business, before identifying new business opportunities and expanding," continued Preston. "A key area where CP Automation can deliver value for example, is that we plan to offer next-day product deliveries and will put together drive conversion kits for the field to facilitate a quick upgrade from older, discontinued Unidrive products to the new E300 or M701 platform."

Following the partnership, CP Automation will stock the E300 AC elevator drive and associated DCP and CANOpen modules, along with M701 regen solutions.

"Extending our longstanding partnership with CP Automation to include our elevator segment products and solutions is a testament to the in-house capabilities and expertise of CP Automation," explained Ralph Real, regional director UK & Ireland at Nidec Control Techniques. "The elevator market segment is very specialised and end users and lift manufacturers demand superior ride comfort and reliability.

"CP Automation has extensive experience within the elevator market segment to ensure Nidec Control Techniques solutions for this segment are correctly selected, implemented and supported, guaranteeing a superior customer experience," continued Real. "With off-the-shelf stock and technical expertise at CP Automation, users of elevator drive solutions are assured of prompt and expert support to keep elevators moving people and goods in comfort, both safely and efficiently."

To find out more about ***AC drives*** for elevator applications, visit the ***CP Automation website***.

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SAFETY FIRST

Dave Cooper, our expert advisor says

DON'T LOSE YOUR BEARINGS

I want to introduce some members in the maintenance side of our industry to a tool that it appears may have been forgotten in the passing of time – the grease gun.

A **grease gun** is a common workshop tool used for lubrication. The purpose of the grease gun is to apply lubricant through an aperture to a specific point, usually from a grease cartridge to a grease fitting or 'nipple'. The channels behind the grease nipple lead to where the lubrication is needed. I have one on my boat which I use to grease the stern tube gland.

As an engineer I use it routinely as I have a great fear of what might happen if I don't. The purpose of the stern tube gland is to stop water from the river making its way up the propeller shaft into the bilges of the boat. Given the outcome of not greasing it, my mind is perpetually focused on doing it and it's on my shut down checklist after every trip.

Funny enough, most maintenance schedules I see for lifts include checking and lubricating where required. The clue so far is in the word "lubrication".

Lubrication is needed where two solid surfaces come into contact with each other. When it comes to bearings we have those that need to be lubricated and those that are defined as "sealed for life" which contain lubricant and don't need topping up. It is important to realise that a "sealed for life" bearing is exactly that – it doesn't need lubricating but it wont last forever.

We face numerous different types of bearing including roller, sleeve, ball and shell bearings. The one thing they have in common is that they all need lubricating.

I am going to express an opinion here which might not surprise many but some may wish to resist. A basic maintenance contract includes cleaning, lubricating and adjusting. Simple as that. There is a very good section on types on maintenance contract in CIBSE Guide D. So, if a bearing fails as a result of not being lubricated the maintenance contractor should compensate for their negligence by replacing the bearing.

That having been said, I do accept that sometimes a bearing will fail and won't give you much notice that it is going to do so. Have a look at some of these examples of bearing failures and let me know whether you think they were instantaneous failures or down to the fact that maintenance was poor (non existent).

HOW ON EARTH DID THESE SITUATIONS ARISE WHEN THE LIFTS WERE HAVING BOTH ROUTINE MAINTENANCE AND LOLER EXAMINATIONS?

In most cases a bearing that is failing will give you some clues – maybe noises or witness marks including:

- A knocking noise directly associated with its rotational speed
- A graunching noise
- Possibly poor ride comfort in the lift car
- A pile of dust building up on the gear raft

This list isn't exhaustive but indicative of some of the things that can happen.

You cannot convince me that the dust in the photograph below hasn't taken a long time to accumulate:

And, you cannot convince me that someone didn't complain about the lift being noisy or the ride quality being a bit lumpy in the example below.

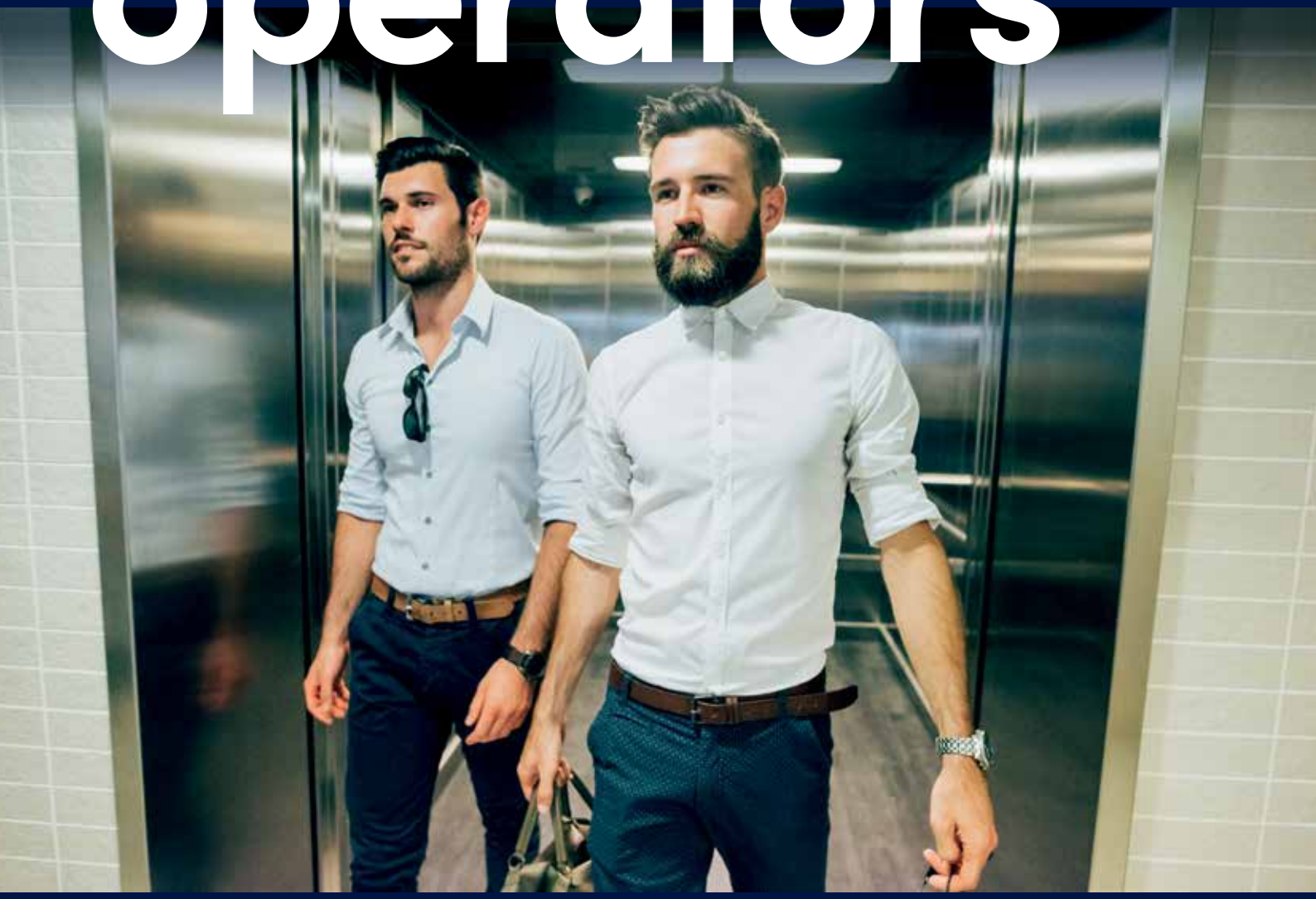
Looking at the photograph above brings me to my closing remark. Just because something is out of sight doesn't mean it's out of mind. Bearings in overhead wheelhouses need lubricating too!

No doubt I will be hearing from you on this one.

BIOGRAPHY

Eurlng Prof. David Cooper MBE is the CEO of UK based lift consultants LECS (UK) Ltd. He has been in the lift & escalator industry since 1980 and is a well-known author and speaker. In 2023 David received an MBE in the King's Birthday Honours list for services to lift & escalator engineering.

Smooth operators



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DAC OPENDAY

On Tuesday 19th September 2023 DAC Group opened their doors to the UK Lift Industry to showcase their latest control system ranges and associated products.

A wide range of customer types – Lift Contactors, End Users, Consultants, Sub Contractors attended this, at DAC's headquarters in Daventry. The customer interaction was very engaging and beneficial for all parties.

Introducing MEC 32 GENESIS and MZ-PRO; DAC's newest additions, these control systems boast simplified connectivity, intelligent IO and a hugely intuitive user interface.

MZ-PRO pushes the envelope further with higher contract speeds, up to 8 Car capability coupled with AURA, DAC's latest Cloud-based remote monitoring which is included as standard on this flagship model.

The inclusion of hardwired and now also simplified connectivity options opens up endless possibilities for on-site labour savings and time savings on site. It is this digitalised approach that lends itself perfectly to DAC's Lean Manufacturing ideology where alongside best quality and reliability, DAC claim that build times are heavily reduced and represent best value for money for its ever-expanding customer base.

Alongside showcasing these exciting new ranges, DAC were supported on the day by Ziehl Abegg, Dewhurst & Schaefer.

"Having our close partners present throughout the day only reinforces our claims of having a truly multi-product, One-Stop-Shop approach" commented Yan Phoenix, DAC Group's CEO.

Phoenix added "We are very proud of what we have achieved within DAC Group so far. We have clear goals and visions to further expand and support the UK Lift Industry with innovative products. We are completely committed to our customers and would like to thank them for their ongoing business".

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STANDING ON BOTH SIDES OF ESCALATORS

Everybody knows the tube etiquette is that escalator passengers must stand on the right, leaving the left-hand side free for walkers. But back in 2015 Transport for London caused concern among passengers at the busy Holborn Tube station by telling passengers to stand on both sides in a bid to ease congestion.

Holborn station is one of the busiest stations on the tube network and has a lengthy 23.4 metre long escalator leading up to the ticket hall. Many commuters avoid the steep climb and choose to stand on the right, causing congestion at the bottom, whilst the left-hand side of the escalator remains largely empty. If everyone stood on both sides would that double the number of people using the escalators and get everyone to the surface quicker?

Celia Harrison, Neera Kukadia, Paul Stoneman and Grant Dyer from London Underground presented a fascinating study of the experiment at Holborn at the Lift & Escalator Symposium in 2015.

Photo by Tom Parsons on Unsplash

1. INTRODUCTION

In seeking to improve safety on London Underground's (LU) escalators, a series of initiatives were put into place. One of those initiatives was a three week series of tests at Holborn Station to encourage customers to stand on both sides of certain escalators. The aims of the tests at Holborn focussed on Congestion and Flow, and Customer Behaviour, in addition to Safety. Previous research affecting these areas underpins the methodology described. Calculations were made to predict how many extra customers might be carried by escalators with a vertical rise of 24 metres (as at Holborn): an increase in the region of 25-30%. This would be sufficient to increase flow in the station and reduce congestion and the associated station control measures normally in place. Many methods of data collection were available and it was decided to collect as much data as possible and analyse it both qualitatively and quantitatively. The outcomes are discussed and followed by a summary of the outcomes and conclusions.

2. AIMS

The aims of the tests were to see if changing the way that escalators were used could:

Improve safety by reducing slips, trips and falls

- Accidents happen every day on LU escalators. LU aims to improve safety by reducing accidents on escalators.
- Most accidents occur when customers have heavy luggage, or are mobility impaired.
- Walking on escalators exacerbates the risk of accidents

Improve the flow of customers through the station in order to reduce congestion.

- LU places emphasis on safe evacuation from stations, focussing on customers exiting stations and managing numbers of customers entering.
- With an increasing frequency of trains passing through stations as the service improves, congestion is an issue on older stations with limited space and new, cost effective solutions are needed to ease the congestion.

Achieve customer behaviour change

- For more than 100 years LU customers have been requested to stand on the right and walk on the left of escalators.
- A significant change in behaviour would be necessary for the proposed tests to be carried out.

3. PREVIOUS RESEARCH

3.1. IMPROVE SAFETY BY REDUCING SLIPS, TRIPS AND FALLS

The Safety Assessment Federation's 2011 paper providing guidelines on BS EN 115, which defines escalator safety requirements in the UK, stated that *"Slips, trips and falls are the most common incidents on escalators … There are a number of reasons why they occur, which include: poor lighting, location of the installation, crowding, distraction, inappropriate footwear, poor judgment by users, horseplay, use of alcohol and drugs, loss of balance, spillages, debris, environmental conditions, use as a static staircase, or by unsupervised minors." [1]*

In an article [2] it was identified that the highest risk group of slips, trips and falls on escalators were those aged 65 and over, and those aged 5 and under.

According to the South China Morning Post in August 2015 [3] it is now mandatory to stand only on both sides of the escalators on metros in Hong Kong and Japan. The practice was brought in to improve safety. "According to the MTR, in the first seven months of 2015, 382 escalator accidents were recorded – about 12 per cent fewer than in the same period last year. Some 51 per cent of the accidents involved seniors and children due to loss of balance, standing too close to the step edge, or carrying heavy luggage."

3.2. IMPROVE THE FLOW OF CUSTOMERS IN ORDER TO REDUCE CONGESTION.

People need more space than the size of their physical bodies and how much space is needed varies from country to country. [4]

LU escalators have width of 1.01m and depth of 0.41m and height of 0.4m. These dimensions mean that it is uncomfortable for people to stand side by side. Two people, side by side, will require 1.22m width, where LU escalators have 1.01m available. One person on a step requires 0.457m, where LU escalators have step depth of 0.41m available. Again, this will make a person in this position very uncomfortable.

"…escalator utilisation and capacities are closely related to human factors such as shoulder width, personal space preferences, and ability to adjust to system speed. Even under heavy queuing, vacant steps can be observed on most escalators…" [5]

This is described as "the empty step phenomenon" and Fruin [4] explains this as why capacity is never as high as two people on every step would be. The two reasons he gives for this is the slight hesitation that people have when getting onto an escalator, and the innate desire for personal space. Fruin [4] also studied movement on stairs and observed that, in general, people keep two vacant steps in front of them when walking on stairs.

Davis and Dutta [6] carried out a study of escalator capacity on LU which observed that escalators with a greater vertical height have fewer people walking up them. Other factors apart from vertical height affect on how escalators are used: where there is more than one escalator, and where escalators are next to a corner which reduces the approach space to the escalator. Non-commuters also have an effect, as they tend to stand rather than walk up escalators.

3.3. ACHIEVE CUSTOMER BEHAVIOUR CHANGE

Larcom et al [7] looked at the effects of forcing behaviour change on commuters by LU workers strike action, where commuters under-experiment with routes in normal times. The implication is that people do not naturally seek change for improvements in their journeys i.e. do not want to change their behaviour. However, if forced to change their behaviour, people can recognise benefits and make changes.

In work carried out by Dolan et al [8], which drew on academic evidence of what influences behaviour, suggestions for innovative interventions were made:

"…much of behaviour change is about battling habits…Habits …usually develop when actions are repeatedly paired with an event of context (e.g. drinking coffee after waking up)… …the most effective way of changing… habits is by going with the grain of behaviour: harnessing the same automatic effects to nudge people onto a different, self-sustaining, track, without always explicitly stating the need to pursue a particular goal." [8]

LU customers' habits of walking, or standing, are very entrenched. A gradual progression on tests with one escalator only, followed by two, then three over the three weeks was decided on in an attempt to introduce the standing on both sides slowly, leaving the option to walk open until the third week of tests. It was decided to use staff to "encourage" customers to stand on the left of the escalators instead of walk.

4. METHODOLOGY

A start date for three weeks of testing was agreed for the 23rd November as this would permit two weeks of tests before Tottenham Court Road re-opened to Central Line trains, which was expected to result in a reduction of customer numbers at Holborn.

4.1. CALCULATIONS FOR A THEORETICAL INCREASE IN CAPACITY OF ESCALATORS AT HOLBORN

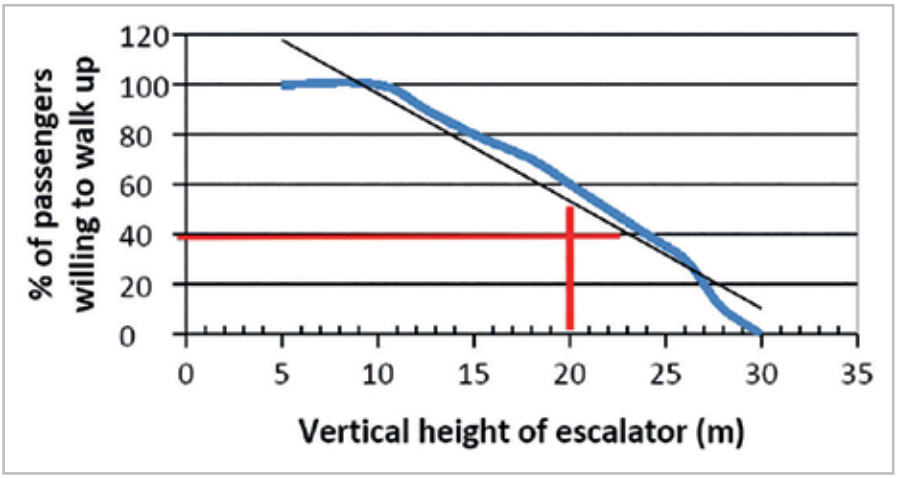
Simple calculations were made to show escalator capacity. LU escalators have a speed of 0.75m/s and a step height of 0.4 m which gives the number of steps/minute as 112.5. With customers standing on both sides of the escalator and occupying every step this gives a theoretical maximum of 225 customers/minute. However, looking at the right hand, stand only, side; and taking into account the empty step previously discussed, this gives a capacity of 56.25 customers/minute.

On the left hand, walking side, with an assumed walking speed of 0.5m/s, an escalator speed of 0.75m/s gives a walking speed of 75m/minute. Given a step rise height of 0.4m this gives a walking speed of 187.5 steps/minute. Taking into account the two step vacancy described by Fruin for stair walking, the speed for walkers on the left hand side of the escalator is calculated to be 62.5 customers/minute.

These calculations do not take into account the vertical height of escalators. It is assumed for the purpose of this calculation that there is a decreasing percentage of passengers willing to walk up a high machine.

The percentages given below are partly based on observations at Canary Wharf with a 10m vertical rise, together with observations of customer walking behaviour on escalators with a greater vertical rise than 10 metres. The graph below shows vertical height vs % of passengers willing to walk. At Holborn the escalator rise is 24 m which gives an estimated amount of 40% of customers willing to walk.

40% of customers walking on the left is 40% of 62.5 customers/minute, which totals 25 customers/minute. If customers stand on both sides of the escalator this gives a rate of 112.5 customers/minute. The difference between rates for standing on both sides of the escalator, or leaving one side for walking 31.25 customers/minute. In theory, passengers standing on left and right of escalator at Holborn should increase number of passengers per minute by 27.8%.



% of Passengers	Vertical height (m)
100	5
100	10
90	12.5
80	15
70	18
60	20
50	22
40	24
30	26
20	27
10	28
0	30

4.2. DATA COLLECTION

It was decided to collect data from as many sources as possible:

- Numbers of customers counted off escalators
- Observers to note crowd behaviour and use of escalators
- Staff de-briefs after each test
- Dwell times and headways of all services
- Gate line exits
- Timed walks from platforms
- Incident comparison
- Customer feedback

The data was to be analysed, both qualitatively and quantitatively.

4.3. MECHANICS OF TESTS AND STAFFING

Two or three members of staff were placed at the bottom of escalator 5, 6 and 7 to encourage customers to stand on both sides of the escalator/s. An observer stood at the back wall of the mid-circulating area to monitor crowd behaviour and assist as necessary. People were located at the top of the escalators to count customers leaving the escalator using a "clicker" counter.

A second observer was located where they could observe crowd behaviour and assist as necessary.

Staff: The tests were carried out by a combination of the Special Requirements Team (SRT) and "volunteers" from Lifts & Escalators (L&E) and Strategy & Service Development – Customer Strategy (S&SD). Non-operational staff were identified by pink hi-vi tabards. Station staff were not to be taken from their normal duties.

4.4. VARIATIONS TO THE PLANNED TESTS

Variations to the tests were made over the three weeks. After the first days of tests loud hailers were used for three days, followed by use of the local PA system in order to be heard. After suggestions from various sources, including customers, some staff in plain clothes volunteered to stand on the left of the test escalators to stop people walking up. This had the added benefit of the plain clothes staff hearing comments from customers on the escalators.

4.5. UNPLANNED INCIDENTS

Day one: escalator 7 had been chosen as "stand only", but was out of service. The test was not carried out on that day. Day four: 58 minutes suspension on the Piccadilly Line (smoke from a train at Kings Cross).

Day six: escalator 6 taken out of service because a fault at 08:32. Escalator 6 was used as a walk down staircase, escalator 4 reversed to "up", with standing on both sides "encouraged" on escalators 5 and 7.

4.6. SERVICE PROVISION

Leading into the tests, both Central Line and Piccadilly Line Fleets had technical problems requiring a large number of cancellations. The Piccadilly Line had up to 13% cancellations the first week, 8% the second week, falling to a maximum of 4% on the third week. The Central Line had a steady maximum of 4% cancellations on all three weeks. Both lines have 78 trains per hour scheduled at this time of day.

5. QUALITATIVE OUTCOMES

5.1. OBSERVATIONS ON SAFETY

Observers noted that there were several issues around customer behaviour that posed a potential safety risk. Many customers began to prepare themselves for exiting the station on the escalator, but on leaving the escalator, would drop items, such as ticket holders, etc., and would stop to pick them up without regard for the surge of people behind them. The same effect was caused by customers with wheeled suitcases, where they would lift the case off the escalator in front of them, hesitate while they extended the handle and then move forward around their case so as to pull it behind them. These little interruptions to the flow of customers exiting escalators had the potential to cause a "pile up". There were no customer injuries.

