September 21–22th 2016

Symposium on Lift and Escalator Technologies

This was the sixth joint Symposium organized by the Lift Engineering section of the School of Arts, Science and Technology at the University of Northampton and the CIBSE Lifts Group. The venue for this two day event was again the Highgate House Hotel outside Northampton in the UK. This practical and comfortable venue set in a rural setting again proved a great success with delegates.

Over 120 delegates attended the Lift Symposium where 23 papers on various lift related topics were presented. In addition to the papers a workshop session was included that gave an overview regarding training and academic courses available for the Lift Industry. This 2016 event was additionally sponsored by LEIA the UK Trade association and supported by the trade press and a number of table top exhibitors.

The Event Welcome

The Symposium was opened by the Associate Dean of the School of Arts, Science and Technology, John Sinclair, who was delighted that the University and the CIBSE Lifts Group had been so proactive in addressing the topic of world lift technology. Sinclair thanked Prof. Kaczmarczyk and the CIBSE Lifts Group for their efforts that had driven the event forward and stated the importance of creating educational and standards institutions. Sinclair gave an insight regarding the University's history and explained that it had been difficult to found a university in Northampton as ancient charters had to be rescinded. However, these barriers were overcome and the University was now gaining a solid reputation and that the Lift sector was part of that success. Sinclair concluded by wishing all the delegates an enjoyable and productive conference.

The delegates were informed that the symposium was divided into 7 sections over the 2 days and to start the proceedings Len Halsey was introduced and invited to the to chair for the first session of 3 papers which focused on technology and innovation. Halsey then invited Ben Langham to the podium to give his paper on 'technology that empowers and drives innovation' and that the symposium was open.

An overview of the event

The presentations and papers given during the two day event covered many issues and the organizing committee had made efforts to present a wide range of lift topic. The balance of papers presented will always be difficult to achieve but the relevance of the event will, to a large extent, depend on that mix. Two days seemed the correct amount of time for the symposium and as the venue was slightly remote the delegates were not distracted by outside attractions which resulted in a good attendance for all the presentations. Importantly a small exhibition accompanied the symposium adding significantly to the event by showcasing a few components and research projects that allowed the all important hands-on experience to take place.

It is impractical to give a comprehensive report on all 23 papers in a single article and we would encourage anyone interested to find out more and acquire the book of papers. This book of papers presented at the 6th Symposium is available from the events website www.liftsymposium.org. However, there were a number of important issues raised and we will highlight a few in this article. These were:

The pressing issue regarding the functionality of induction loops within lift cars that are there to help people with

hearing problems. John Trett a well respected figure in the lift industry unfortunately recently went deaf and he has taken up the challenge to improve and ensure that the regulations and functionality of the equipment are fit for purpose. Trett had found that even though induction loops are often installed in lifts and buildings most seem to be incorrectly tuned which renders them useless. This simple tuning so that hearing aids can really work is certainly an issue that needs to be addressed and Trett showed some simple and cost effective ways this can be achieved.

Significant Papers presented by research engineers from the London Underground highlighted safety initiatives and looked at moving people from 'street to platform and from platform to street'. They found that standing on both sides of the escalator step and stopping passengers walking up the

units greatly helped the congestion and flow of people through the station. In another paper they also highlighted the ineffectiveness of balustrade and newel-end safety signs. They were practically developing new information systems that are being or will be trialled and the results of that will be of great interest to industry and operator alike. These included holograms, painted foot-prints, digital signs, painted comb-plates and much more.

Intelligent and sophisticated technical systems were often raised at this symposium as part of the presentations. It became clear to the delegates that there was a conflict over which part of the lift system should be the key intelligent unit, should it be the dispatcher or controller? This will obviously be an area of much discussion over the next few years and we suspect many papers on this topic.

The control and future use of multi car systems were reflected in many papers and it was clear that research engineers are and will be developing strategies and systems in the next few years. It is clear that these rope-less systems are and will be of interest and be a hot topic at lift conferences for some time to come.