Tottenham Court Road, which is the next station from Holborn on the Central Line, had no Central Line trains stopping while upgrade works were being done. This caused increased numbers of customers at Holborn which led to congestion: the station response to this was to implement "station control" by holding customers exiting from the Piccadilly Line in the lower circulating area at the bottom of escalators 2 and 3 while congestion cleared in the mid-circulating area. During the escalator tests, "station control" was only implemented once and this was during the first week. There were few gate line problems over the three weeks and none of them led to over-crowding of the ticket hall.

5.2. CUSTOMER FEEDBACK

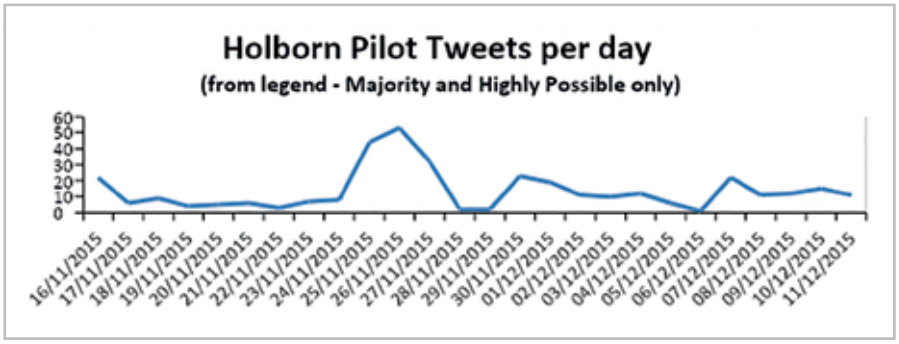
5.2.1. CUSTOMER CONTACT CENTRE AND EMAIL

Six customers gave feedback received via the Customer Contact Centre and seven customers from other sources (e.g. phone or direct email). Recurring themes were that the tests would not work (to relieve congestion); people feel deprived of the choice to walk and/or exercise; and, that it delays their journey. Three customers understood and supported the tests, but felt that the choice to walk up at least one escalator should remain.

5.2.2. TWITTER

Twitter comments were selected based on certain keywords: Holborn, both side, escalator, pilot, stand, test and trial. The date range was selected to include a period prior to the first day that escalator tests were carried out on Tuesday 24th November. There was a large increase in tweets on the first two days of tests. The number of tweets fell sharply at the weekend to none and then rose sharply on Monday, but not to as high a level as the previous week. Again, the number of tweets fell gradually over the week, briefly reaching zero over the weekend. On the final week there was a peak on the Monday which fell over Tuesday and Wednesday.

Each week the tweets peaked on the first day of tests. These coincide with the expansion of numbers of escalators included in the tests. The tweets fall off over the week as customers became accustomed to the new restrictions placed upon them. Less than half of the tweets looked at were negative. Others were humorous, neutral or questioning.



5.2.3. MEDIA

On the second day of the test period the media began to take an interest, with journalists going to Holborn station and taking covert footage and interviews. The intense media interest had an impact on the tests. The most positive impact was that customers were given an explanation of how the tests were aiming to improve flow and reduce congestion.

Once media reporting began, customers affected by the tests began to verbally express their opinions, both positive and negative, in an uninhibited way and to take films of their ride on the escalators on their mobiles. Customer behaviour changed as they felt observed.

5.2.4. CUSTOMERS AT HOLBORN

Customer response directly given at Holborn during the tests was wide-ranging. There was frequent non-verbal communication in the form of head-shaking, particularly if the person concerned met the eyes of a member of staff. Many people gave short, negative feedback, e.g. "This is a stupid idea"; "This is not working"; "You are making me late". Initially there was a high frequency of people asking for information and saying that it would not work. After the first week, the comments changed from saying that it would not work, to saying that they did not like it or did not want to do it, implying a level of acceptance and compliance. Another theme that was mentioned frequently was that customers felt they were being deprived of exercise and the choice to walk.

There was also a significant amount of positive feedback with customer comments that the flows from the platforms had improved and suggestions on how the tests could be improved. Some customers suggested that staff/students be used to "enforce" the standing, by standing on the left in front of customers.

By the third week, SRT staff reported that some regular customers said good morning and made a point of standing on the left of the escalators.

5.3. OBSERVATIONS ON CUSTOMER FLOW, CONGESTION AND CUSTOMER BEHAVIOUR

The first day of week one brought the most resistance from customers and it took the longest to gain compliance. By the third week, most customers were compliant by Tuesday. From the first days of the tests it was observed that the mid-circulating area cleared much more quickly. Apart from one day during the first week, no "station control" was required.

Over the three weeks there were various staff, with different styles, assisting with "encouraging" customers to stand on both sides of the escalators concerned. Most noted that humour worked best in achieving compliance. One member of staff encouraged couples to stand side by side and hold hands.

It was observed that if customers stood side by side and talked, or held hands, customers behind them did not attempt to pass them.

It was observed that those customers who really wanted to walk found a way to do so e.g. weaving between other customers on both sides of escalator. One man pushed a child aside so that he could walk, demonstrating how strongly ingrained the habit of walking can be that overcomes the social norm that prohibits the touching of other people's children. Standing on both sides of the escalators was most effective when the mid-circulating area was congested.

6. QUANTITATIVE OUTCOMES

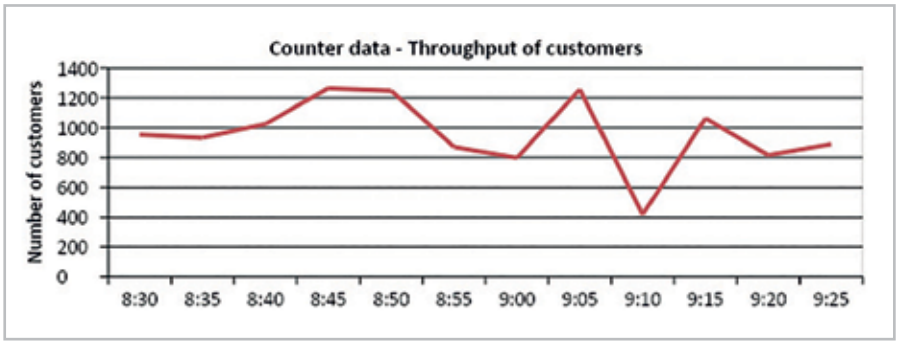
6.1. SAFETY

Incident reports from LU Safety and Environmental Analysis (LUSEA) were run which allowed comparison between the three weeks of tests and the previous three weeks, and the three corresponding weeks from the previous year. There were only two customer related escalator incidents reported: one on the 22/11/15 and one on the 29/11/14, with none reported during the trial period. With such small numbers this is not considered significant.

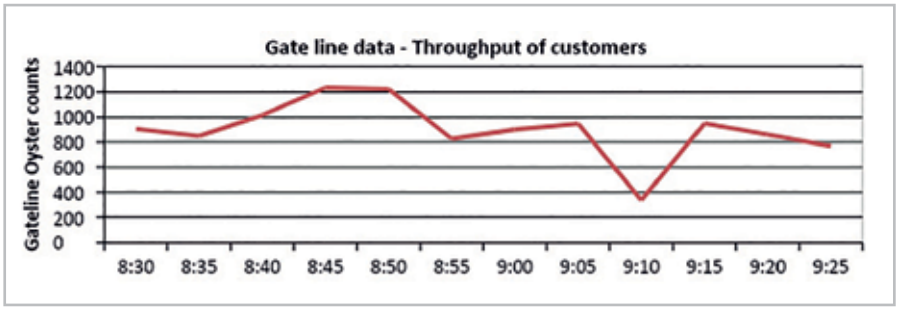
6.2. CONGESTION AND FLOW

To compare escalator usage of standing and walking, simple calculations were completed to understand if there was an improvement in customer throughput. In week 2, escalator 5 gave customers the option to walk up the escalator; the total amount of people that used this escalator was approximately 12,745 customers. In week 3 when escalator 5 was standing only, approximately 16,220 customers used it. This is around a 30% increase in the throughput of customers, matching our predictions.

On Tuesday 8th Dec (Week 3, Day 2) all escalators were standing only, meaning the gate line data and physical counting was very similar. Human error accounts for an approximate 8% discrepancy between the two. Graph 5 shows the counter data of the three escalators. Graph 6 shows the gate line data. The peaks in customers are at 8:45, 9:05 and 9:15 and low flows at 8:35, 8:55, 9:10 and 9:25. The headways show that the Piccadilly line had delays between 8:55- 9:00. Trains from both directions came in at 9:01 after a five minute gap in the service, which explains the dips and the peaks at 9:05. Between 9:08 and 9:11, there were delays on both lines in both directions, causing the exaggerated dip on the graphs.



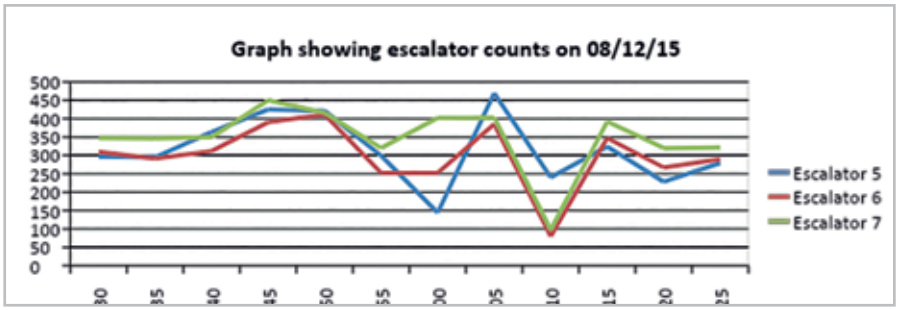
Graph 1 Throughput of customers on all 3 escalators



Graph 2 Throughput of all customers exiting the station

6.3. CUSTOMER BEHAVIOUR

It was observed that customers exiting the Central line would normally use escalator 7, and customers exiting the Piccadilly line would use escalator 5. Escalator 6 is between them and was used by customers from both lines, but mainly the Central Line. Using headway data for 08:30-09:30 from the final week of the trial it can be seen that delays in the service of the different lines demonstrate customers' preference for particular escalators.



Graph 7 Counts for each escalator on 8/12/15

Graph 7 has a high peak between 9:05 - 9:10 on Escalator 5. A train on the eastbound Piccadilly line came in after a 4 minute delay. These customers arrived at the escalators at 9:06, showing that customers from the Piccadilly Line tend to use escalator 5. Between 9:10 and 9:15, there were very few customers on escalators 6 and 7. Only one Central Line train arrived at this time; there were no Central line customers exiting the station for 4 of the 5 minutes, demonstrating that Central line customers tend to use Escalator 7 and 6.

7. SUMMARY OF OUTCOMES

7.1. SAFETY

During the tests over the three weeks at Holborn, no injuries relating to escalators were reported. When compared to the period prior to the tests and against the same period last year, the data was not statistically significant.

Some customer behaviour was observed which posed some risk to themselves and others. When exiting escalators, customers tended to show a lack of awareness regarding the flow of customers behind them e.g. stopping to pull a case in a different direction, etc. With increased flows the need to keep customers moving becomes more of a priority.

7.2. CONGESTION AND FLOW

Observations by station staff and those implementing the tests confirmed that encouraging customers to stand on both sides of escalators does improve the flow of customers and relieves congestion. These observations were confirmed quantitatively with an approximate increase of 30% matching the prediction of increased capacity for standing on both sides of escalators at Holborn.

"Station control" was only implemented on one day during the first week of tests. Prior to the tests, implementing "station control" was something which happened on an almost daily basis. This is a good indicator that flows had improved. Service provision had a significant impact on customer flows.

7.3. CUSTOMER BEHAVIOUR

There was a wide variety of customer behaviours during the tests which were exacerbated by the intense media interest in the tests. Customers expressed concerns about prevention of exercise, lateness, not believing that improving the flow in this way worked.

The media attention appeared to make customers feel less inhibited in expressing their feelings, but also had a major benefit of explaining what the tests were trying to achieve. There were a significant number of customers who were interested and/or positive about the tests. Some observed that they could see that the flows from the platforms had improved and others suggested ways to improve the tests. Very few customers submitted feedback to TfL: there were 13 submissions from an approximate 130,000 customers affected by the tests.

It was noted by staff that humour worked best in achieving compliance and when customers stood side by side and talked, or held hands, customers behind them did not attempt to pass them. Those customers who really wanted to walk found a way to do so. One man pushed a child aside so that he could walk, demonstrating how strongly ingrained the habit of walking can be that overcomes the inhibition of touching of other people's children. Standing on both sides of the escalators was most effective when the mid-circulating area was congested and minimal encouragement was used to get customers to stand on both sides of the escalators.

8. CONCLUSIONS

Regarding safety there were no significant incidents or injuries reported. Customer behaviours at the exit points of escalators do present some concern where interruption to customer flows are concerned.

The tests were successful in easing congestion and improving customer flows. However, the tests required a large number of staff to implement. This is a consideration in how to take this forward.

Customer behaviour was only changed for the duration of the tests, with "normal" escalator usage resuming when the tests were over. Some strong emotions were displayed by customers who wished to continue in their habitual routine, although most were compliant. Significant numbers of comments related to wanting a "walking" escalator for the purpose of speed, exercise and in case of lateness.

It is clear that implementing "standing only" escalators would not be suitable for all locations given that shorter escalators achieve greater efficiency when walking is permitted; not all locations have congestion issues which would benefit from this approach; and, each location varies in physical characteristics which could affect the efficiency of how the escalator is used.

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[7] S. Larcom, F. Raunch, T. Willems (2015), "The Benefits of Forced Experimentation: Striking Evidence from the LU Network", University of Oxford, Department of Economics Discussion Paper Series, Number 755.

[8] P. Dolan, M. Hallsworth, D. Halpern, D. King, I. Vlaer (2010), "MINDSPACE: Influencing Behaviour Through Public Policy", Institute for Government, UK.

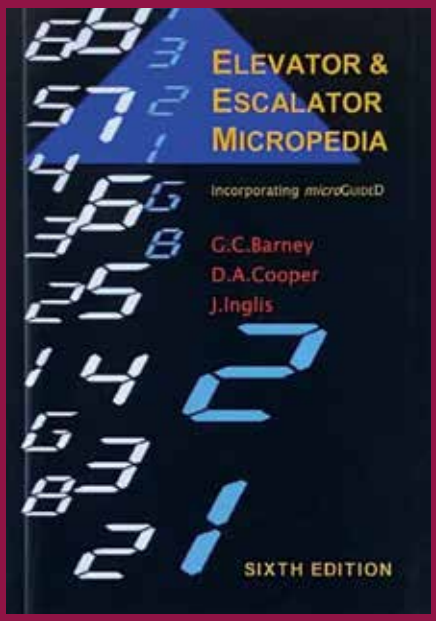
BIOGRAPHICAL DETAILS

Celia Harrison is a Duty Reliability Manager, recently seconded to Customer Strategy Analyst in Strategy and Service Development at London underground Neera Kukadia is a Graduate Engineer with London Underground

Paul Stoneman is a Design Engineering Manager in Lifts and Escalators at London Underground

Grant Dyer is a Customer Strategy Manager in Strategy and Service Development at London Underground

ELEVATOR & ESCALATOR MICROPEDIA



The Elevator & Escalator Micropedia is a compendium of useful data providing a handy first "port of call" for information. It comprises: a glossary of over 2150 terms; drawings of lift components; tables & formulae and a "microGuideD" referencing CIBSE Guide D 'Transportation systems in buildings'.

The book has been compiled by industry experts from authoritative sources across the world. It will be of practical use to designers, field service personnel, installers and engineer surveyors.

Also, building owners, facilities managers, lift operators, teachers, researchers, students, etc. will find it a helpful reference book.

This edition has been extensively revised to cover the advent of EN 81- 20 / 50 and the emergence of the ISO 8100 family of standards.

Copies of the Elevator & Escalator Micropedia can be obtained from

https://www.cibse.org/knowledge-research/knowledge-portal/geem-elevator-escalator-micropedia-6th-edition-soft-cover

Price £12.50, {£11.00 CIBSE Members} (no VAT)

Celebrating

the life of

DR-EUR.ING GINA BARNEY

1935 - 2023

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 also did considerable work as an 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 in 2014 for his work on EN 81-20 and 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

MY STORY OF LIFT TRAFFIC ANALYSIS, DESIGN AND CONTROL 1960 – 2020

In honour of Gina's extraordinary life and achievements we are printing her story, providing an objective view of the developments in lift traffic design since 1960 and written while she was still with us so we have not changed the tense at all.

GINA (*née* GEORGE) BARNEY

1. INTRODUCTION

This story is my story and will be told in a narrative style in the first person as I was and am still there. Rather than run a time line, I will tell this story based on the people that made it, as evidenced by material in the public domain and by personal contact. There will be material in the archives of lift manufacturers and elsewhere that is missing from this story (unknown-knowns). Most people mentioned are still alive today, some I know personally, others only by reputation. Inevitably there will be people and events left out of this story. An example of this is that during the writing of this story a colleague reminded me of a citation in an article to a paper Dos Santos and I published in 1974[1].

My first encounter with the lift industry was in January 1968, when Michael Godwin (Adrian Godwin's father) came to the University of Manchester Institute of Science and Technology (UMIST), where I was a Lecturer, seeking help with the stopping and levelling of Ward-Leonard drives. This was a technical problem. David Closs, a student at UMIST, was looking for an MSc project. He resolved this technical problem in September 1968. His work pump primed my interest and my near 50 years work in lift traffic analysis, design and control.

Subsequently I was fortunate to work with many clever people as you will see, who sometimes had eureka moments and were gone, but some have become equally enthused for lift traffic analysis, design and control. The work at UMIST continued to 1993, when I retired and since then I have carried on the work independently.

There are four books and a landmark paper that I have authored/co-authored which objectively report my work and the work of others in the field where it is known. They are:

Landmark Books

Book (1) Barney, G.C. and Dos Santos, S.M., 1977, *"Lift traffic analysis design and control"*, Peter Peregrinus.
Book (2) Barney, G.C. and Dos Santos, S.M., 1985, *"Elevator traffic analysis design and control"*, Peter Peregrinus.
Book (3) Barney, Gina, 2003, *"Elevator Traffic Handbook"*, Taylor & Francis.
Book (4) Barney, Gina and Al-Sharif, Lutfi, 2016,*"Elevator Traffic Handbook"*, Routledge.[2]

Landmark Paper

Barney, G.C. and Dos Santos, S.M., 1975, *"Improved traffic design methods for lift systems"*, Bldg. Sci.

[1] Green, M.F and Stafford-Smith, B., 1977, A survey and analysis of lift performance in an office building, Building and Environment, Vol. 12, pp. 65-72, Pergamon Press.
[2] Records 283 references and 32 bibliographic entries of all the people and publications we could find in the field.

2. BACKGROUND

2.1. TRAFFIC ANALYSIS AND DESIGN

In the beginning from 1890 to 1960 there were many people who laid the foundations of modern lift traffic analysis and design[3]. This list compiled by Dr Lee Gray for his paper included: Root (1890), Hill (1893), Darrach (1901), Kidder (1904, 1916), Pelham Bolton (1908), Tweedy (1912-13), Ehrlich (1914), Cook (1916 - 1932), Gumpel (1916), Gillette and Dana (1918), Jones (1923 - 1926) Grierson (1923), Marryat (1924), Kinnard (1930), Annett (1935, 1960), Phillips (1939, 1951), Molloy (1941).

In 1968 I was blissfully unaware of this work. My foundations were built on George Strakosch's landmark book published in 1967, which did inform me at least of Bassett Jones.

2.2. TRAFFIC CONTROL

Six "Eras" of traffic control can be identified:

Era	Dates	Traffic Control Type
I	1850–1890	Attendant simple mechanical control
II	1890–1920	Attendant and electrical car switch control
III	1920–1950	Attendant/dispatcher and pushbutton control
IV	1950–1975	Automatic group control: IVa scheduled traffic control to 1960 IVb demand traffic control from 1960
V	1975–1990	Computer based group control
VI	1990 –	Call allocation group control

The transition from a human pulling a rope to a computer making decisions took nearly one hundred and fifty years. This story starts in Era IVb.

2.3. TRAFFIC SIMULATION

The early traffic simulations used batch based processing, where paper tape, or cards, or magnetic tape drives provided the input method and line printers produced reams of paper for the output. In between the algorithms were coded, possibly in Fortran, but often in assembly language.

Interactive computing is relatively recent dating from the late 1960s/early 1970s. Today "Apps" are everywhere. Interactive traffic design only became possible when time sharing computers video display units became available.

3. THE BEGINNING – MY FOUNDATIONS – MY MENTORS

BASSETT JONES

Jones, when working for the General Electric Company was interested in sizing lift motors for the duty that they had to meet[4] So he wanted to know the number of stops[5]. He was also interested in drive dynamics[6]. He was not a lift industry member.

[3] Gray, Lee, 2017, Lift Traffic Analysis 1890-1960, 7th Symposium on Lift & Escalator Technologies, September 2017
[4] https://archive.org/details/generalelectricr26gene
[5] Jones, Bassett 1923, The probable number of stops made by an elevator, GE Rev., 26, (8)
[6] Bassett Jones, 1924, Time-velocity Characteristics of the High-speed Passenger Elevator. General Electric Review, Vol. 27, February 1924

GEORGE STRAKOSCH

He worked for Otis and later became a consultant. In 1967 he wrote a landmark book[7] that updated the work of R.S. Phillips' 1939 book [8] He gave a traffic design method. This was the first significant attempt to bring traffic analysis into one place. He defined and used the concepts of five minute peaks, handling capacity and interval and established a lift's cycle time as the round trip time.

Strakosch's method was very pragmatic – basically a recipe system – and not at all formulaic. He added the times to open and shut the doors, the time that passengers take to get in and out and the time to move up and down to provide a value for a Round Trip Time.

MICHAEL GODWIN

He is very important to my history. When we met he was Technical Director of William Wadsworth, Bolton. Very innovative and intuitive, he was very much in advance of his time. It was he who suggested putting the call buttons on the landing. I do not know if he had heard of Leo Port (see Port), but sometimes great minds are separated by 12,000 miles.

He and I set up Lift Design Partnership in 1974, which became Lerch Bates Europe, in 1990, when Michael retired. I remained Chairman/Chairman Emeritus until 2002. Besides producing a radically new standardised specification for public housing lifts[9] his main technical innovation was Bush House [10](see Beebe and Lim).

To this day he is interested in linear motor driven lifts. And this is how he met and employed Haider Al-Abadi[11] for nineteen years, currently Prime Minister of Iraq.

JORIS SCHROEDER
Joris Schroeder when reading for his doctorate in 1955 derived a formula for the highest reversal floor *H*[12].

He was also very brave to produce the first implementation of Call Allocation at Schindler's Ebikon offices in December 1989. This was against strong company opposition and significant industry derision at the time. All the usual ill informed "*No one will use it*", etc. He used the technical specification that Dos Santos and I published in our 1977 book (Book 1). He did not fully implement the specification, such as penalty functions, dynamic uppeak subzoning, adaptive algorithm, etc. Today the industry derision has disappeared to be replaced by over enthusiastic adoption of what is (commercially) called "Destination Control", see David Closs below. Joris sadly passed away before he saw the fruits of his endeavours – a badly missed interlocutor.

Schroeder also published equations for *H* and *S* to adapt the *RTT* equation so that an uppeak calculation could be performed for Call Allocation. The variable *k* is the famous look ahead.

4. THE MIDDLE 1960-2017

DAVID CLOSS
In my autobiographical note I mention David Closs as my first MSc student in 1968 and my first PhD student. After completing his MSc, Closs registered for a PhD to research the behaviour of traffic control algorithms[13]. His first analysis considered the best method for a lift to answer a set of landing calls (the "travelling salesman" problem).

[7] Strakosch, G.R., 1967, Elevators and escalators, 1/ed, Wiley
[8] Phillips, R.S., 1939, Electric lifts, Pitman
[9] Godwin, M.,1973, Formulating the specification, Lift, 15, pp141-146
[10] Godwin, M., 1986, Bush House: Lifts of the World
[11] Al-Abadi , H. J, 1980, Disc and linear forms of electronically controlled permanent-magnet claw machines, PhD thesis, University of Manchester, 1980
[12] Schroeder, J., 1955, Personenaufzuege (passenger lifts), Foerden und Heben, 1 (in German)
[13] Closs, G.D., 1970, The computer control of passenger traffic in large lift system, PhD thesis, UMIST

He concluded the best method was directional collective and elaborated four rules:

Rule 1 A car may not stop at a floor where no passenger enters or leaves a car.
Rule 2 A car may not pass a floor at which a passenger wishes to alight.
Rule 3 A passenger may not enter a car travelling in the reverse direction to the passengers required direction of travel.
Rule 4 A car may not reverse direction of travel while carrying passengers.

To which can be added a pragmatic rule:

Rule 5 Car calls take precedence over landing calls.

There are some workers[14] today who suggest that Rules 2 and 4 can be violated for the convenience of the traffic algorithm. This defies Closs.

Closs went on to analyse what he called "Call Allocation"[15], ie: to give the control algorithm a passenger's destination and not just their direction. This meant putting the destination call buttons on the landing not in the car. His analysis showed the promise of this idea.

After graduating in 1970, Closs did not stay in the industry.

SERGIO dos SANTOS
He is responsible for the major developments of: the derivation of the RTT equation; interactive simulation; the analysis of various traffic conditions and control algorithms; and most importantly a full definition of the Call Allocation traffic control algorithm in two forms: Hall Call Allocation and Adaptive Call Allocation. Sergio dos Santos took Closs' work further on.

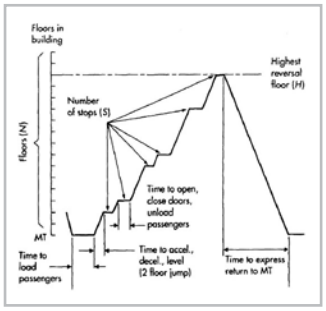
Interactive Simulation
In May 1972 he registered for an MSc with me. By 1972 it was obvious that we would not get anywhere unless we could emulate or model a lift system in some way. In May 1972 I defined a basic simulation program comprising an input module, a control and simulation module and an output module. I gave Dos Santos this specification and went to Argentina for three months.

When I got back Dos Santos had done it and had also coded a simple full collective algorithm as Closs had defined it into a fully interactive program[16].

We had LSD (Lift Simulation and Design) simulation[17] program! Dos Santos agreed to read for a PhD on this topic.

Round Trip Time Formula

In the course of the programming the LSD program, it was obvious that the Strakosch "recipe" method of sizing could better be described mathematically. We defined the now classical *RTT* equation in the period of Dos Santos' work and published the first version of it in our 1975 paper as:



$$RTT = 2H\,t_1 + (S+1)\,t_2 + 2Pt_3$$

This is the basic equation and obeys Closs' rules. It can be adapted for other conditions than uppeak (not given here).

[14] Gerstenmeyer S., Peters R. D., 2014, Reverse Journeys and Destination Control, Proceedings of the 4th Symposium on Lift & Escalator Technology

[15] Sometimes called "Destination Control", which is ambiguous, it is the user that determines the destination not the traffic control algorithm! Destination Control is the commercial name for Call Allocation.

[16] In the 1970s must computers operated in batch mode.

[17] Dos Santos, S.M., 1972, Lift simulation, MSc dissertation, University of Manchester Institute of Science and Technology

The equation presentation has changed little over the last 42 years, except to make it more understandable to the mathematically challenged and now looks like:

$$RTT = 2Htv + (S+1)(T-tv) + 2Pt\,p$$

This equation is simple in concept and it is worth explaining.

Three independent variables (t_v, t_s, t_p) and three dependent variables (*H, S, P*).

The first term is for the time a lift is moving, ie: a travel distance of H floors with a time between floors of t_v.

The second term is *S* times (+1) the time consumed in stopping, ie: for door operations, drive control.

The third term is what the passengers do, ie: get in and out of cars taking a time of t_p.

The middle term is the most significant, as a second added here may reduce the handling capacity by 5-10%.

The variables *H*, and *S* are dependent on the number of passengers (*P*) in the car, when it leaves the main terminal and the number of floors above the main terminal (*N*).

So there is really only one independent variable and two dependent variables! And these are evaluated by Bassett Jones (1923) for *S* and Joris Schroder for *H* (1955).

Dr Lee Gray in his paper highlights George Hill's search for a "*uniform law*" for lift traffic analysis[18]. The two equations above (the only two in this paper) might do it – 82 years later?

Call Allocation Traffic Control Algorithm

Working with Closs' skeleton derivation of the Call Allocation traffic control algorithm, Dos Santos developed a full specification of the two variations of the algorithm. The first was Hall Call Allocation. The second was Adaptive Call Allocation. There were many features: penalty functions, dynamic uppeak subzoning, adaptive algorithm, etc. all described in his thesis[19] and in our jointly authored book Lift Traffic Analysis Design and Control in 1977 (Book 1). By putting this specification into the public domain by prior publication of Closs' and Dos Santos's PhD theses in 1972 and 1974 it prevented it being patented by a manufacturer (one tried and failed) and could be offered to all. The specification has never been fully implemented by any manufacturer although Schroeder was close to it. And Peters has a closer representation of HCA, but not ACA in Elevate.

Analysis of Traffic Conditions

Dos Santos and I realised that having an interactive program (LSD) meant we had a powerful tool to analyse all traffic patterns and any control systems. At the time LSD was being developed the traffic control systems were based on relays and some electronics. They were not simple. The main ones were fixed bidirectional sectors, eg Otis VIP 260, fixed time based sectors, eg: Express Mark 4 and dynamic sectors, eg: Schindler Aconic.

The question is how do they affect actual performance?

Dos Santos programmed these algorithms into LSD and ran over 2000 simulations and produced a series of graphs for uppeak, down peak and interfloor traffic. To do this he invented traffic profiles, which you can see today as "templates". This work enabled some rules of thumb to be developed and these fed back into the design process.

Alongside this work Dos Santos also programmed the Hall Call Allocation algorithm and analysed it. During this work he developed Adaptive Call Allocation (ACA), which switched the cost function (aka performance index) from journey time to waiting time for low loads.

[18] Hill, George Hill, 1893, Some Practical Limiting Conditions in the Design of the Modern Office Building, The Architectural Record, Vol 5, 445-468 (April-June 1893)
[19] Dos Santos, S.M., 1974, The design, evaluation and control of lift systems, PhD thesis, UMIST

Dos Santos did not stay in the lift industry but went on to be the Rector of the Universidade do Minho, Portugal from 1985-1998.

LEO PORT
Port proposed, what we all accept now, taking the pushbuttons out of the car and putting them in the hallway/lobby/foyer/landing. It was the first proposal for Call Allocation, which is what Closs called it. Port patented[20] it as PORT–El in 1961, which he let expire in 1977. He had two implementations, one in the Law School at the University of Sydney[21] and the other was in the Australian Milk Marketing Board offices. Both installations were low rise and only had two or three lifts. Port did not have any computing power so he programmed the lifts to always go to the same floors using simple fixed logic.

He became Lord Mayor of Sydney in 1975 and died in office in 1978.

In retrospect Call Allocation traffic control systems should be called Port-El systems to honour someone, who changed the whole scene of lift traffic control.

PETER TREGENZA
The formula derived by Jones and Schroeder used the simple probability distribution function (pdf), often known as a rectangular or constant pdf. What this represents is people arriving with a constant interval between them. But do people arrive like that? It is thought that a Poisson pdf was more likely, see Alexandris. Tregenza in 1972 accepted this and developed relationships[22] for the variables *S* and *H*.

Dos Santos was subsequently able to show that a Poisson pdf gave smaller values for S and H and hence a more optimistic design than the constant pdf. This allowed the simpler formulae and processes to be the chosen procedure.

NICOS ALEXANDRIS
Alexandris was a mathematician and registered for a PhD[23] with me. Out of intellectual curiosity he was set the task to prove mathematically what had been discovered by the Dos Santos simulations, hence the title "*Statistical models in lift systems*". His first task was to survey buildings to determine the arrival process. He found it to be (probably) Poisson. By queuing theory he was able to show the 80% loading factor to be the interface between a good system and a poor system. Along the way he developed a general analysis[24].

BRUCE POWELL
The story of random behaviour would not be complete without mentioning Bruce Powell. Powell is a long-time contributor in the application of mathematical modelling to lift design and control

systems. I first came across his work ca1972[25] and it might well have influenced Alexandris and Dos Santos. He shaped some of the theory we use today. After university his career was in the lift industry initially at Westinghouse, where he was involved in coding simulation software ca1967. He later moved to Otis and in 2002 reached the inevitable destination of becoming a consultant. In 2005 he was one of the "Four Doctors".

RICHARD PETERS
I have known Richard Peters since he was an undergraduate (1986) and I and Lutfi al-Sharif were pleased to examine him for his doctorate[26]in 1997. Amongst other things (the list is long), working from first principles, he derived the Generalised Analysis method[27] which improves on Alexandris' work by providing a more extensive method of analysing any peak traffic flow, not just uppeak.

However, his most significant contribution to lift traffic analysis, design and control, by far, is the implementation of interactive computer simulation programs.

His interest in lift traffic simulation began whilst employed at Ove Arup and when he set up his own company in 1997 - Elevate was born. I worked with Peters, for five years from 2002, to develop simulation technology. That is why many of the graphs and tables resemble LSD and PC-LSD [28].

Peters' simulation has done what I never achieved by becoming a worldwide industry standard, applied by more lift professionals than any other traffic design software. LSD only achieved 20 sales – but it was programmed in FORTRAN 4, and ran on machines the size of a transit van. It could be said LSD lives on in a different guise.

I and my students have used simulation as a powerful research tool. Peters has followed this route and developed a number of dispatching concepts and design ideas in a similar manner to Dos Santos, when using LSD. As an adjunct to this work, Peters has carried out surveys on lift traffic and lift performance for research, and as a basis for making decisions about the benefits of modernisation. This work has proved that the area based traffic design method is the correct approach and validated my work.

His many contributions can be seen in the CIBSE and BCO guidance. In the former he has published a number of traffic templates based on buildings surveyed.

Peters has always been a friendly, but robust challenger of my work. The whys and the where fores in many a profound debate. In particular my concept of sizing a lift by area and not mass. He was a sceptic until his surveys showed design by area was the more realistic scientific approach. Area based design has been in his software since 2010 and now is used by the vast majority of designers worldwide for lift selection. See Gina Barney (encore).

[20] Port, L.W., 1961, Australian patent specification 255218, 1961
[21] Port, L.W., 1968, The Port elevator system, University of Sydney, June, 1968
[22] Tregenza, P.R., 1972, The prediction of passenger lift performance, Archit. Sci. Rev
[23] Alexandris, N.A., 1977, Statistical models in lift systems, PhD thesis, UMIST
[24] Alexandris, N.A., Barney, G.C., Harris, C.J., 1979b, Derivation of the mean highest reversal floor and expected number of stops in lift systems, Applied Mathematical Modelling, Volume 3, August 1979
[25] Gaver, D.P. and Powell, B.A., 1971, Variability in round trip times for an elevator car during uppeak, Transpn. Res.

LUTFI AL-SHARIF

Al-Sharif worked for a lift manufacturer in Jordan. He became my PhD student in 1989[29]. In work for his doctorate he evolved a predictive method called the inverse S-P of deducing the number of passengers from the number of stops. It is interesting to note that Bassett Jones used this formula to determine the variance of S from its expected value *E(S)*.

Another lift control problem that Al-Sharif investigated was bunching[30]. This phenomena is very destructive of lift performance.

After a brief excursion on escalators for London Underground and consultancy, he returned to the University of Jordan. He is currently very active in lift research and education.

As a result I am pleased he has joined me as co-author in the second edition of the *Elevator Traffic Handbook*, Book 4.

In the book he makes a new suggestion that he calls the HARINT plane. This is a visualisation of the conventional iterative process to balance the two design parameters handling capacity and interval. This method provides a route to determine the necessary value of *P*, which is the number of passengers a car must accommodate.

He hopefully can ensure a continuing life to the Elevator Traffic Handbook (Book 4).

He has moved from Manchester, England to Amman, Jordan.

[26] Peters, R.D., 1997, Vertical transportation planning in buildings, Eng.D. thesis, Brunel University
[27] Peters, R., 1990, Lift traffic analysis: Formulae for the general case, Building Services Engineering Research & Technology, 11(2), 1990
[28] These can be seen in Book 3.
[29] Al-Sharif, L., 1992a, Predictive Methods in Lift Traffic Analysis, Ph.D. Thesis, Oct 1992, UMIST,
[30] Al-Sharif, L.R. 1993, Bunching in lift systems, Elevator Technology 5, IAEE Publications

SINHO LIM

S.H.Lim was another one of my PhD students[31]. Observations by Lim of legacy controlled lift systems had indicated that the response times to answer landing calls follow an exponential curved shape. This distribution curve has a large number of calls answered in zero time or during the first time band. However, there is a long tail to the distribution with some calls waiting very long periods of time. He developed a new traffic control algorithm called Computer Group Control (CGC). The full text was published in Book 2 in 1985[32].

The intention of a CGC Traffic Control System is to provide an even service to all floors, where every landing call is given a fair consideration. This means that the landing call that has been waiting the longest should be given the first consideration for service. To achieve this egalitarianism, landing calls are considered to form a queue and will generally be served in the order of their waiting time. The intention of the CGC algorithm design was to bring the tail closer to the average and to sacrifice the "instant" collection of some calls by moving the exponential away from the origin to a Gaussian shape similar to the Rayleigh Distribution curve. Jon Halpern (see Acknowledgements) subsequently extended this concept and he analysed a number of other distributions[33]-[34].

JONATHAN BEEBE

Jonathan Beebe was my PhD student in 1977 and graduated in 1980. In 1980 Lift Design Partnership were appointed to modernise the lifts in Bush House (home of the BBC World Service at that time). Beebe first of all worked on the single car controller and was later joined by Lim to implement the CGC algorithm. A unique feature of the Bush House implementation was the ETA and actual time displays on the landings.

After the Bush House handover in 1984, Beebe continued to work on lift monitoring equipment. In 1989, Beebe stopped working full time in the lift industry, but maintained an

interest in applying current techniques for the modelling and development of software systems to lift management.

As a result of Lim's work on CGC being published (in Book 2) the Bush House code was taken up by a continental lift company and in 1994 Beebe assisted their commercial implementation. Subsequently, from about 2007 Beebe has been continuing the development of CGC and other cost function (*aka* performance index) based algorithms. It is not known if CGC is embedded in other companies' products.

In 2003 Beebe published the Standard Elevator Information Schema[35], which in 2005 was applied in the design and prototype implementation of a city-wide remote monitoring system to be used on to all new and refurbished lifts in government buildings in Hong Kong. He continues to be active in retirement on the integration of lift systems into the Internet of Things and open standard information modelling.

[31] Lim, S.H. 1983, A computer based lift control algorithm, Ph.D. thesis, UMIST
[32] Barney, G.C. and Dos Santos, S.M., 1985, Elevator traffic analysis design and control, Peter Pereginus
[33] Halpern, J.B., 1992, Variance analysis a new way of evaluating elevator dispatching systems, Elevator World, September
[34] Halpern, J.B., 1993, Variance analysis of hall call response time, in Elevator Technology 5, proceedings of Elevcon '93, Vienna, Austria, November 1993, pp 98 – 106
[35] Beebe, J.R., Standard Elevator Information Schema, http://www.std4lift.info/, 2003-8

MARJA-LIISA SIIKONEN
I first met M-LS in 1993 at ELEVCON, Rome, when she was awarded best paper. She worked closely with Roschier and Kaakinen[36] at Kone, Finland. She has over 50 lift papers. She instigated the "Four Doctors"[37] meeting in September 2004 to develop lift traffic definitions, which still stand today.

Over the years we have debated many things robustly. And she has 23 references in Book 4 after Peters with 26 and myself with 29. She out ranks me on Google Scholar with 803 citations to my 653. She and Peters are the only two people formally acknowledged in Book 4. Her work has centred on traffic design and traffic control systems and her group at Kone have greatly contributed to the survey data vault.

Recently she has been Convenor of ISO/TC178/WG6/SG5 revising ISO 4190-6: 1984 (to be known as ISO 8100-32).

ANA LORENTE
Computer simulation is a very powerful research tool to inform a design process. This was particularly true in recent work on the energy efficiency of lifts. I met Ana as the Spanish (AENOR) delegate to ISO/TC178/WG10 in May 2009. WG10 was developing the ISO 25745 series of energy standards. She was researching life cycle analysis for a doctorate and not making much headway. On joining WG10 she gained a purpose. To populate the equations being developed by the Working Group, values of load, distance travelled and balance factors had to be obtained. Ana volunteered to find these. She knew little about lift traffic design, but soon did and carried out thousands of simulations using Peters' simulation. The Convenor of WG10 said, "*These simulations have helped accelerate the development process of these (ISO 25745) standards and provided invaluable scientific input on which to develop the classification for lifts*".

She decided to include this work in her LCA thesis and she became my latest doctoral student. She graduated in 2013[38].

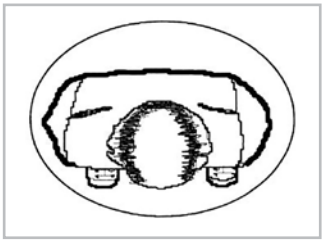
Ana has illustrated the power of simulation.

GINA BARNEY (encore)
The forgoing relates much of my involvement in lift traffic design and control. This autobiographical note relates to my recent independent work. This is to do with the sizing of lift cars.

I became conscious of the anomaly between the stated passenger capacity (in persons), displayed on the in-car rating plate and the actual number of passengers observed in a car. In the mid1980s, I struggled with the notion that according to the BS 5655-½ standard of the time a 450 kg car with a platform area of 1.2 m^2 could accommodate 6 persons (ie: 0.21 m^2/person) and a 2500 kg car with a platform area of 5 m^2 was rated at 33 persons (ie 0.15 m^2/person). The former occupancy would be comfortable, but the latter somewhat like the London Underground during rush hour.

The reason for this was that the standard calculated the number of 75 kg passengers that would be needed to fill the car to the rated load. A safety matter. It was unfortunate that architects, developers, lift companies and consultants, including me, believed this as real life.

So what should the occupancy be for traffic design?



In the USA, circa 1920s, a 150 lb (68 kg) person stood on two square feet (0.186 m^2).

This equates to a 75 kg person occupying a space of 0.2052 m^2. Fruin[39] drew a person template with a body ellipse of 600 mm by 450 mm, which is also 0.21 m^2.

Strakosch in his 1967 book observed the loading of lift cars did not meet the assumed loading based on weight.

As the result of my research work in the late 1980s, I published an actual value for passenger capacity in Table 3.4 of the 1993 edition of CIBSE Guide D based on a body ellipse of 0.2 m^2 and a 5% reduction for handrails, etc. But I did not apply it properly to my designs.

Surprisingly the ISO Technical Report ISO/TR 11071-2, 1996[40] said:

"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."

My ideas were also expressed in the many editions of the Elevator and Escalator Micropedia from 1997[41]. But no one took any notice. The change from mass to area based lift car sizing was fully recommended in the 2000 edition of CIBSE Guide D.

In 2001, Peter Day[42],[43] made a number of supporting observations and confirmed what many had reported.

The Elevator Traffic Handbook published in 2003 (Book 3) continued to inform the concept and although only 800 copies were sold it reached the people who needed it. In 2006 the ISO Technical Report ISO/TR 11071-2[44] repeated its 1996 text.

My strong stance in Guide D: 2000 alerted Richard Peters to the concept. At first Peters doubted the concept, but on confirming it for himself by on-site observations, finally introduced it into his proprietary software design program in 2010. Book 4 (with Al-Sharif) uses a wholly area based selection for lift car sizing.

The latest editions of the British Council of Offices guidelines[45] recommend area based car selection.

In conclusion it is important to size lifts to fit people, not to weigh them. That is, a method based on providing the personal space, which is comfortable for a person to occupy. This method has replaced the previous method using weight (mass) over a period of evolution commencing in the 1990s and which became almost fully established in the 21st Century.

In the future all designers will use area based selection so that *P* passengers can be comfortably accommodated in a lift car.

[36] Roschier, N.R. and Kaakinen, M.J. 1980, New formulae for elevator round trip time calculation, Elevator World, August 1980. – 7.4.1, A1
[37] Barney, G.C., Peters R.D., Powell, B.A. and Siikonen, M.L., 2005, Towards agreed traffic definitions, Elevator World: February 2005 (pp 108), Elevatori, ½005, Elevation, Issue 42
[38] Lorente, A.M., Lifts Life Cycle Analysis Modelling, Classification of Lifts Energy consumption and Rules for Environmental Statements, Doctoral Thesis Centro Politécnico Superior. Universidad de Zaragoza, 2013

5. THIS IS NOT THE END – IT IS JUST THE BEGINNING

"If you can look into the seeds of time, and say which grain will grow and which will not, speak then unto me."
--William Shakespeare

[39] Fruin, J.J. 1971, Pedestrian planning and design, Metropolitan Association of Urban Designers and Environmental Planners
[40] ISO/TR 11071-2:1996, Comparison of worldwide lift safety standards - Part 2: Hydraulic lifts
[41] Barney, G.C., Cooper D.A. and Inglis, J. 1997, Elevator & Escalator Micropedia (reprinted 1998, 2001, 2006)
[42] Day, P. 2001a, Passenger comfort - Are you travelling comfortably? Elevator World, April. 2001
[43] Day, P. 2001b, Lift passenger comfort have we got it right?, Elevatori, September 2001
[44] ISO/TR 11071-2:2006, Comparison of worldwide lift safety standards - Part 2: Hydraulic lifts(elevators)
[45] British Council for Offices Guide for Specification, 2014

Will we ever reconcile calculation and simulation?
One of the perennial problems that the lift industry has long grappled with is the reconciliation between the design of a lift system using calculation and the corresponding results obtained from such a system under simulation. It has always been disconcerting to find that lift systems designed using the conventional calculation techniques do not produce the same results, when simulated.

But why don't calculations and simulations line up? One obvious answer is that calculations can consider non integer numbers of passengers whereas in simulation they must always be whole numbers! There are many other reasons (see 17.2 of Book 4).

Why Calculate?
Simulation is a powerful research tool. Dos Santos et al has shown this for lift traffic design and control and Lorente has shown it for energy calculations. Simulation has been able to inform the calculation theories and has enabled them to be improved.

However my mantra is "*Calculation first – simulation second*". I can get close to a final design by simple spreadsheet calculations. Why should I waste time doing endless simulations when I can get there quickly by calculation? Simulation gives reassurance and gilds the reports in a commercial exercise.

Will Call Allocation Group Control Spell the End of Building Sectoring?
It has been long accepted that lift traffic systems installed in buildings with more than 20 floors should be sectored or zoned. It is recognised that having a dedicated bank of lifts for each section of the building can prove to be wasteful, especially if the peaks of the traffic of the different section of the building do not coincide.

Call Allocation group control systems are becoming more widely used in new lift installations, often inappropriately. One of the main advantages of using Call Allocation group control systems is the fact that they are able to group passengers such that the number of stops are reduced, and hence the passenger travelling time is kept below specified values.

It is suggested that the lifts within different groups could be combined into one group and controlled by Call Allocation group control. This will probably force the use of the dynamic sub zoning algorithm missing in current implementations of Call Allocation.

Will Call Allocation Ever be Used Properly?
First there are no full implementations of Call Allocation as specified in Book 1. Peters' simulation program is close.

Second to achieve an advantage there needs to be at least four lifts in a group. Many installations use Call Allocation as a sales gimmick.

The answer is probably not.

Better Educated and Training of Lift People
More complex control algorithms will require a new level of skill and understanding on the part of traffic design engineers. The area of traffic design skills rest with a small number of people and needs to be propagated to lower level staffs (sales staff, consultants, etc.) maybe by intelligent design engines implementing the algorithms inculcated by the true experts. Peters and I have developed a simple car selection table using an expert system[46].

Information sharing is a great opportunity to introduce a new generation of creative and imaginative engineers into the industry and thereby enhance its profile in the public perception.

[46] Available on request

Will the Paternoster Come Back?
Peters and Gerstenmeyer[47] have suggested a modern form of the Paternoster with ropeless linear motor drives and have derived traffic design methodology. There are two problems: safety and security of service. Presently the Essential Health and Safety Requirements of the Lifts Regulations would not permit such a system. And if they did meet the EHSRs, then service resilience is dependent on an unobstructed shaft (broken down lift ahead).

Information Sharing
How long have I been asking for open data? Ever since BRE awarded UMIST a contract to data log lifts back in 1975.

Smart buildings, smart cities, Internet of Things, BIM Level-3, etc. require the sharing of all sorts of operational information with building owners and users. Hopefully, the ancient reticence (obstinacy-sic) to disclose any information about lift operation will be overcome by the realisation of the new and valuable business opportunities that greater interconnectedness opens up.

ACKNOWLEDGEMENTS…all those mentioned above and those below:

Adam Scott for British Council of Offices recognition.
Adrian Godwin for support now and then.
Albert So for many design and energy contributions and many equations.
Bill Sturgeon for publishing my earlier work and encouragement.
Bill Swindells for moving LSD software to PC-LSD and supporting lift research.
Craig Pearce for lobby work.
Derek Smith of Otis/LEIA for jokes.
Greg Kavounas for the low call express floor formulae and Figure of Merit for DD lifts.
H.D. Motz for ideal kinematics formulae.
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Helen Parlow for the first lift simulation in the UK.
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Nick Mellor of Pickerings/LEIA for challenges.
Peter Day for engineering innovation of P and inventing CIBSE Guide D.
Quentin Bates for tolerance.
Rory Smith for occasional but significant gems.
Sadeh Hirbod for PC-LSD research work and still being in touch.

… and many more people - too many to mention - who I have been stimulated by, worked with, supervised or have influenced.

[47] Gerstenmeyer, S. and Peters, R., 2016, Proceedings of The 6th Symposium on Lift & Escalator Technology

AUTOBIOGRAPHY

Born 1935, Dr Barney left school at 16. She has the technician qualifications of ONC (1954) and HNC with distinction (1956); the graduate qualifications of BSc with honours (1959), MSc by research (1962)[48] and PhD (1965)[49]. She has the professional qualifications of CEng, FIEE and HonFCIBSE (for exceptional services to the Institution).

Following the award of her doctorate she moved to connecting particle physics analysing equipment to IBM computers and after joining UMIST designing and creating a hybrid computer for control research. Dr Barney founded a research group at UMIST into all aspects of lift systems in January 1968, whilst a lecturer and senior lecturer in the Control Systems Centre, University of Manchester Institute of Science and Technology (UMIST). From 1985 – 1990 she was Director of (computer) Networking at Manchester University retiring fully from academic life in 1993 to work full time as a consultant.

Dr Barney has authored, co-authored or edited over 20 books and over 100 reviewed papers. Notable of these are Books 1-4 indicated in the Introduction.

Gina is Technical Editor and Contributor to CIBSE Guide D: 2000, 2005, 2010 and 2015. She is a Member of BSI – MHE/4 Committees, delegate to ISO/TC178 WG6 and WG10 working groups, BRE Associate, Member of CIBSE Lifts Group and CIBSE Professional Conduct Committee, English Editor of Elevatori, Freeman of the City of London, Liveryman of the Worshipful Company of Engineers. Expert witness. Currently she is Principal of Gina Barney Associates.

She still finds time for ballroom, Latin, sequence and Scottish Country dancing, gardening and driving a fast car. Trustee of several Sedbergh Town charities.

[48] The stability of controls systems containing cascaded nonlinearities University of Durham, MSc, 1962. {Control theory}

[49] The magnet control of the Birmingham Proton Synchrotron, University of Birmingham, PhD, 1965. {Control practice}

This article was published on the B4RN website on February 24th, 2021, the author was Mark Gray. Broadband for the Rural North (B4RN) is a community-led project to bring high-speed broadband to homes and businesses in rural northern England as well as Cheshire and Norfolk. It functions as an Internet Service Provider.

B4RN

https://b4rn.org.uk

LIFE OUTSIDE LIFTS

Long time B4RN volunteer, Gina Barney is the subject of a DCMS case study. The Department for Digital, Culture, Media & Sport has highlighted her as an "inspirational community broadband champion."

You can read the article in the red box below while Gina tells us in her own words below what it's like to volunteer for B4RN.

"What I most like is meeting and talking to people (and drilling holes)"

"B4RN is great. I love it", says Gina. Perhaps no surprise given her background as Director of Networking at Manchester University. She says putting the network in Cautley was "real fun", adding she and other volunteers ploughed on whatever the weather.

Gina recalls one particular challenge, "problems such as the River Rawthey were solved with a farmer's bow and arrow, some binder string, two cubic metres of concrete and a wire catenary across the 30metre gorge."

Gina's well known among local volunteers and admits to telling them off for things like getting chambers wrong. She know she's not perfect though:

"On the very last section of 34km of duct to the Cross Keys Inn what do I do? Crimp the duct and get a telling off myself."

Meeting people is a highlight for Gina. In 2018, she needed a wayleave. The farmer turned her away. Gina went back on the day of the local elections. She picks up the story on the 3rd of May that year, at 8pm: "We stood on the doorstep for 20 minutes and he eventually let me in. It was dark so I asked if he would put the light on. We sat on the floor for an hour just talking and he missed casting his vote. I got the wayleave; and a friend. He's sadly is no longer with us."

Gina enjoys doing house installations. "The faces of the residents are unbelievable", she says, "this octogenarian woman turns up waving a one metre bit on the end of a SDS impact drill." She's drilled 80 holes in residents' walls for free (although a post-job tipple of sherry and whisky has occurred as thanks). She's not put off by lying in cupboards!

With Cautley done, Gina's been helping out Lunds. It's a rugged patch – a gateway further north for the B4RN network to Mallerstang. It took a year to get 12 properties on, despite Covid.

Gina has a lot of time for the B4RN staff and contractors too. She recalls helping one contractor retrieve his favourite "puncher" from under the A683. Then there's a memorable anecdote about having to shoo away an ostrich from one of our splicing team!

Gina says she's not too old to learn: "On one occasion in Lunds this keen and younger volunteer questioned my ability to walk a rough track near Lady Anne's Highway to sort a route out. He was being considerate. Off we go with me leading and showing off. What happens? I slip in a beck. There was a lot of swearing. Down to Sedbergh Health Centre for 11 stitches."

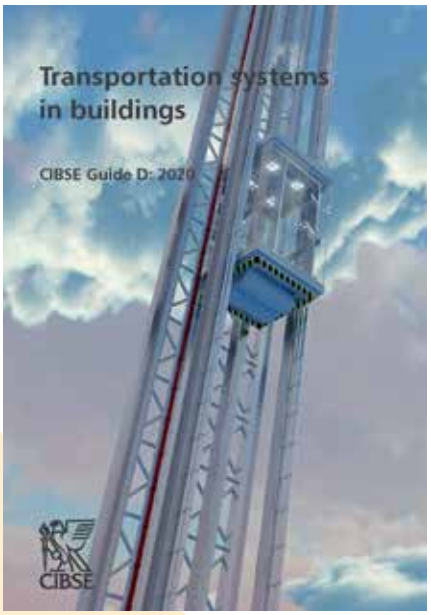
So is it time to stop? "I really can't. I have learnt a lot about rural networks. What I most like is meeting and talking to people (and drilling holes). They all eventually trust me and now I know where all the house keys are in Cautley.

Read the DCMS case study here:

NEWS FROM THE CIBSE LIFTS GROUP

The CIBSE Lifts Group annual seminar will be held on Thursday, 2 November 2023, at CIBSE HQ, 222 Balham High Road, SW12 9BS.

The topic is CIBSE Guide D: Transportation systems in building. A Review and looking forward to Guide D 2025



At this seminar, CIBSE Guide D 2025 lead authors will review CIBSE Guide D 2020 and discuss changes being considered for the new Guide D 2025. Participants will be invited to ask questions and propose additional changes to the Guide.

Tickets can be purchased here:
https://bit.ly/3L5aSdh

Seminar Fee £50
(Apprentices and Students £25)

PROGRAMME
THURSDAY,
2 NOVEMBER 2023

13.30
Registration

14.00
Welcome: Michael Bottomley, Chair: CIBSE Lifts Group

14.05
PART 1 - Adam Scott, Richard Peters

Section 2 Interior circulation (AS)

Section 3 Lift traffic planning (RP)

Section 4 Advanced lift traffic planning (RP)

Section 9 Lift traffic control (RP)

Appendix 2 Lift kinematics (RP)

14.45
PART 2 - John Carroll, Nick Mellor, Dave Cooper, Steve Normington, Adam Scott, Micky Grover-White

Section 5 Types of transportation systems (JC)

Section 6 Firefighting lifts and evacuation lifts (NM)
Section 6 Firefighters lifts and evacuation lifts (NM

Section 10 Escalators/moving walks (DC, SN)

Section 11 Accessibility of lifts and escalators (AS, MGW)

15.25
Break

15.40
PART 3 - Paul Burchett, Mike Turner, Nick Mellor, Adam Scott

Section 7 Lift and escalator components and installation (PB)

Section 8 Lift drives and controls (MT)

Section 12 Electrical and environmental systems (NM)

Section 13 Energy efficiency (AS)

16.20
PART 4 - Jonathan Beebe, Dave Cooper, Vince Sharpe, Micky Grover-White, Chuan Lim

Section 14 Lift surveys, remote monitoring and BMS (JB)

Section 15 Commissioning, testing, maintenance and thorough examination (DC)

Section 16 Upgrading of safety, performance and equipment of existing lifts (MGW)

Section 17 European Directives, UK Acts and UK Regulations (CL)

Section 18 British, European and International Standards (CL)

Section A1 Legislations, standards etc. (CL)

17:00
Close

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Keep up to date on our web site

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Battersea Power Station Phase 3B

"Fujitec
have consistently
exceeded our expectations,
taken care to meet programme-
critical dates and where issues
have arisen, they have been dealt with
quickly and efficiently."

James Wixley
Development Director
Battersea Power Station

Fujitec are soon to Handover a 14-unit Lift Package equipped with features such as destination control (DFGS), remote monitoring (Elvic), speed gate, smart phone and smart building interface for Battersea Power Station (BPSDC) a first purpose built 200,000 sq ft grade A office space. The office product (designed by Foster & Partners) seeks to set the standard for all future commercial office assets across the wider Battersea Power Station Estate. As such the quality and specification of the vertical transport sought is best in class and Fujitec were able to meet every aspect of the projects demands.
This is the first dealings Fujitec have had with BPSDC & their chosen builder SRM but throughout the sale, procurement, pre-construction/design process and delivery – soon to be handover, Fujitec are proud to say we have hit every-milestone in professional and organised way and most importantly become part of the team.

8-10 Waterloo Place, London SW1Y 4BE

"Fujitec
Made us look-
Good on this
Project"

Rony Eappen
Associate
Director, D2E

8-10 Waterloo Place is a Grade II listed 18th century building located within the James's conservation area It has 5 upper floors of office space and basement and a ground floor and mezzanine which previously housed a branch of Lloyds Bank. There is an imposing, ornate central staircase, with listed ornate railings going all the way round and that run right through the 6 floors. The previous 8-person lift installed in the early 1960s, went through the central stairwell in a steel and back-painted glass structure.
The deign was ambiguous but Fujitec responded and offered a commercially and technically viable bid and despite popular belief that Japanese companies are inflexible, Fujitec persevered in offering flexibility and engineering excellence.

A LIFE IN THE DAY

Talking Teamwork and TV fame with Richard Jones

Celebrating his 21st year in the lift industry, Richard Jones is now Managing Director at Fujitec. A global leader in vertical transportation solutions, Fujitec is at the forefront of developing new technology and Richard told us all about his role and future aspirations.

ALTHOUGH HE'S SPENT OVER TWO DECADES IN THE INDUSTRY, RICHARD'S FIRST STEP MAY HAVE BEEN A HAPPY ACCIDENT. HE EXPLAINED TO US HIS JOURNEY AND WHAT HIS DAYS NOW LOOK LIKE.

"I've been a lifeguard, postman, door-to-door salesman… but in 2001 I thought it was time to get a proper job! I went for an interview with Kone, with no clue of what the job actually was. In fact, on my first day, I still didn't know what the job was! But I must have been good enough at it, I stayed there for around six years before taking a job at Schindler, where I was for 14 years. In May this year I stepped into my role here at Fujitec as Managing Director.

"I'm an early riser. It's not uncommon to see me active from 3am! 5am is 'Teddy time', when I take my German Shepherd, Teddy, for a walk before the day begins. Then every day is different; in 20 years, I don't think there's been two days the same. I prefer being out in the field talking to clients, engineers – really making the most of meeting face to face. There are so many opportunities that arise when you meet someone in person and I think the industry is at risk of losing that personal connection as we hide behind our computers."

WITH A FEW MONTHS AT FUJITEC UNDER HIS BELT, RICHARD'S PRIORITY AT THE COMPANY IS ONE MANY WILL RECOGNISE AS AN INDUSTRY-WIDE FOCUS.

"Health and safety is, and will always be, a number one priority. We're no different to any other vertical transportation company in that respect; safety is paramount to the industry. Here at Fujitec, we pride ourselves on our health and safety record and we are continually striving to keep our workers and customers safe.

"Another of my priorities is to set realistic expectations with our customers. We don't overpromise, and for me, it's quality over quantity, working with a happy and strong team that ultimately delivers what we promised to like-minded customers. We understand the importance of innovation, but there is still room for the human touch, face to face conversations and the reality of doing exactly what we said we would, getting the basics right and providing that as a strong foundation.

"I want Fujitec UK to be known for being a genuine company to do business with; to be honest and to have integrity and never pulling the wool over our customers' eyes."

WITH EYES FIRMLY FIXED ON PROVIDING A RELIABLE, HONEST SERVICE, RICHARD EXPLAINED HIS ASPIRATIONS FOR THE FORTHCOMING YEARS.

"In terms of the business, I want Fujitec to grow to a position of great strength, one that clients and employees all want to be part of. Personally, my focus is on being known for being an honest person, one who cares about our people's wellbeing, as well as providing exceptional customer service. The two go hand in hand, and when I look back in a few years' time, knowing I've contributed to our people's wellbeing and promoted good customer service will give me more satisfaction than any title or position. If I've earned the respect of my peers, then that will suffice.

"One area I think I've been successful within the industry is working with a wide spectrum of people and learning from their approaches. I've worked with some legends, but I've also seen the other side of the scales with terrible management, and probably learnt more from them! They've helped me see how I don't want to operate and what is important to invest in and focus on when managing people.

"Looking at the wider industry, it's crucial that we start to highlight the differences in the UK markets, compared to the rest of the world. People tell me that the two are similar, but I disagree! Just because something works in certain cities, doesn't mean it'll work in the UK, for example. We need to tailor our services and ways of thinking to cater to different markets in different areas of the world.

"Perhaps one piece of advice I'd pass onto anyone regarding this industry is to be 'humble'. No one knows everything and when you surround yourself with a great team then it's a lot easier to resolve any situation and indeed, to be successful. Being part of and building exceptionally strong teams stems back to having played many team sports growing up, from rugby to football and cricket as well. There's no 'I' in team as they say – managers who do not believe that are destined for a fall. Celebrate success and fully understand 'why' things may not be going as well as expected from time to time."

WITH A FOCUS ON PEOPLE INSIDE OF WORK, RICHARD EXPLAINED ABOUT LIFE OUTSIDE OF WORK AND THE IMPORTANCE OF HIS FAMILY.

"I'm a massive rugby fan, Welsh rugby in particular, and love following Wales to their matches. We also love travelling as a family, visiting European cities, and enjoying cruises as well as my favourite place, Las Vegas. I find now that hobbies are realised through my daughters; my eldest represented Wales in swimming, and my youngest has just been accepted to the Brit School, to follow in the footsteps of superstars like Adele and Amy Winehouse. We're hoping she's the next female Tom Jones! I'm very proud of them both.

"Undoubtedly my wife runs the show at home but I would not change that for the world."

IF YOU DIDN'T KNOW, RICHARD HAS A CLAIM TO FAME...

"I don't really like to talk about it… but I was on, and won, The Chase! Having grown up with sisters who constantly boasted about how they would beat me at quizzes, I needed to prove my talents! I applied to about 15 game shows, and after two years of applying to The Chase, I was successful. It was really good fun, I destroyed the Chaser and was the main contributor in the 'final chase' and I'd love to do it again. It also finally shut my sisters up! Please get in touch if you want the link -- ;)"

LOOKING TO THE FUTURE, RICHARD HAS HIS SIGHTS FIRMLY SET ON SUCCESS.

"My dream is that Wales will win the rugby world cup one day. But aside from that, the most exciting thing in my life is watching my family grow into adulthood. I've got no firm plans of retirement – which will be good news for some, bad for others! But I will continue to work to help people enjoy the industry, coming together to forge relationships based on honesty, respect and integrity. Life's too short to worry too much."

"My dream is that Wales will win the rugby world cup one day. But aside from that, the most exciting thing in my life is watching my family grow into adulthood. I've got no firm plans of retirement – which will be good news for some, bad for others!

EXPERTISE, EXPERIENCE, EDUCATION...

All of these could be found at the 14th Lift & Escalator Symposium which took place at the Hilton Hotel, Northampton on 21st/22nd September.

It was wonderful to welcome many old friends and new amongst the 140 delegates, and conversations were wide and varied across the two days.

The keynote speaker, Rachel Smalley, Head of Inclusive Design at Jacobs, started proceedings off with a bang, her questions about what defines inclusivity were thought provoking and will carry on being talked about for a long time.

After a heartfelt tribute to the late great Dr Gina Barney, where it was pointed out that one Gina is being replaced by 5 others on the revisions for the 2025 edition of CIBSE Guide D - we were in to the first session, chaired by Philip Hofer from Jardine Schindler. Kevin Vinson from Otis has undoubtedly sold many tickets for Lift 109 at Battersea Power Station as he took us on the journey in today's great glass elevator.

Adam Scott, SWECO, chaired the next session on IoT & Technology with fascinating papers on technology, connectivity and AI, followed by a session on Traffic Simulation & Dispatching chaired by Len Halsey.

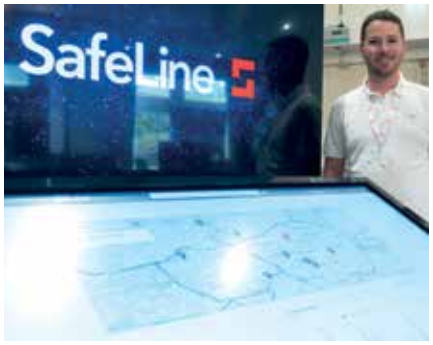
We regrouped on Day two for a session on evacuation chaired by Nick Mellor from LEIA, with a lively panel discussion.

Richard Peters chaired the final session on Engineering, where the inaugural Dr Gina Barney Emerging Excellence Award for Vertical Transportation was given. The award aims to acknowledge individuals who have demonstrated exceptional promise and dedication to advancing knowledge in the vertical transportation sector. Michael Eibel, Lift Engineering in Austria and Erich Spirgi from 3i Business Solutions in Switzerland presented a paper on the change in the dynamic elongation in steel wire rope traction systems which ticked every box for the award. Congratulations to Michael and Erich.

A big thank you to all the exhibitors, all the stands were interesting with a lot to look at and talk about.

The dates for 2024 are **September 18th and 19th,** venue TBC but get it in **your diaries now!**

A big thank you to all our exhibitors: CPA Automation, DAC, Drucegrove, Lester Controls, Safeline, Sassi, Schaefer, TVCL and the UoN



Drucegrove

All the fabulous speakers and session chairs!
The papers are now all available here: ***https://liftescalatorlibrary.org/paper_indexing/abstract_pages/00000533.html***

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- Intelligent fault detection and maintenance
- Control system
- Computer modelling, lift traffic analysis and simulation

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LIFT & ESCALATOR SYMPOSIUM

This paper was first published at the 13th Symposium on Lift and Escalator Technologies, 21-22 September 2022, organised by The Lift and Escalator Symposium Educational Trust. For more information see ***www.liftsymposium.org***

DYNAMIC SIMULATIONS FOR LIFT DOOR HEALTH DIAGNOSIS

MATTI LIN, GABRIELA ROIVAINEN
KONE Corporation, Finland

Keywords: Asystem simulation, lift, lift door, fault analysis

Abstract: System level simulations enables new possibilities to perform fault analysis of lift door systems to recognize root causes and malfunction indicators linked to the most critical failures. Thesimulation method utilized for the approach is object-oriented modelling where elements from all areas of engineering are connected to each other as building blocks. Elements such as controller, belt transmission and door mechanics are interconnected forming a complex system representing physical lift door systems. The approach provides explicit outputs of each included element of simulated systems in time domain. In this paper, the outputs of door drive system are described in more detail, including motor encoder data and torque output. Multiple malfunction simulations have been computed and validated with data acquired from physical counterparts of the simulated lift door system. The validation results have proved the credibility of simulations and demonstrated new opportunities to utilize the simulations for developing fault diagnostics.

1. INTRODUCTION

Increasing urbanization have led to higher utilization of lift systems and increased importance of reliability of lift systems. Kaariaho stated that lift doors have the highest call out rate from all lift system components [1]. Thus, by optimizing condition monitoring capabilities for lift doors, maintenance process for entire lift systems is improved.

The challenge is that the condition monitoring optimization requires data from faulty lift doors as the most of doors are functioning correctly. It is also unlikely for lift door systems to have isolated cases of individual malfunctions which is required to identify distinguishable fault related indicators. Furthermore, data collection, analysis and labelling are done with back reports which as a process has potential for improvement.

In this paper, a solution of using system level simulations to provide synthetic data for training machine learning (ML) models for condition monitoring of lift doors is presented. The method of providing synthetic data using simulations have been proven as an efficient method for improving ML algorithms as discussed in paper by Klein and Bergmann [2]. The simulations can provide data from lift door systems with individual malfunction cases which from the fault identification patterns can be isolated.

The lift door simulations model presented in this paper have been validated and discussed in a Masters thesis [3].

2. SIMULATION METHOD

Lift simulations targeted different aspects of door performance and design optimization. The studies are primarily conducted by analyzing the system from static perspective. In this paper the focus is on dynamic simulations, since they are the most effective in capturing indicators and root causes of underlying lift door related malfunctions. Dynamics of the lift doors must be captured to detect the subtle changes in the system before failure modes linked to studied malfunction cases occur during operation cycles.

The lift door model described in this paper has been created using object-oriented modelling method. In this method, different components from various fields of engineering are modelled as building blocks which are interconnected to each other forming the complex mechatronic system as demonstrated in Figure 1. Equations are formulated and calculated based on these building blocks and interconnections during simulation computations. [4] The quantities of system variables are solved explicitly in non-linear timesteps which is available as output data.

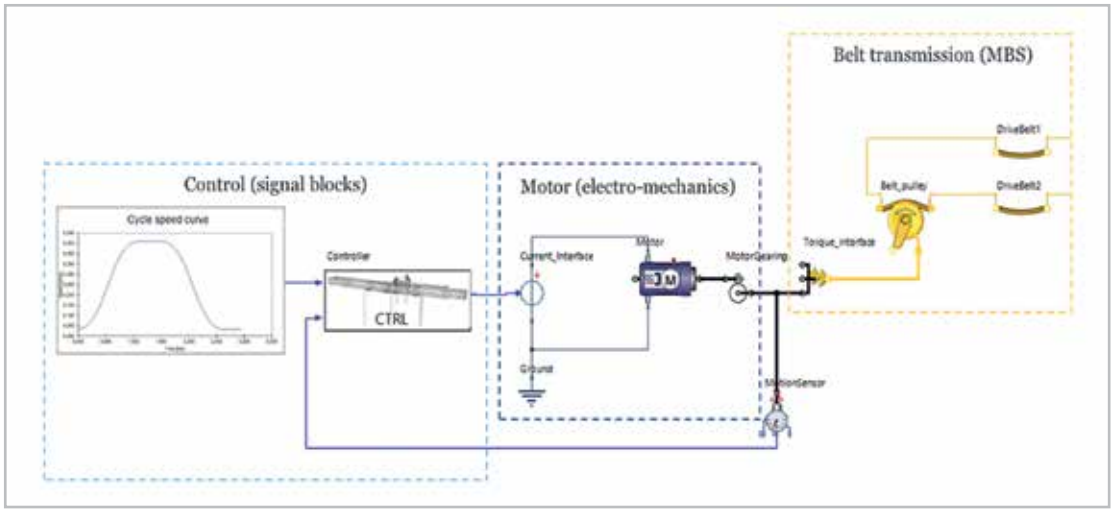

Figure 1. A belt drive system created with SimulationX

A major benefit of using the modular object-oriented modelling is the efficiency the method brings in altering between various configurations of lift systems which are simulated. Modular building blocks representing components of lift door system can be replaced, changed, and reparametrized. These variations can be for instance, lift door panel type, lift door dimensions, speed settings, coupling mechanism. Another benefit of the method is the possibility to include parts from all fields of mechatronic in a single model. By combining all fields of engineering in a system, risks of miscommunications or misconception between cross-discipline experts and engineers are reduced.

Failures of lift door related malfunctions are known to occur in system level. Therefore, cross discipline computation is required in order to include all major factors linked to the lift door malfunctions in simulations. The system level simulations enable high precision simulations with low computational time. However, the challenge for the method is the model simplification definitions. To capture the studied phenomena, contributing components and their interactions must be identified.

3. DOOR MODEL

A two-panel side opening lift door model has been created with a multi-physics software called SimulationX. The software consists of libraries containing elements of mechanics, electronics, and signal processing which have been utilized in the lift door model. (Figure 2)

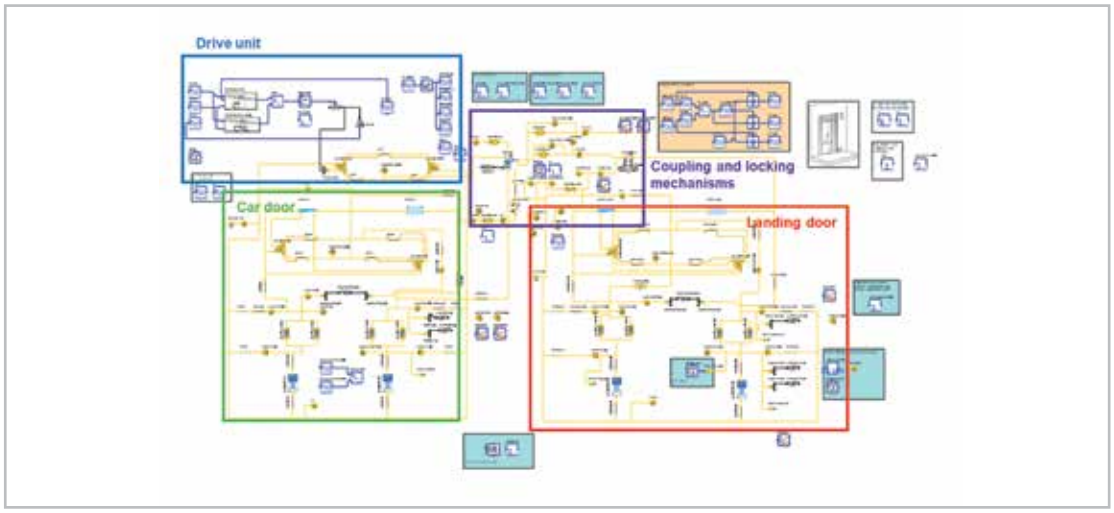

Figure 2. The architecture of lift door model

3.1. MECHANICS

As described in the thesis related to the lift door model, mechanics of the model have been built from elements from multibody dynamics in SimulationX library [3]. The mechanical components have been modelled as rigid bodies which have been connected to each other via kinematic joints and various force elements. Elasticity in main contributing components have been simplified by connecting the rigid bodies with spring-damper force elements as demonstrated in Figure 3.

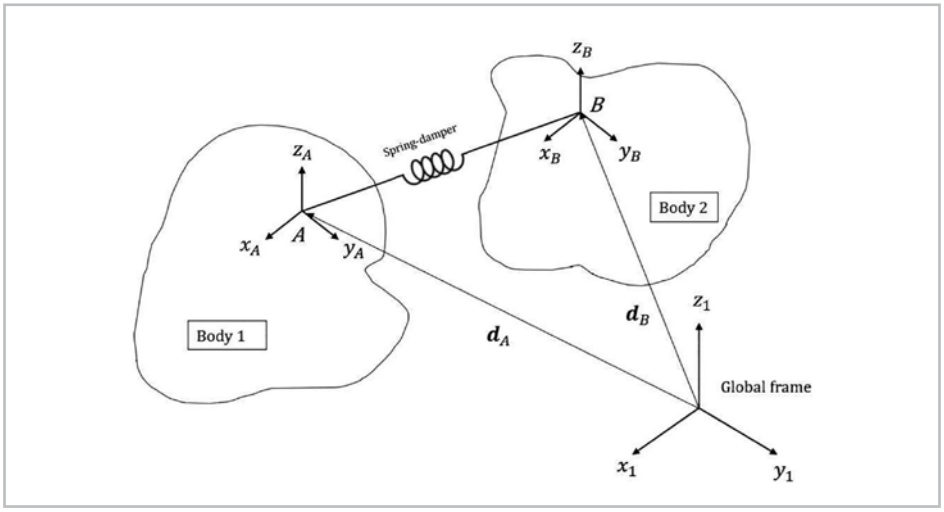

Figure 3. Creating elastic connections between rigid bodies. [3]

For each rigid body, mass, centre of gravity, inertia tensor, position and orientations must be defined from component documentations or 3D-models. The stiffness of elastic material, connections and contacts are defined from analytical methods or laboratory tests.

3.2. CONTROL AND ELECTRONICS

Lift door drive systems operates with closed-loop feedback control as demonstrated in Figure 4. The controllers operate in principle of proportional-integral control mechanism. [3]

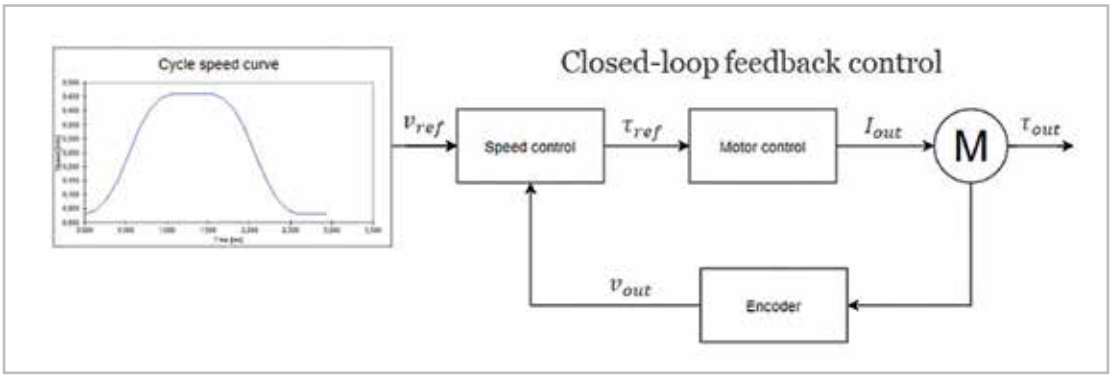

Figure 4. Door drive control loop. [3]

Reference speed curves for door drive cycles are generated inside the model which are defined by lift door speed profile standards which states four speed settings for the two-panel side opening doors. In the model, the motor is modelled as an external torque element connected to the belt transmission. This torque output element is then controlled by the control loop. A detailed motor architecture can be added in the model for studying drive system related malfunctions.

3.3. OUTPUTS

Dynamic response of each element included in the lift door model can be saved and utilized for malfunction studies. Since the end goal of the malfunction analysis is to detect malfunction related indicators, data which are measurable in lift door systems have been selected as outputs for the simulations. Outputs available in lift door systems are door motor current intake and angular position. Other variables utilized for malfunction analysis such as belt position and belt force have been calculated from the lift door motor outputs. These variables have been collected from test lift doors for the validation comparisons displayed in the results section.

4. RESULTS

The simulation results of normal and faulty run for standard lift door cycles are presented in this paper. The faults focused on this paper are related to the issues occurring in lift door locking mechanisms which are safety mechanism for ensuring that lift doors are only opened when the doors are operated. Lift door lock related failures leads to situations where lift doors are stuck which may cause passenger to be trapped inside the lifts. Therefore, it is beneficial to prevent lock related faults occurring to improve lift door reliability, availability, and customer satisfaction.

The normal runs were simulated first to validate applicability of the lift door model used for the fault analysis. The procedure for validation was done by measuring the lift door data from test doors for standard door cycles and comparing the measured data with the simulation data from the identical drive cycles. Results of validation comparison for a normal door cycle are presented in Figure 5. Validation comparison shows deviance at the end of the door cycle because the simulated lift door drive was not programmed to hold doors close in close end force as the feature was not required for the malfunction analysis done in the study which is related to the first section of the door cycle. After the validation comparison for normal runs passes acceptance criteria set for the fault analysis, the validated model can be further utilized in malfunction simulations.

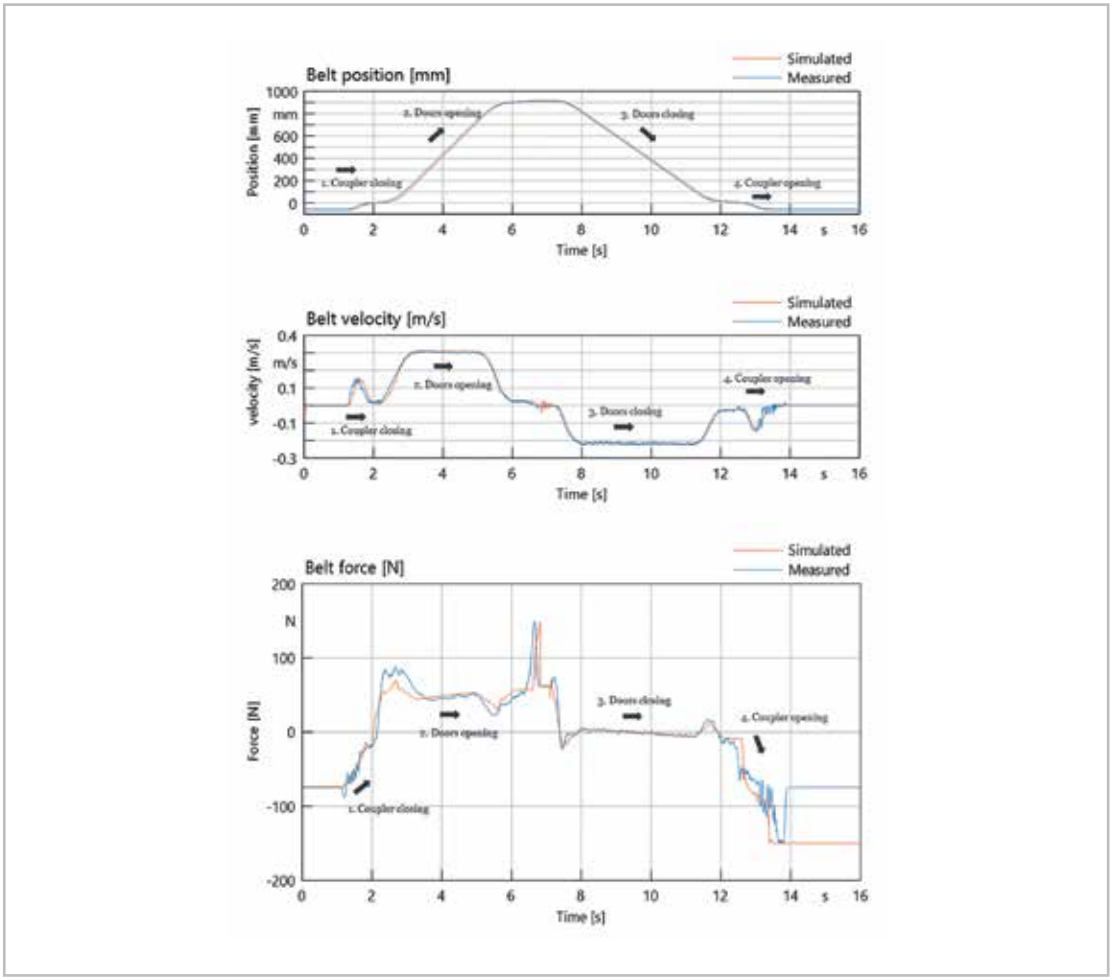

Figure 5. Validation comparisons for normal lift door cycles.

The malfunction simulations are performed by progressively impairing the simulated system to slowly approach the failure mode of the studied fault. For instance, the lift door lock related fault is known to be caused by diminishing lock clearance between lock hook and the counterpart of the lock hook. As displayed in Figure 6, malfunction simulations have been performed by removing lock clearance each simulated door cycle. Then by analyzing the simulation results, the pattern indicating lift lock jamming have been identified from the data. In this case, the jamming lock caused a surge in torque demand during lock opening which can be seen as belt force spike in the outputs.

Subsequently, the identified pattern is validated with laboratory tests by conducting the same cycles with test doors as computed in simulations. In the lock jamming tests, the lock clearance was decreased progressively over multiple door cycles. During each cycle, the motor outputs were measured. The test data is then compared with the simulated data to validate if the signature patterns for the studied case repeats in the measured data as demonstrated in the Figure 6.

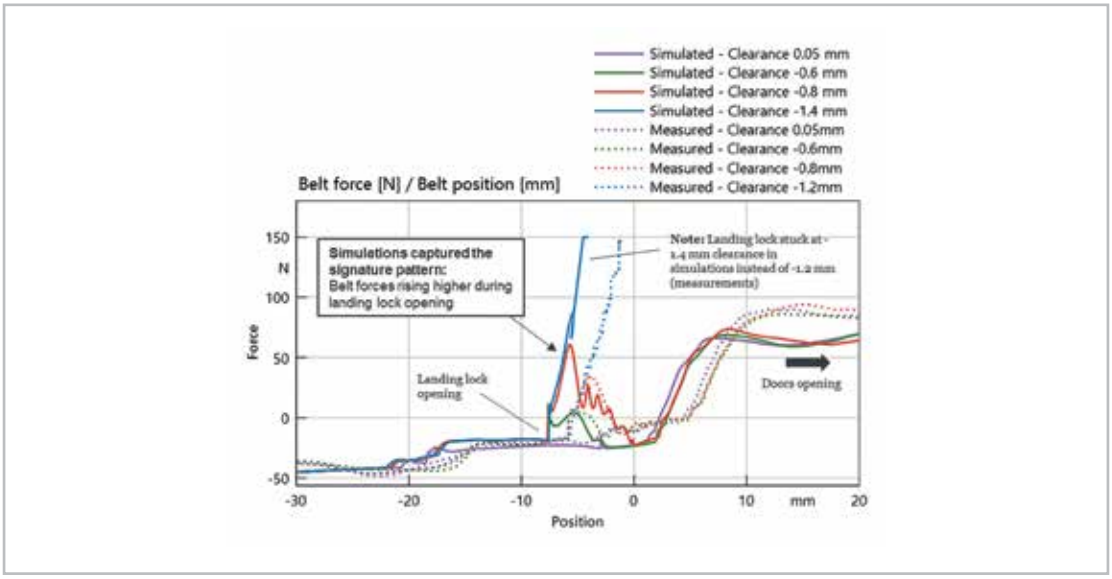

Figure 6. Identified malfunction pattern for lift door lock jamming. [3]

CONCLUSION

In this paper, simulation method and use cases for system level object-oriented simulation for lift systems have been presented. The lift door system presented in this paper was successfully validated for normal runs and the selected malfunction case. The simulation results correlated well with the measured outputs from test doors and capture the malfunction related pattern.

The validation results proved the capability of the simulations to be utilized for developing maintenance process of lift doors. By identifying the patterns leading to failure modes, thresholds can be set for condition monitoring algorithms in order to flag potential malfunctions in monitored systems. In addition, the faults with validated distinguishable identification patterns from either simulations or measurements can be labelled and utilized as training data for machine learning algorithms.

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ACKNOWLEDGEMENT

Firstly, we would like to thank ESI Group consulting company for their guidance and support during the project. We would then want to express our gratitude to **Petri Kuisma** for sharing his expertise and providing test data for the project.

BIOGRAPHICAL DETAILS

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Education

2021
MSc in Mechanical Engineering, Aalto University of Technology, Finland

Work Experience

2019
Research assistant, Aalto University, Finland

2020-2021
System engineer trainee, KONE, Finland

2021
Thesis worker, KONE, Finland

2021
onwards Simulation Engineer, KONE Corporation

Gabriela Roivainen
Education

2000
Doctor of Science in Electric and Mechanic Engineering, Petroleum-Gas University, Romania

2014
Licentiate of Science in Acoustic Engineering, Aalto University, Finland

Work Experience

1995 – 2003
Lecturer, Petroleum and gas University, Romania

2003 – 2008
Research Engineer, Metso Paper, Finland – paper machineries
2008 onwards Senior Expert, KONE Corporation

LIFT & ESCALATOR SYMPOSIUM

This paper was first published at the 13th Symposium on Lift and Escalator Technologies, 21-22 September 2022, organised by The Lift and Escalator Symposium Educational Trust. For more information see ***www.liftsymposium.org***

THE INVESTIGATION OF EFFICACY AND FIRE RESISTANCE CHARACTERISTICS OF FIREBARRIER IN THE LIFT INDUSTRY APPLICATIONS

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[2]EES UK Ltd, 6 Edgemead Close, Round Spinney Ind Est, Northampton, UK

Keywords: Landing door, Hoistway, CFD, Fire Rating, Composite.

Abstract: Although it would be preferable for the lift well to be located in the fire-protected area of the building, it is not always possible. Therefore, most newly installed lifts are required to have adequate fire resistance for the length of time corresponding to the fire rating of the building in which they are fitted. The national and international regulations specify such fire rating requirements. However, the regulations fail to address the scenarios that involve lift service or installation periods. In most cases, the lift shaft is then fully or partially open with an exposed area of the entrance creating a significant hazard in time of a fire. In this paper, a novel solution is presented to this problem by considering the design standards, regulations and fire resistance testing procedures. The flow simulation and computational fluid dynamics software are used to simulate and validate the suitability of the proposed solution. It is shown that the development of a temporary fire barrier covering the lift well is feasible. However, further testing and full certification are needed to produce a final, commercially viable product.

1. INTRODUCTION

When designing a hoistway with all its components, multiple factors are taken into consideration. The material of door leafs, the architraves, and the other components associated with the lift entrance must be chosen and engineered with strength, longevity, and fire protection in mind. Fire protection is most commonly achieved by using components with known fire resistance and insulation properties. As most of the lift panel components are made of sheet metal, specialised techniques are used to account for and, in some cases, take advantage of metal thermal expansion. For example, when heated by fire, a door panel jams itself in between the sill and top header, sealing any previous gaps at the bottom and the top area. Another instance is the use of overlapping smoke fillets to prevent the formation of excessive gaps between panels (Fig. 1).

British and international regulations form a series of standards concerning the safe design and testing of passenger and goods passenger lifts [1–3]. Therefore, if the lift construction fire rating is certified and fully compliant with the building fire regulation, it becomes part of the building fire rating [2], [4], [5]. In other words, the whole building's fire rating is compromised if the lift entrance is no longer fire-protected.

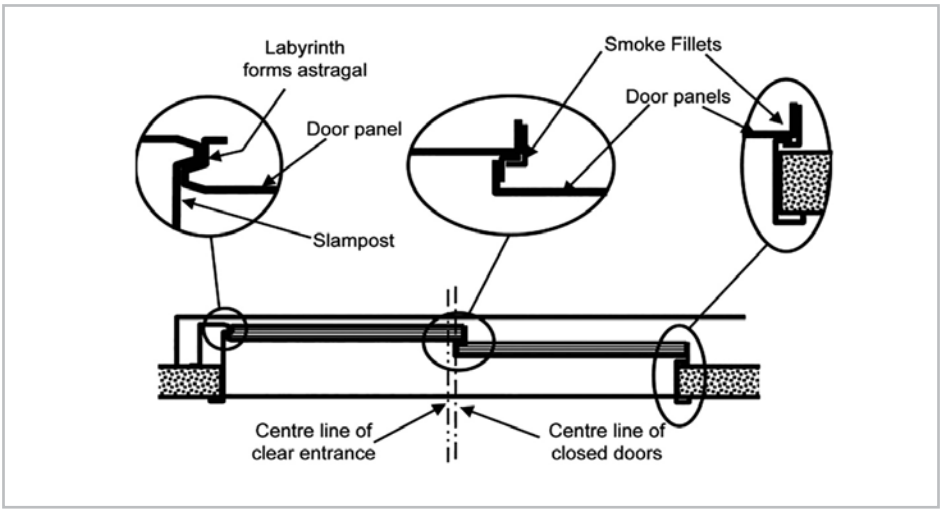

Figure 1 Smoke Fillets

Amongst many aspects, the stack effect, also known as the "chimney effect", is one of the most dangerous fire propagation phenomena when the lift shaft entrance fire resistance is compromised. This happens primarily while the lift entrance is being serviced or during its installation when part or the whole of the hoistway is open. Although it is most prominent in tall multi-story buildings, its impacts can be observed even in the two or three floor lift shafts [6]. In principle, the stack effect occurs when high-temperature gases rise inside the lift shaft, causing a change in the pressure relative to the neutral pressure plane [7]. As a result, it generates movement of the air in the lift shaft, changes the density of the air inside it and, in many cases, sucks in the fresh air into the fire room.

This paper looks at the current applicable construction and fire regulations and testing methods. It explores possible methods of developing the temporary fire barrier and using the simulation software to analyse the fire propagation thwarting characteristics of the found solution.

2. STANDARDS, FIRE TESTING AND SIMULATION SOFTWARE

2.1. REGULATIONS

In the UK, the primary standards employed in the lift industry relevant to this study are EN 81-20[2] and EN 81-58[3], with EN 81-50[1] and EN 1634[8]/ BS EN 1363-1[9] defining testing procedures to implement them accordingly.

EN 81-20 sets out safety requirements for construction and installation, while EN 81-50 sets out test and examination requirements for specific lift components. In addition, the standards contain several requirements with the aim of improving passenger safety.

The landing and car door section of EN 81-20 (paragraph 5.3) explicitly defines rules on how the door should be designed and installed, with details ranging from the dimensions and clearances to its mechanical strength and movement. In this regulations segment, we learn that the strength of the landing door must be assessed with static load and a pendulum shock test with the given criteria for acceptance. We can also find the critical rule concerning the fire safety of the door. The section defining door behaviour under fire conditions states, "Landing doors shall comply with the regulations relevant to the fire protection for the building concerned. EN 81-58 shall be applied for the testing and certification of such doors"[2].

Most manufacturers have adopted EN 81-58 fire test methods with the corresponding testing procedures of EN 1634 as it allows the door design to be recognised as suitable in all European countries. The typical duration of the fire-resistance rating is 30, 60, 90, and 120 minutes, with most manufacturers aiming for the two-hours rating as standard.

CRITERIA OF PERFORMANCE AS DEFINED BY THE EN 81-58:

Integrity (E) - The main criterion for judging the performance of the test specimen is the integrity. For lift landing doors, as long as the leakage rate per meter width of the door opening does not exceed 3.0 $m^3/(min \cdot m)$, the integrity criterion is satisfied. This is not taking into account the first 14 minutes of the test.

Thermal insulation (I) - If insulation requirements apply, the insulation criterion l is no longer satisfied when the average temperature rise exceeds 140 K. The maximum temperature rise on the door leaf, over panel and side panel with a width ≥ 300 mm shall not exceed 180 K.

Radiation (W) - If radiation requirements apply, the radiation criterion is satisfied until the measured radiation exceeds the value of 15.0 kW/m^2, measured as specified in EN 1363-2[9].

DIRECT FIELD OF APPLICATION:

Test results in terms of Integrity (E) and Thermal Insulation (I) are considered to be applicable to doors of sizes different from those of the test specimens, all other constructional details being the same, within the following limitations:

- without correction to be applied on the measured leakage rate.

1. a similar door of lower height than the tested specimen.

2. a similar door with a door opening or an opening width in the wall equal to the one tested within a range of +/- 30%.

- after correcting the measured leakage rate as a function of the increase in height, as specified in "Interpreting the leakage rate curve".

1. a similar door with an increased height of up to 15%.

CRITERIA OF PERFORMANCE AS DEFINED BY THE EN 1634[6]/ BS EN 1363-1[7]:

Integrity (E) - Unless otherwise specified in the relevant test method, the integrity of separating elements shall be evaluated throughout the test by cotton wool pads, gap gauges and monitoring the test specimen for evidence of sustained flaming.

Gap gauges -

a. whether the 6 mm gap gauge can be passed through the test specimen, such that the gauge projects into the furnace, and can be moved a distance of 150 mm along the gap; or

b. whether the 25 mm gap gauge can be passed through the test specimen such that the gauge projects into the furnace.

Thermal insulation (I) - If insulation requirements apply, the insulation criterion l is no longer satisfied when the average temperature rise exceeds 140 K. increase at any location (including the roving thermocouple) above the initial average temperature by more than 180 K.

DIRECT FIELD OF APPLICATION:

Unlimited size reduction is permitted for all types except insulated metal doors where a reduction to 50% width and 75% height of the tested specimen is the limit of variation. The size increase is permitted only for those which are required to satisfy integrity or integrity and insulation and then only up to:

- 15% height, 15% width and 20% area

Considering the table, when designing the temporary fire barrier, it is clear that not all of the rules applicable to the permanent hoistway construction are transferable. Consequently, if the solution is to be deployed within a short time and made easy to use, some compromises must be made. Therefore, priority is given to the fire safety and strength of the entrance gate. Thus, creating a physical barrier capable of stopping anyone from falling into the shaft, preventing access to the lift shaft for an unauthorised person, and being able to withstand 120 minutes fire scenario are the main objectives which are considered to develop the prototype.

2.2. FIRE TESTING, PREPARATION AND PROCEDURES

A number of scaled-down components have been tested in the glow plug laboratory furnace (Fig. 2) in preparation for the official fire testing. The process eliminated the unsuitable components and narrowed down the list of the most appropriate materials. It became clear that composite materials offer the best possible solution. The construction with only metals leads to very high levels of thermal expansion, increases weight and adds difficulty and complexity to secure the structure in place under fire conditions.

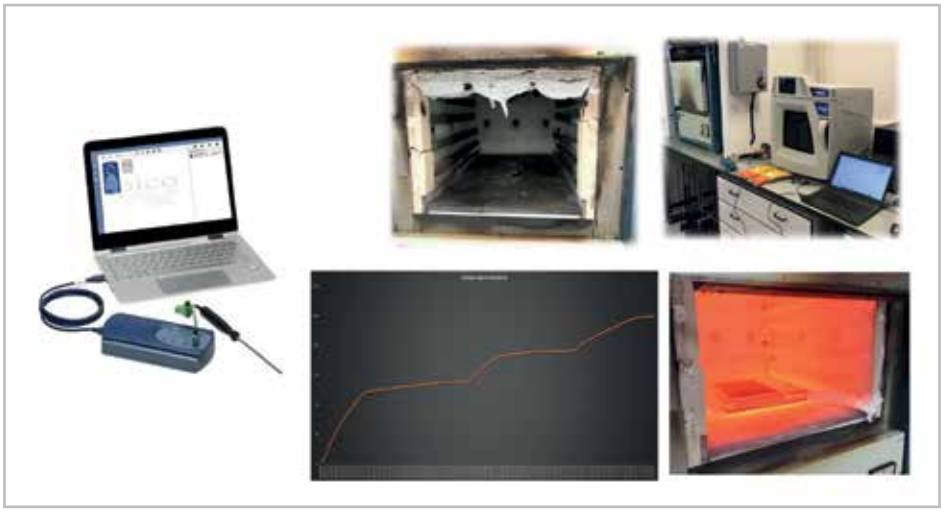

Figure 1 Testing of scaled-down components

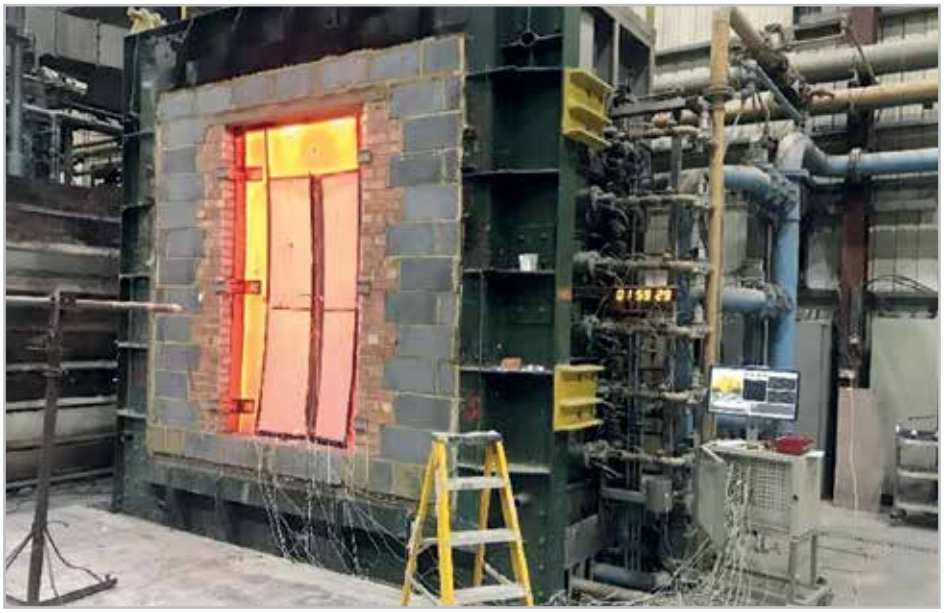

Figure 2 Furnace Fire Testing

Lift landing doors are tested from one side only, unlike regular fire doors. In principle, the landing door specimen is mounted into a furnace wall. As the fire penetration is tested inwardly into the shaft, the landing side of the door set is the part facing the fire while in the controlled furnace. Figure 3 shows prototype fire testing at the BRE Global facilities. The temperature inside the furnace follows a specific heating curve given by the logarithmic function which is shown in Fig. 4.

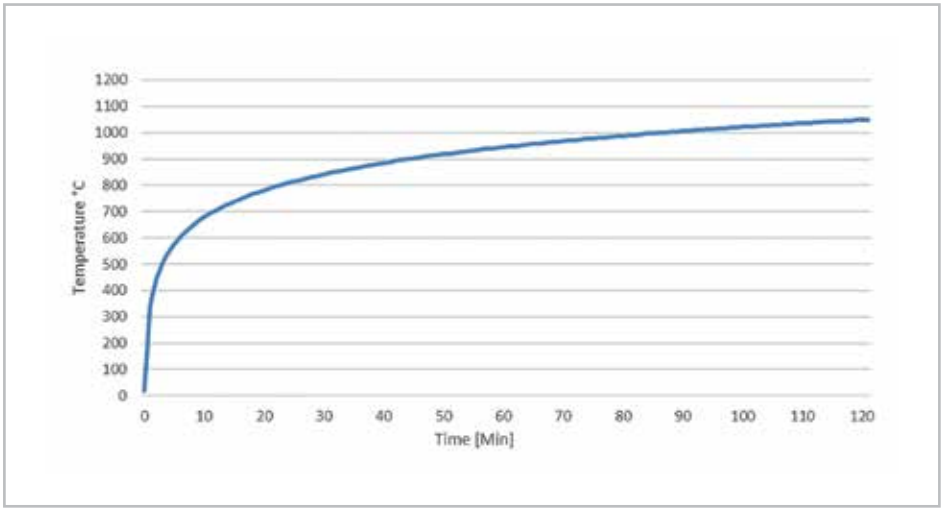

Figure 3 Temperature/Time Curve

The relationship between the average furnace temperature T and time t follows (Eq. 1):

$$T = 345 \log_{10} (8t + 1) + 20. \quad (1)$$

A set of thermocouples is deployed to monitor the temperature on the door's surface, and the data is saved for later analysis. Regular visual evaluations are performed throughout the test, and probe testing is performed if any potential gap development is spotted. The door set passes the Integrity (E) test if the number and size of gaps around the entrance do not exceed a specified limit [8].

2.3. USE OF ANSYS FLUENT AS SIMULATION SOFTWARE

Ansys Fluent is used as the platform for numerical simulation. Its Computational fluid dynamics (CFD) code capabilities allow for modelling fluid flow, turbulence, heat transfer, mass transfer, and chemical reactions [10]. Manufacturers commonly use it to test design ideas and prototypes. The software is part of the Ansys products range, and its application capabilities are broad, as described above. Since the early 1930s, CFD techniques have been used extensively in the design and analysis of engineering systems, with simplified calculations executed by scientists and engineers. Initially, fluid flow calculations were limited to 2 dimensional due to the lack of computational power. However, the advancements in technology and software made the use of simulation tools like Ansys more powerful and essential to designing a new product.

The data collected during the full-scale fire testing, combined with the temperature and physical behaviour information of particular components gathered in the small-scale furnace tests, would be used to validate the CFD model. Once the model is defined and validated, then it can be used to simulate different scenarios in various building combinations.

3. CONCLUSION

In this research, it is shown that the development of the temporary fire safety-compliant hoistway barrier is feasible. From the initial findings, it can be concluded that the composite materials offer the most appropriate solution for the prototype. The composite materials used in this work present reliable strength and fire resistance properties while maintaining a low weight. However, further investigation is required to finalise the product design and overcome manufacturing limitations. In addition, full compliance with the regulations and successful fire rating tests are essential factors before it can be brought to the market.

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BIOGRAPHICAL DETAILS

Mateusz Gizicki has a bachelor's degree in mechanical engineering from the University of Northampton and is currently working towards achieving his doctorate in the area of multi-physics and computational fluid dynamics. He is a member of the Institution of Mechanical Engineers. He has experience in research and development in the industry environment as well as academia. In addition, he has recently completed the Knowledge Transfer Partnership project, which combined management skills with complete product development as an associate.

Stefan Kaczmarczyk has a master's degree in Mechanical Engineering and he obtained his doctorate in Engineering Dynamics. He is Professor of Applied Mechanics and Postgraduate Programme Leader for Lift Engineering at the University of Northampton. His expertise is in the area of applied dynamics and vibration with particular applications to vertical transportation and material handling systems. He has been involved in collaborative research with a number of national and international partners and has an extensive track record in consulting and research in vertical transportation and lift engineering. Professor Kaczmarczyk has published over 90 journal and international conference papers in this field. He is a Chartered Engineer, being a Fellow of the Institution of Mechanical Engineers, and he has been serving on the Applied Mechanics Group Committee of the Institute of Physics.

Brian Henderson has made elevators a career having been in the Lift Industry while completing a dual trade apprenticeship with EPL KONE in Australia over 35 years ago. Winner of the Australian Apprentice of the Year in 1990, he subsequently worked internationally with KONE and its subsidiaries. His keen interest in business resulted in multiple new start business operations in Australia, Asia, the UK and the EU covering a number of industries. One of those businesses was Elevator Engineering Services UK Ltd which enters its 20th year of operations in 2023, providing research, development, engineering and manufacturing solutions to the medical, food, automotive and lift industries amongst others and also developed the KTP project subject matter.

Neil Clark has 28 years of experience in Fine Limit Sheetmetal work. He worked for several years in control panel manufacturing and the lift Industry. Joined EES UK Ltd in 2009 as a workshop supervisor and helped to bring all the EES UK's manufacturing 'in-house'. He currently holds the production manager position, overseeing design, manufacturing and production. He specialises in finding and implementing bespoke fabrication solutions for customers from various industry sectors, ranging from lifts and escalators, motorsport, construction, and food packaging to control panels.

Dr Rasoul Khandan's work experience in higher education span over 15 years with a specific interest in Mechanical and Manufacturing Engineering. Currently, he is the programme director of MSc Professional Engineering at Aston University. Before joining the University of Aston in December 2021, he was a Senior lecturer in the Technology department at University of Northampton for over 4 years. He has also worked in other higher education institutes such as Loughborough, Swansea and Bournemouth universities since 2008. Dr. Khandan's research interests are: Advanced and Digital manufacturing, Lean Manufacturing, Digital Twin and Industry 4.0.

LIFT & ESCALATOR SYMPOSIUM

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REGULATING LIFT AND ESCALATOR SAFETY IN HONG KONG

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Keywords: Electrical and Mechanical Services Department, Hong Kong, lift and escalator safety, regulator, facilitator, promotor.

Abstract: Quality and safe lift and escalator services are vital for a densely populated city dominated by high-rise buildings as in Hong Kong. The Electrical and Mechanical Services Department ("EMSD") of the Government of Hong Kong Special Administrative Region ("HKSAR") is responsible for regulating the safety of lifts and escalators in Hong Kong by enforcing the Lifts and Escalators Ordinance (Cap.618) through various means, such as conducting risk-based audit inspections, carrying out prosecution and disciplinary proceedings, implementing codes of practice as well as the registration of contractors, engineers and workers. EMSD has also rolled out various initiatives to facilitate the sustainable development of the lift and escalator trade, including maintenance price survey for lifts, performance ratings of registered contractors, collaboration with the trade and training institutes to recruit new blood etc. In addition, EMSD promotes lift and escalator safety to the public via diversified publicity and education programmes. This paper will examine the ways on how EMSD plays its role as "Facilitator" and "Promoter" in addition to its traditional role as a "Regulator" on regulation of lift and escalator safety in Hong Kong, and the outcomes of its efforts.

1. ENFORCEMENT OF LIFTS AND ESCALATORS ORDINANCE

Hong Kong is the city with the most skyscrapers in the world[1]. There are over 300 skyscrapers which rise taller than 150 meters and over 1,200 high-rise buildings which rise taller than 100 meters in the city. Quality and safe lift and escalator services are vital for such vibrant and vertical city with population density of around 6,830 persons per square kilometer and yearly visitors of more than 58 million[2].

1.1. THE OLD REGULATORY REGIME

It takes us back to 1960s when the regulatory control over lift and escalator safety was first implemented in Hong Kong. The Lifts and Escalators (Safety) Ordinance (Cap.327) ("ex-LESO") was enacted in 1960 as the first ordinance to regulate lift and escalator safety in Hong Kong. It provided a legal framework for EMSD to exercise regulatory control over lift and escalator safety in Hong Kong. Since its enactment, the ex-LESO went through various major amendments over the years, but still it was not able to resolve the deep-rooted drawbacks which had hampered enforcement for lift and escalator safety, e.g. ambiguity of responsibilities among owners and property management agents in upkeeping safety of lifts and escalators, lack of a registration system to monitor the quality of frontline workers who carried out lift and escalator works, low penalty level for committing offences, lack of public surveillance on expiry of use permit for lifts and escalators, etc.

1.2. REVAMP OF THE LEGISLATIVE FRAMEWORK

In 2009, the Government of the HKSAR took the initiative to transform the regulatory regime over lift and escalator safety to address the increasing public concerns over lift and escalator safety and to make the regulatory framework capable of coping with market changes and long term development requirements. Following public consultation and the necessary legislative processes, the Lifts and Escalators Ordinance (Cap. 618) ("LEO") was enacted and came into full operation in end 2012 to regulate lift and escalator safety and related matters in Hong Kong.

[1] Top 10 Cities with the Most Skyscrapers in the World, (web page no longer available).

[2] Hong Kong in Figures (2018 Edition), ***https://www.statistics.gov.hk/pub/B10100062018AN18B0100.pdf***

MAJOR MODIFICATIONS OF THE LEGISLATIVE REQUIREMENTS IN RESPECT OF LIFT AND ESCALATOR SAFETY IN THE LEO INCLUDE:-

- adoption of the "Responsible Person" (RP) concept to replace "owner" – both owners and property management agents have the common objective for upkeeping the safe operation of a lift or an escalator;
- expanding the applicability of regulatory control – all lifts and escalators within the territory, including those belonging to the Government of the HKSAR and the Housing Authority, are now under a unified regulatory system;
- strengthening the registration regime – formalized and upgraded the requirements for registration as contractors and engineers, imposed the need to renew registrations at intervals not exceeding five years, introduced the worker registration system to grant legal status to qualified tradesmen, and required practitioners to complete professional development training for renewal of their registrations;
- stiffening the penalties for offences – the maximum fine for offences is increased to HK$200,000, and there are no changes in imprisonment terms; and
- additional measures to improve operational effectiveness and efficiency – the regulator, i.e. EMSD, is empowered to issue "Improvement Orders" to demand rectification, within a specified period, of non-compliances or defective items of a lift or an escalator; and periodic examinations of a lift or an escalator can be advanced by not more than two months to accommodate use permit processing time.

The changes in the legislative requirements of the LEO as compared with the ex-LESO are significant, in particular in (i) the use of RP to replace "owner" to make more stakeholders subject to regulatory control, and (ii) imposition of the registration renewal requirement under which existing registrants would have to give up the perpetuity of their registration status. Notably, the change would be extremely difficult, if not impossible, without the mutual understanding and concerted efforts of stakeholders acting in common pursuit of better lift and escalator safety.

1.3. REGULATOR FOR LIFT AND ESCALATOR SAFETY

As the regulator, EMSD regulates lift and escalator safety in Hong Kong under the legislative framework of the LEO by various means:-

- **Equipment compliance**

  The LEO stipulates that a registered lift/escalator contractor who undertakes the installation of a lift/escalator must ensure that the works are not to be carried out unless the lift/escalator and all its safety components[3] are of a type in respect of which the contractor has obtained approval from Director of Electrical and Mechanical Services (DEMS). In applying the type approval, the following information should be provided for detailed assessment by EMSD:-

[3] In accordance with Schedule 2 of the LEO, the safety components for lifts include safety gear, overspeed governor, door locking device, buffer, ascending car overspeed protection means, unintended car movement protection means and any safety circuit for a lift that contains any electronic component, while those for escalators include step and pallet for an escalator.

  - information of the lift/escalator manufacturer, e.g. name, address, history, organization, size of plant, product range, yearly production, brochure, job references, etc.;
  - general specifications of the lift/escalator applying type approval, e.g. type examination certificates, model numbers and their applications, type of major components adopted in the lift/escalator model, confirmation from the manufacturer that the brands/models of lift/escalator are designed and manufactured to the requirements of the "Code of Practice on the Design and Construction of Lifts and Escalators" (Design Code) issued by EMSD, etc.;

- type test certificates and reports for safety components issued by approved independent testing institutes;

- technical information of the lift/escalator applying type approval, e.g. installation, operation and maintenance manuals, typical electric schematic diagrams of the power circuits and safety circuits with explanatory notes, supporting drawings, illustrations and calculations, maintenance schedules issued by manufacturers, etc.;

- quality assurance certificate (e.g. ISO 9001) including manufacturers of lift/escalator model and related safety components; and

- arrangement of training and technical support provided by manufacturers.

- **Quality control**

  As stipulated by the LEO, only Qualified Persons[4] (QPs) or persons under the direct supervision of a QP at the place at which the works are carried out are allowed to carry out lift and escalator works. QPs are required to be in possession of the necessary qualifications and experience, and have obtained registrations from EMSD. If not registered, the personnel who want to undertake the lift/escalator works have to work under the direct supervision of a QP. Personnel who have registered under the LEO as contractors, engineers, and workers are required to renew their registrations so as to be able to continue to carry out lift/escalator works. The renewal requirement is to ensure that they are fit and proper to continue to perform the legislative duties conferred or imposed on them.

  On the other hand, the LEO imposes restriction on subcontracting lift and escalator works. Except with written approval of EMSD, a registered lift/escalator contractor who undertakes any lift/escalator works (except installation or demolition of a lift/escalator) must not subcontract the works or any part of the works to any other person who is not a registered lift/escalator contractor.

- **Setting of standards**

[4] Qualified Person is defined under section 2(1) of the LEO. In essence, a Qualified Person can be taken, in relation to lift/escalator works, as a registered lift/escalator worker or registered lift/escalator engineer employed by the registered lift/escalator contractor who has been contracted to carry out the lift/escalator works. An independent registered lift/escalator engineer can also be regarded as a Qualified Person in respect of any lift/escalator examination being carried out.

  The LEO empowers DEMS to issue any code of practice that in DEMS's opinion is suitable for providing practical guidance in respect of any matter concerning the safety of lifts or escalators, including providing practical guidance in respect of the design, use and operation of lifts or escalators and providing practical guidance to persons who carry out any lift works or escalator works. In this regards, EMSD has issued two codes of practice, including (i) the "Code of Practice on the Design and Construction of Lifts and Escalators" (Design Code), which sets out technical details, methods, procedures and safety rules for compliance with the requirements of the LEO on the design and construction of a lift and an escalator, or any associated equipment or machinery of a lift or an escalator, and (ii) the "Code of Practice for Lift Works and Escalator Works" (Works Code), which provides guidance to set out the minimum industry standards for satisfying the requirements under the LEO, taking into account the trade skills and risk perception of the general practitioners. In drafting these two codes of practice, references have been made to relevant safety standards of the European Standards Institution as well as local safety requirements derived from previous lift and escalator incidents happened in Hong Kong, and the trade together with relevant stakeholders have been consulted on the contents with their comments suitably incorporated.

  There are also other standards set out for the trade under the LEO to ensure lift and escalator safety. As stipulated in the Lifts and Escalators (General) Regulation (Cap.618A) (a regulation made under the LEO), a registered lift/escalator contractor is required to:-

- post a notice in specified form signifying the suspension of service of a lift/escalator within 4 hours if the normal use and operation of the lift/escalator cannot be resumed within 4 hours from the time at which an incident involving the lift/escalator has come to the knowledge of the contractor; and

- attend to the failure of any emergency device of a lift (i.e. alarm system, emergency lighting, intercommunication system and ventilation fan) within 4 hours from the time when it has knowledge of the failure and notify DEMS in the specified form, within 24 hours after it has knowledge of the failure, if it is unlikely that the failure can be rectified before the end of the 24-hour period.

- **Prosecution and disciplinary proceedings**

The LEO imposes different levels of fine and imprisonment to reflect the seriousness of different offences. In order to have punitive and deterrent effect against contravention, the penalties for offences have been stiffened in LEO – the maximum fine for offences is increased from HK$10,000 to HK$200,000 while the longest imprisonment remains as 12 months.

Apart from prosecution, the LEO also establishes, as further punitive and deterrent measure, disciplinary proceedings to punish the registered persons (i.e. registered contractors, registered engineers or registered workers) on committing disciplinary offences, which include the followings:-

- committing misconduct or neglect in any professional respect;

- convicting an offence under the LEO;

- obtaining registration or renewal of registration under the LEO by fraud or misrepresentation;

- having failed, without reasonable excuse, to attend before a disciplinary board or an appeal board either as a witness or as a person in respect of whom the board is meeting; and

- convicting in Hong Kong or elsewhere of any other offence that may bring their profession into disrepute.

A complaint alleging a disciplinary offence against a registered person may be made by DEMS or by any other person by submitting the complaint in specified form to DEMS. A disciplinary board, consisting members of professional engineers, registered lift/escalator engineers, registered lift/escalator workers, property managers and laypersons having the role of management committee member or lift/escalator owner, will be established to hear the case and to decide on the disciplinary case. If the disciplinary board determines the registered person in concern has committed the disciplinary offence alleged in the complaint, it may order the person be reprimanded and fined a maximum sum of HK$100,000 for registered lift/escalator contractors or HK$10,000 for registered lift/escalator engineers/workers, and order the Registrar to cancel or suspend the registration of the person.

- **Registration system**

Under the LEO, the registration regime covers registered lift/escalator contractors, engineers and workers, with different qualifications and experience requirements as shown below.

- Registered Contractor (RC)

An individual is eligible for application for registration as a lift/escalator contractor, if he/she:-

- has at least a director, partner or employee who is a corporate member of the Hong Kong Institution of Engineers, or a registered lift engineer and/or a registered escalator engineer;
- has not less than two other employees with one of them being qualified to carry out lift works and / or escalator works independently;
- is in possession of necessary facilities, resources and workforce for carrying out lift works or escalator works; and
- is capable of obtaining technical support from a lift manufacturer or an escalator manufacturer for technological updating, technical training of staff, and sourcing of spare parts.

- **Registered Engineer (RE)**

An individual is eligible for application for registration as registered lift/escalator engineer, if he/she has the qualifications and experience specified in any of the following routes:-

ROUTE 1	is a registered professional engineer under the Engineers Registration Ordinance (Cap. 409) in mechanical engineering, marine and naval architecture engineering, electrical engineering, electronics engineering, building services engineering, or control, automation and instrumentation engineering; and
	has at least 2 years' relevant working experience and has the necessary practical experience in lift works or escalator works
ROUTE 2	has a bachelor degree in mechanical engineering, marine and naval architecture engineering, electrical engineering, electronic engineering, building services engineering, or such equivalent or higher qualification as recognized by the Registrar; and
	has at least 4 years' relevant working experience and has the necessary practical experience in lift works or escalator works

The applicant has to pass in both the written examination and interview organized by EMSD in order to obtain the registration status.

Registered Worker (RW)

An individual is eligible for application for registration as registered lift/escalator worker, if he/she has the qualifications and experience specified in any of the following routes:-

ROUTE 1	has been an apprentice in trade of lift electrician or lift mechanic or equivalent and completed a craft certificate course recognized by the Registrar; and
	has at least 4 years' relevant working experience, of which at least one year was obtained within the 5-year period immediate before the date of submission of the application; and has necessary practical experience and relevant training.
ROUTE 2	has completed a certificate course in building services engineering, electrical engineering, electronic engineering, marine engineering, mechanical engineering, or such equivalent or higher qualifications as recognized by the Registrar; and
	has at least 4 years' relevant working experience, of which at least one year was obtained within the 5-year period immediate before the date of submission of the application; and has necessary practical experience and relevant training.
ROUTE 3	has passed a trade test for lift works or escalator works recognized by the Registrar; and
	has at least 8 years' relevant working experience, of which at least one year was obtained within the 5-year period immediately before the date of submission of the application; and has the necessary practical experience and relevant training.

To regularly assess the competency of these registered persons, the registration status of all these registered persons has to be renewed by application to the Registrar at intervals not exceeding five years.

- **Risk-based audit inspections**

The risk-based enforcement approach is adopted for lift and escalator safety regulation. A high level of audit inspections is maintained with a closer focus on lifts and escalators at higher risk and works performed by practitioners with poorer performance track records. In reinforcing the risk-based inspections, reviews are regularly made in respect of different aspects of the regulatory system including:-

- contractors – analyze the level of risk by comparing, for example, the number of complaints against different RCs, tip-off cases, durations and/or frequencies of lifts being put out of services, staff movements, drastic changes in maintenance capacities or workforce level of a RC, etc.;

- lifts/escalators – changeover frequencies of maintenance services providers, age of installations, complexity of installations, number and types of complaints, problematic locations, etc.;

- works – lift works involving major alteration, brand new design or non-standard installation, at unconventional locations, etc.

Currently, the target number of audit inspections for lifts and escalators carried out by EMSD is set at around one in seven lifts/escalators. Despite limited manpower resources, the yearly average number of inspections for lifts and escalators carried out by EMSD has increased from 8,964[5], while the ex-LESO was in force, to 11,207[6], while the LEO was in force, i.e. an increase of about 25%. With such dedication to inspections as well as maintenance and examination works by registered persons, the yearly average of reported incidents[7] due to equipment fault involving per 1,000 nos. of lifts and escalators has decreased from 0.67[8], while the ex-LESO was in force, to 0.15[9], while the LEO was in force, i.e. a decrease of about 78%.

- **Shared Responsibility**

Under the new regulatory regime of the LEO, the concept of "Shared Responsibility" is adopted. With such concept, different stakeholders, including registered lift and escalator contractors, engineers, workers, RPs[10] for lifts and escalators, the Government of the HKSAR as well as the general public (as users of lifts and escalators), should jointly take part in and share the responsibility for upkeeping lifts and escalators in a proper state of repair and in safe working order. In this connection, EMSD has taken various measures, with the aim of raising stakeholders' awareness (in particularly that of RPs for lifts and escalators and the general public) of the importance of "Shared Responsibility" in assuring high lift/escalator safety standard and quality lift/escalator services:-

- Clear indication of validity period on use permit

[5] Such figure is the yearly average of inspections for lifts and escalators carried out by EMSD for the years from 2008 to 2012 (i.e. 5 years in total), during which the ex-LESO was in force.

[6] Such figure is the yearly average of inspections for lifts and escalators carried out by EMSD for the years from 2013 to 2017 (i.e. 5 years in total), during which the LEO was in force.

[7] According to the LEO, when there is a lift/escalator incident belonging to a type as listed in Schedule 7 of the LEO, the Responsible Person for the lift/escalator must inform EMSD within 24 hours after the incident comes to the Responsible Person's knowledge.

[8] Such figure is the yearly average of reported incidents due to equipment fault involving per 1,000 lifts and escalators for the years from 2008 to 2012 (i.e. 5 years in total), during which the ex-LESO was in force.

[9] Such figure is the yearly average of reported incidents due to equipment fault involving per 1,000 lifts and escalators for the years from 2013 to 2017 (i.e. 5 years in total), during which the LEO was in force.

[10] Responsible Person for a lift/escalator is defined under section 2(1) of the LEO as a person who owns the lift/escalator or any other person who has the management or control of the lift/escalator (e.g. representative of building or facility management company).

User surveillance is a very effective means to spot non-compliances. A new use permit arrangement has been introduced in the LEO to replace the posting of safety certificates adopted in ex-LESO to facilitate user surveillance. Succinct and key information, i.e. the expiry date, is now shown on the use permits prominently to enable the public to effectively monitor whether a use permit has expired, and whether or not the lift or escalator has been examined by a registered lift or escalator engineer to confirm its safe working status.

Figure 1 Use permit for lift (left) and escalator (right) adopted in LEO

- Incident reporting by Responsible Persons

The LEO stipulates that, if there is an incident[11] relating to a lift or an escalator, the RP for the lift or escalator must within 24 hours after the incident comes to the person's knowledge, notify EMSD and relevant registered lift or escalator contractors in writing. This could advocate proper management of lifts and escalators among RPs who now have legal obligations to ensure the safe operation of the installations under the LEO.

- Announcement of maintenance price figures for lifts

EMSD has released the average maintenance price figures on the lifts in private residential and commercial premises (which are both based on statistical analysis on the contract prices collected from independent sampling survey on lifts in Hong Kong) on half-yearly basis for public reference since 2014 and 2015 respectively. The sharing of price information serves as a reference for facilitating RPs for lifts to choose among registered lift contractors for provision of lift maintenance services.

- Registered lift and escalator Contractors' Performance Rating System

EMSD has launched the registered lift and escalator Contractors' Performance Rating (CPR) System since 2009. Under the system, EMSD posts on its website the rating indices of RCs in regard of their performance in lift and escalator maintenance services (based on non-compliances identified by EMSD during audit inspections), warning letters issued to RCs, number of reported major incidents, etc. The release of such information for the public's reference injected greater objectivity and transparency into the control process. The information enables RPs for lifts and escalators to make an informed choice in the selection of RCs for the provision of lift and escalator maintenance services and, at the same time, impressed on RCs the need for improving their services so that they can achieve a better performance rating and popular reputation.

[11] Incident is defined under Schedule 7 of the LEO. Lift/escalator incidents to be reported to EMSD include, for instance, death or injury of person involving a lift or any associated equipment or machinery of a lift/an escalator, and, failure of main drive system, safety component and safety equipment of a lift/an escalator.

2. FACILITATION OF THE SUSTAINABLE DEVELOPMENT OF THE LIFT AND ESCALATOR TRADE

2.1. UNDERSTANDING THE TRADE

EMSD is not only the regulator, but also the "Facilitator" for the lift and escalator trade in Hong Kong. It keeps its finger on the pulses of the trade through conducting Trade Survey so that necessary assistance can be timely provided to help the sustainable development of the trade. The bi-annual Trade Survey is for:-

- collecting information for analysis of the salary trend for past years and salary structure of workforce (including registered engineers, registered workers and general workers) in the lift and escalator trade;
- canvassing information on the working conditions and working pattern of the workforce (including registered engineers, registered workers and general workers) in the lift and escalator trade; and
- seeking views of various groups of practitioners in the lift and escalator trade regarding the difficulties and problems encountered, ways to attract new employees, issues in the trade which hinder the provision of quality services to the public and how to improve the situation.

It is glad to note from the 2016 Trade Survey results that the satisfaction level of trade practitioners, for both REs and RWs, have been going up and their salaries have increased by around 6.5% a year. This betterment could partially be attributed to EMSD's series of administrative measures to nurture the healthy trade environment that is conducive to enhance lift and escalator safety, including the CPR System, maintenance price survey for lifts in private and commercial premises, the pro forma maintenance contract for use by RPs, etc. With these information announced periodically and publicly, RPs can readily make reference to them when selecting a competent RC to deliver quality services at a fair and reasonable market price.

Apart from the Trade Survey, EMSD also holds regular liaison meetings with trade associations and sets up a "Lift and Escalator Maintenance Working Group" in collaboration with the trade practitioners. On the other hand, a permanent non-statutory body "The Lift and Escalator Safety Advisory Committee (LESAC)" has also been established since 2013 to advise EMSD on matters relating to the administration and enforcement of the LEO and other matters relating to lift and escalator safety referred by EMSD. The establishment of LESAC provides a forum, with a wide participation[12] to facilitate discussions and exchange of views in a broader perspective on matters relating to lift and escalator safety. It has also enhanced community participation which at the same time brought in expertise and experience in related matters for better formulation and implementation of policy by EMSD.

[12] The LESAC involves committee members from professional bodies, lift and escalator trade, training institutions, property & facility management sector, general community and the government of the HKSAR.

2.2. ATTRACTION OF NEW BLOOD TO THE INDUSTRY

Having said of the betterment of the trade, there is a sustained concern of the trade on its aging workforce, with the average age of REs and RWs at 50.2 and 46.7 respectively. To this end, there has been close collaboration between the trade and EMSD in the past years to attract more new blood to join the industry. Starting from 2014, the government and the industries introduced the "Earn & Learn" Scheme to provide cash allowance, guaranteed salary, as well as structured training programme for attracting young people to enter the trade as apprentices. Since then, the number of new apprentice has significantly increased from about 70 a year to over 250 a year in 2016, and such enrolment has been sustained in the current school year. On the other hand, EMSD has also taken the initiative to establish partnership with the trade to launch the "Pilot Cooperative Apprentice Training Scheme (PCATS)" since 2016 to attract more new blood to join the lift and escalator trade. Technician trainees under the Scheme are trained in both RCs and EMSD; and on completion of their 4-year training, will acquire sufficient experience for registration as RW to work independently in RCs.

Apart from recruitment of apprentice, the number of new trainees taking graduate engineer training scheme in RCs has also increased substantially from the usual annual intake of about 5 a year to 15 in 2017. Since it has been planned to ultimately uplift the registration qualification for RE to registered professional engineer, EMSD has been actively encouraging RCs to provide Graduate Scheme "A" Training programme, accredited by the Hong Kong Institution of Engineers, to more graduate engineers.

2.3. CULTIVATION OF INNOVATION AND TECHNOLOGY

EMSD holds regular seminars to promote new lift and escalator technology. Trade practitioners and professionals will be invited to share their latest products and research results with a view to promoting their use in the trade. These seminars provide a forum, with participation of practitioners from the lift and escalator trade as well as property and facility management, to facilitate discussions and exchange of views on the latest development of lift and escalator technologies.

In view of the tight manpower of the industry, the better and wider use of technology for relieving the manpower is certainly welcome. EMSD has conducted a pilot project on adopting Remote Monitoring System (RMS) for lifts in 2015. As reflected from the pilot project, RMS could effectively reduce 20% of system breakdown and 45% of maintenance suspension time. With the fruitful outcome, EMSD has already extended the implementation of RMS to other government premises and liaised with RCs to adopt RMS for lift and escalator maintenance services in government premises.

Furthermore, in line with the directive of 2017 Policy Address on development of Innovation and Technology (I&T) in Hong Kong, EMSD has launched "E&M InnoPortal"[13]. It is a platform for a public list of the technology needed by various government departments, public bodies and the Electrical & Mechanical (E&M) trade, and it invites the I&T collaboration from innovators in the private sector to solve the problems. On the other hand, universities and start-ups etc. are also welcomed to put on the platform their E&M related innovation and new technologies, including those related to lifts and escalators (e.g. new products developed for enhancing efficiency and safety of lifts and escalators), to match the market needs. EMSD will provide venues for trial of suitable projects, conduct prototype testing and pilot projects in a collaborative way, and upload validated performance reports of trial cases to the platform for sharing with the public with a view to jointly promoting and driving the research and development and application of E&M related innovation and technology.

[13] Website of "E&M InnoPortal": ***https://inno.emsd.gov.hk/en/home/index.html***

2.4. PROMOTION OF OCCUPATIONAL HEALTH AND SAFETY

EMSD has been devoting continued efforts in promoting the safety of lifts and escalators. Over the years, different types of competitions, e.g. lift and escalator safety quiz, and lift and escalator work safety improvement competition, have been held to enhance the safety of lifts and escalators in the industry and related organizations, thereby reducing accidents and enhancing the trade practitioners' awareness of work safety. EMSD also jointly organizes regular seminars with the Construction Industry Council to promote lift and escalator work safety. On the other hand, issues relating to lift and escalator work safety will be discussed in the regular LESAC meetings, liaison meetings with trade associations and meetings of the Lift and Escalator Maintenance Working Group.

3. PROMOTION OF LIFT AND ESCALATOR SAFETY TO THE PUBLIC

EMSD also acts as a "Promotor" for lift and escalator safety in Hong Kong by implementation of various public education and publicity activities to enhance the public's awareness of the safe use of lifts and escalators and the importance of proper maintenance for these installations.

3.1. PUBLIC EDUCATION ON LIFT AND ESCALATOR SAFETY

Over the years, EMSD has been carrying out public education on lift and escalator safety by various means. Below are some of major activities of public education:-

- conducting seminars on lift and escalator safety for the general public emphasizing relevant legal requirements under LEO and proper and safe use of lifts and escalators;

- implementing Safety Ambassador Outreach Programme – in 2017, over 400 sessions of outreach talks were conducted for kindergartens, youth centres and elderly centres, reaching over 19,000 participants to promote the proper and safe use of lifts and escalators.

- producing TV Announcements in the Public Interests, leaflets, guidelines, posters, stickers, newsletters, promotional videos, etc. on lift and escalator safety;

- carrying out various publicity activities to promote lift and escalator safety, e.g. carnival, competition, symposium, etc. – in 2017, EMSD has jointly organized the "Building Management Week 2017", which was well received by participating organizations and the public, with Water Supplies Department, Buildings Department, Fire Services Department, Food and Environmental Hygiene Department and Home Affairs Department to promote good practices in quality building management; and

- setting up "Responsible Persons' Corner"[14] at EMSD website to provide one-stop information on lift and escalator safety for reference by RPs.

[14] Website of "Responsible Persons' Corner: ***https://www.emsd.gov.hk/en/lifts_and_escalators_safety/responsible_persons_corner/index.html***

3.2. QUALITY LIFT SERVICE RECOGNITION SCHEME

EMSD has launched the "Quality Lift Service Recognition Scheme" (QLSRS) as a pilot scheme in 2015. It is a voluntary lift service recognition scheme targeting at RPs for lifts of private buildings, with the following objectives:-

- to encourage RPs to enhance the safety level of their lifts and to make the operation of the lifts more effective, reliable and comfortable through implementation of modernisation works; and

- to improve the lift management services of RPs of private buildings to meet the users' increasing demand for quality lift services.

The target participants of the QLSRS are RPs for lifts of private buildings, which include private residential buildings, office buildings, industrial buildings, shopping malls and hotels.

Applicants of the QLSRS are assessed in the following areas:-

- status of implementation of the seven lift modernisation solutions;

- lift management performance of the RP; and

- lift suspension time due to equipment failure.

Qualified RPs who achieved the specified standards will be presented with certificates with relevant ratings (Gold, Silver and Bronze Awards) in recognition of their achievements in implementation of lift modernization works as well as their dedication to continuous provision of quality lift management service. The QLSRS in 2015 has received 94 no. of applications, covering 1,230 no. of lifts, 254 no. of premises and 39 no. of Incorporated Owners / property management companies. 3 Gold Awards, 26 Silver Awards and 16 Bronze Awards were issued. With the support from applicants and the trade, the QLSRS has driven a positive effect in promoting the industry to continuously enhance the quality of lift services. Full implementation of the QLSRS is being planned for launching in late 2018.

3.3. PROMOTION OF LIFT AND ESCALATOR MODERNISATION

Lifts and escalators in Hong Kong were installed in different decades. Although they adopted the level of technology appropriate at the time of installation, there is room for improvement to make them safer, more reliable and comfortable with the rapid technological advancement in recent years. In this connection, EMSD has issued the "Guidelines for Modernising Existing Lifts" [15] and "Guidelines for Modernising Existing Escalators"[16] in 2012 and 2016 respectively to encourage RPs to carry out modernization works for their aged lifts and escalators through the recommended solutions.

[15] "Guidelines for Modernising Existing Lifts": ***https://www.emsd.gov.hk/filemanager/en/content_803/Guidelines%20for%20Modernising%20Existing%20Lifts%20(E).pdf***

[16] "Guidelines for Modernising Existing Escalators": ***https://www.emsd.gov.hk/filemanager/en/content_803/Guidelines%20for%20Modernising%20Existing%20Escalators%20(E).pdf***

As a further step-up promotion for lift modernisation, EMSD has set up the "Lift Modernisation Resource Corner"[17] at EMSD website in 2017 to provide one-stop information to RPs regarding lift modernisation. EMSD has also been issuing letters to RPs of aged lifts since 2017 for reminding them of the modernisation solutions applicable to their lifts and encourage them to implement the appropriate recommended solutions as soon as possible.

4. WAY FORWARD TO ENHANCE THE SAFETY OF LIFTS AND ESCALATORS IN HONG KONG

Acting expeditiously on important and emerging issues in the best interests of the public, EMSD will continue to deploy resources effectively to focus attention on where the potential risks are comparatively higher. Looking forward, EMSD will step up regulatory efforts in causing RPs for lifts and escalators to implement modernisation works for aged lifts and escalators to enhance public safety. In particular, EMSD will formulate checklists for assessing the risk level of lifts and require registered lift engineers to use the checklist for risk assessment during annual examination of lifts. If, after assessment, the risk of the lift is identified high, EMSD will consider issuing an Improvement Order requiring the RP to implement modernisation works for the concerned lift within a reasonable time limit. Study will also be conducted to assess whether it is necessary to mandate RPs to modernise their aged lifts. In this regard, EMSD will make reference to the relevant experience of overseas countries, including the implementation status of relevant legislation, consider the feasibility of dedicated supporting measures to RPs for assisting them to comply with the requirements, and conduct regulatory impact assessment and timely consultation with the public and the industry on the proposed initiative.

On the other hand, efforts will be focused on the harmonisation of the Design Code with new EN standards. With EN81:½:1998+A3:2009 superseded by EN81-20:2014 and EN81-50:2014 in September 2017, different milestones requiring type-examination certificates complying with the new EN standards have been set for the type approval for new and existing models of lifts as well as safety components. Furthermore, the Design Code is currently under review to incorporate the requirements under the new EN standards. With harmonisation of the Design Code with the new EN standards, the trade could reduce the effort on assessing the compliance of models of lifts on conforming to the requirements for installation in Hong Kong.

Moreover, EMSD will continue to encourage RPs to engage independent REs to resolve occasional disputes between RPs and their appointed RCs, which may arise from the poor performance of the concerned RCs, queries on the needs for repairing/improvement works suggested by the RCs, occurrence of incidents etc., by carrying out independent audit inspections of the concerned lifts and escalators and provision of professional advice accordingly.

Finally and yet importantly, EMSD will continue to act as a "Facilitator" and "Promotor" in encouraging wider use of new technologies in the industry. Promotion of adopting new technologies will not only be confined in lift and escalator maintenance works, but will also be extended to apprentice and safety training in the lift and escalator trade. With the view of achieving quality and safe lift and escalator services, EMSD will continue to collaborate with different stakeholders to explore the possibility of wider use of new technologies in the industry so as to cope with the challenge of increasing demand for manpower resources and make the operation of lifts and escalators more comfortable, safe and reliable.

[17] "Lift Modernisation Resource Corner": ***https://www.emsd.gov.hk/en/lifts_and_escalators_safety/responsible_persons_corner/lift_modernisation_resource_corn er/index.html***

BIOGRAPHICAL DETAILS

Ir Eric Y.H. PANG is a Government Electrical and Mechanical Engineer of the EMSD, Government of the HKSAR. He possesses diversified engineering and managerial experience in the regulation of lift, escalator, amusement ride, aerial ropeway, builders' lift, fuel gas and electrical systems, as well as the provision of one-stop multi-disciplinary engineering services for various specialist engineering systems. He is currently the Assistant Director of the Gas and General Legislation Branch of EMSD, and is responsible for overseeing the Gas Standards Office and the General Legislation Division of the Department. Ir PANG is a Fellow of the Hong Kong Institution of Engineers and a Member of the Institution of Electrical Technology in the United Kingdom.

Ir. Cheung Kim Ching is the Chief Electrical and Mechanical Engineer of the General Legislation Division at EMSD, a regulatory body and law enforcement department with regard to electricity, gas, lift and escalator safety and related E&M areas within the Government of the HKSAR. His duties include management and administration of the regulatory functions related to the safety of lifts and escalators, amusement rides, aerial ropeways and builders' lifts and tower working platforms. Ir. Cheung graduated from the Hong Kong Polytechnic in 1987 and subsequently obtained the Master of Science in Electrical Engineering from The Hong Kong Polytechnic University in 1997. He is a Chartered Engineer and Corporate Member of the Hong Kong Institution of Engineers, the Chartered Institution of Building Services Engineers and the Institution of Engineering and Technology in the United Kingdom.

Ir Alex C.F. LAI is a Senior Electronics Engineer of the EMSD, Government of the HKSAR and responsible for enforcement of the Lifts and Escalators Ordinance (Cap. 618) in Hong Kong. He also possesses with diversified engineering experience in electronics, control, automation and information systems. Ir LAI is a Corporate Member of the Hong Kong Institution of Engineers and a Chartered Engineer of the Institution of Engineering and Technology in the United Kingdom.

LUI Graham is an Electrical and Mechanical Engineer of the Government of the HKSAR with engineering experience in building services design, operation and maintenance as well as regulatory enforcement on lift and escalator safety in Hong Kong. Currently working as the Engineer of General Legislation Division of EMSD, he is responsible for enforcement of the Lifts and Escalators Ordinance (Cap. 618) in Hong Kong. Mr. LUI is a Chartered Engineer registered with the Engineering Council of the United Kingdom and a Member of the Institution of MechanicalEngineers.

Due to expansion, TVCL have an exciting opportunity for a Monitoring Field Engineer and an Assistant Monitoring Field Engineer based in and around London.

For further details:
Monitoring Field Engineer
https://www.tvcl.co.uk/careers/monitoring-field-engineer/

Assistant Monitoring Field Engineer
https://www.tvcl.co.uk/careers/assistant-monitoring-field-engineer/

ELEVATOR PITCH

Today we're meeting Alice Black, owner of Blacks Productions and an expert in creative film and photography. Alice specialises in lift photography, and we caught up with her at the Southend Cliff Lift, Britain's shortest railway, at just 17 metres. Open since 1912, it still operates each day.

DOORS CLOSING, GOING UP...

FIRST OFF, CAN YOU TELL US ABOUT YOUR CONNECTION TO THE LIFT INDUSTRY?

Lifts run in the family so when I took up a new photography hobby in lockdown, it seemed like a natural place to start. The more I then looked into lift companies' social media and websites I started to noticed there were quite a lot of low quality images and stock images being used for content. This made me curious and when I investigated even further it seemed that lift photography just wasn't a thing. So, me being the creative being that I am thought, "Why can't I make this a thing?!". And so the journey begun.

TELL US BRIEFLY ABOUT YOUR JOB, HOW DID YOU GET INTO PHOTOGRAPHY?

Funny story...my career actually started off in front of the camera, when I graduated as a dancer. I then moved into personal training and competed as a figure athlete (still in front of the camera), this unfortunately went out of the window in lockdown when all the gyms shut. So I took this as a great opportunity to change career paths. I bought my first camera, a Canon 80D, I YouTubed how to turn it on and spent lockdown practising.

My first few jobs were for online clothing brands and children's birthday parties, but after my first lift job at Oxford University (which may or may not have hosted a few famous wizards…), I knew that this was the route I wanted to go down. I now run my own production company, providing photography and videography services, meaning I get to do what I love every day.

WHAT WAS YOUR VERY FIRST PHOTOGRAPHY JOB?

I've got a friend who is in the band East 17, he recently joined the band and wanted me to film behind the scenes of their new music video. I had no idea what I was getting into, but I went along and filmed in an old nine-bedroom house which could be described as being in somewhat… disrepair. After wading our way through the house from room to room for 12 hours (yes some of the rooms were flooded) I can confirm it was quite the experience. I had no idea how the video would turn out, but it looked epic.

WHAT HAS BEEN YOUR FAVOURITE JOB SO FAR?

I've embarked on an adventure recently, recording a podcast for the lift industry. It's called Stuck in a Lift, and is sponsored by VM Elevators. It's a podcast to learn about our peers and to inspire young adults to join us in the industry. Despite how many people are in the industry, it's actually quite a small world and you can find yourself talking within the same circles day to day, so I want to create a platform for people to share their journeys. You can follow us on Spotify.

WHAT'S YOUR IDEA OF A PERFECT JOB?

My perfect job would be Owen Grady from Jurassic World, played by Chris Pratt – a raptor trainer, just hanging out with dinosaurs all day would be great. Either that or a wizard from Harry Potter, because I'm a huge Harry Potter fan. Not a nerd at all.

WHAT DO YOU LIKE TO DO OUTSIDE OF WORK?

Lego takes over a lot of my life. I'm a big collector, I reckon I've got over 200 Lego sets, some don't even come out of the box! I loved Lego as a kid, but when I was competing as a body builder, I used it as a distraction between meals! I even auditioned for the Lego Masters TV series, I roped my mum in to be my AFOL (adult fan of Lego) partner.

WHEN YOU WERE YOUNGER, WHAT DID YOU WANT TO BE WHEN YOU GREW UP?

I always wanted to dance. Luckily I got to do that! I started dancing when I was 10, so fairly late for a dancer. I danced every day, and then went on to dance school. I opened the FA cup final in 2012, I've acted in Eastenders, got to the semi-finals in Got to Dance on Sky 1, I danced for a Harrods Christmas launch, some really fun things.

IF YOU COULD EAT ANYTHING, ANYWHERE, WHAT WOULD IT BE AND WHERE?

It would have to be Nando's carrot cake – which they sadly don't make any more, it's the best carrot cake I've ever eaten. I'd eat it looking out to sea.

DO YOU HAVE A FAVOURITE QUOTE?

"No day but today." It's from one of my favourite musicals, Rent. I've got it tattooed on me, and it's always stood out for me from a young age. If you're going to do something, you might as well do it now.

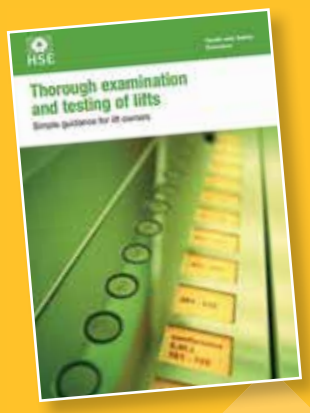
IF YOU HAD TO CHOOSE YOUR FAVOURITE LIFT, WHAT WOULD IT BE?

I do love a stylish passenger lift straight out the wrapper before anyone has had a chance to put their grubby hands on it. They look great to photograph!

With stunning views out to sea, it's definitely time to find some carrot cake to enjoy. Thank you to Alice for giving us a peek behind the scenes of her life. You can find out more about her production company at *www.blacksproductions.co.uk*.

LETTERS FROM THE PIT

John is Lift Industry News' very own agony uncle and is here to support you when your vertical transportation relationship is going through a bad patch.
WISH TO ASK JOHN A QUESTION »
www.liftindustrynews.com/dearjohn or scan the QR code.



Suggest having some text and a link to the guidance online?

DEAR JOHN

Question "My lift maintenance company has been providing LOLER inspection reports and I am a bit concerned they are marking their own homework. Do you have any guidance on this?"

JOHN SAYS

Guidance in the HSE note INDG339 is a good starting point and offers the following:

"Marking their own homework" is one expression to be considered however I would also suggest "creating their own revenue stream" could be another.

Selecting a competent person:

A competent person is someone who has sufficient technical and practical knowledge of the lift to be able to detect any defects and assess how significant they are. It is also important that the competent person is sufficiently independent and impartial to allow them to make an objective assessment of the lift. For this reason, it is not advisable for the same person who performs routine maintenance to carry out the thorough examination, as they are then responsible for assessing their own work. You can use someone from an external company or someone from within your own organisation to act as the competent person as long as they meet the above criteria. However, few owners or lift operators have the necessary competence in-house.

If you intend to use an external person, you should ensure that they understand what is meant by a 'thorough examination' and what the law requires. Accreditation by the United Kingdom Accreditation Service to the relevant standard (BS EN ISO/IEC 17020:2004) is an indication of the competence of an inspection body. Most insurance companies can recommend accredited inspecting organisations.

The Lifting Operations & Lifting Equipment Regulations 1998 ACOP (ISBN 978 0 7176 6588 0) is also a good source of detailed reference (Page 50: 296-300) gives guidance on 'competent person' and impartiality.

Given that in UK law a limited company is deemed to be single entity person then the literal interpretation of the above would support the advice that the maintenance company **should not** carry out the LOLER inspection.

"Marking their own homework" is one expression to be considered however I would also suggest "creating their own revenue stream" could be another. I have witnessed LOLER reports advising that a control panel should be replaced as an immediate defect when in reality the 'inspector' had failed to reinstate the lift into service following his visit!

On another related point and a pet hate of mine is the term 'Insurance Inspection'. The correct term is a LOLER Thorough Examination Report. Whilst the inspection is a statutory requirement it does not need to be carried out by a company affiliated to or recommended by a building insurance broker. A lift owner or duty holder needs to ensure that the inspection is carried out (bi-annually in the case of passenger carrying devices) by a competent person and produce the report accordingly in line with Regulation 9 & 10 of the Lifting Operation and Lifting Equipment Regulations 1998. The inspecting agency needs to meet the definition of competence as advised above. A copy of the report can be presented to an insurance company as required to evidence the examination.

On a parting note, should we also be considering the other point I have highlighted above regarding **sufficient technical and practical knowledge of the lift?** How many calls have maintenance companies attended when the LOLER inspector has been unable to return a lift to service following a thorough inspection? In our fast moving industry has technology overtaken the criteria for these specialists to operate safely and competently? Do all inspectors have manufacturers specific and regular product training in order to meet the HSE's guidance? Food for thought.

As always, answers and corrections are welcome.

JOHN BENTLEY

John is an established professional within the lift industry, with over 42 years of varied management and technical experience with a specific interest in quality service delivery, sympathetic lift modernisations where viable, and the development and adaptation of modern technology and design installed in existing environments.

His career started with H&C Lifts/Dover Elevators (USA) and in 1998 he established his own contracting business, trading as ANSA Elevators Ltd. – now recognised as one of the leading independent lift engineering companies in the UK. Since 2015 he has been part owner of LECS (UK) Ltd employed as a Director and Project Engineer covering all aspects of building transportation design and maintenance. He provides the company with all lift traffic analysis support along with expert witness information gathering and reporting.

John believes you never stop learning, so is currently studying Lift Engineering at the University of Northampton.

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