At the Symposium closing Professor Stefan Kaczmarczyk, Postgraduate Programme Leader for Lift Engineering, Department of Engineering, Faculty of Arts, Science and Technology, The University of Northampton, commented:

"The Lift Symposium has grown to become an important discussion forum which this year brought together over 120 industrial and academic experts representing 18 countries from within the field of vertical transportation engineering. The conference covered a broad range of subjects, such as the energy, modern equipment, maintenance, traffic design and dispatching, history and future developments in standards and safety of building passenger transportation systems. In view of the present world-wide interest in the development of safe, efficient and cost effective high-performance vertical transportation systems the proceedings of the event has presented an opportunity for the delegates to discuss the current trends and direction for future design, development and research in this important area of engi-

List of Sessions and Presentations

09:15 – 09:30	Welcome and Introduction- John Sinclair (Associate Dean, School of Science and Technology) / Prof Stefan Kaczmarczyk (Dept of Engineering and Technology)
Session 1	**Technology and Innovation – Chair: Len Halsey**
09:30 – 09:50	How current technology trends are empowering us all to drive innovation-Ben Langham
09:50 – 10:10	Installing and calibrating loop amplifiers to EN 81-70 so that test certificates can be produced for audio frequency induction loop systems (AFILS) in accordance with BS EN 60118-4 – John Trett
10:10 – 10:30	Integration of lift systems into the internet of Things and the need for an open standard information model – Jonathan Beebe
Session 2	**Traffic, Design and Dispatching – Chair: Adam Scott**
10:50 – 11:10	Global dispatcher interface – Richard Peters
11:10 – 11:30	An overview of India, travelling tall – Anandi Khandekar
11:30 – 11:50	Your lift journey – how long will you wait? Caroline Bird, Richard Peters, Elizabeth Evans, Stefan Gerstenmeyer
11:50 – 12:10	Towards a systematic methodology for the design of lift traffic systems in highrise buildings – Lutfi Al-Sharif, Ghazi Al Sukkar, Asma Hakouz, Nama A. Al-Shamayleh
Session 3	**Equipment and Maintenance – Chair: Dave Cooper**
14:30 – 14:50	The role of economic factors in traffic planning and selection of lift equipment – Rory Smith
14:50 – 15:10	The report of thorough examination as a management tool for maintenance – Dominic Dawson
15:10 – 15:30	Innovations in pulley design to address new requirements in the international lift market – Jawk Meijer
Session 4	**Lift Industry Training and Academic Education Workshop – Chair: Len Halsey**
16:00 – 16:20	Apprenticeships and vocational level qualifications – Nick Mellor and Lawrence Dooley
16:20 – 16:40	Academic qualifications – Stefan Kaczmarczyk
16:40 – 17:00	Professional institutions and registration – Dave Cooper
17:00 –	Questions

Day Two

Session 5	**Codes and Standards – Chair: Nick Mellor**
09:30 – 09:50	The 1935 code of practice for the installation of lifts and escalators – Lee Gray
09:50 – 10:10	Understanding the requirements of the new EN-81 Standards – Sam Tanno (presented by Nick Mellor)
10:10 – 10:30	Lifts in health: Health Technical Memorandum 08-02 revisited – Gina Barney
Session 6	**Design, Engineering & Energy – Chair: Rory Smith**
11:00 – 11:20	A study into the influence of the car geometry – Hayder Al-Jelawy
11:20 – 11:40	Dynamic lift control for improvements in energy efficiency – Vicente Pacheco
11:40 – 12:00	Map-based active compensation of lateral vibrations in lifts – Raul Monge, Javier Saumell, Jose-Manuel Rodriguez
12:00 – 12:20	Evaluating a holistic energy benchmarking parameter of lift systems by using computer simulation – Ricky Chan, Albert So, Stefan Kaczmarczyk
12:20 – 12:40	Modelling of a ropeless passenger transportation system for active damping of cabin vibration – Jonas Missler, Thomas Ehri, Benedikt Meier, Stefan Kaczmarczyk and Oliver Sawodny
Session 7	**Safety and Evacuation – Chair: Ben Langham**
14:00 – 14:20	Pilot for standing on both sides of escalators – Celia Harrison, Neera Kukadia, Paul Stoneman, Grant Dyer
14:20 – 14:40	Fire elevators, escalators & moving walks management system in an airport – Giovanni Pappalardo
14:40 – 15:00	London Underground escalator passenger safety strategy – Phil Harley, Kevin Seaborne
15:00 – 15:20	Exploring the concept of using lifts to assist the evacuation of very tall buildings – Peter Sumner

Symposium Closed by Richard Peters and Jonathan Adams

neering and technology, with peer-reviewed papers on the subject of research published and disseminated worldwide. The Authors will have an opportunity to submit their papers for publication in an open-access peer-reviewed journal Transportation Systems in Buildings (TSIB) which is edited and managed jointly by the University of Northampton, the Chartered Institution of Building Services Engineers Lifts Group and the Lift and Escalator Industry Association."

Then finally Dr. Richard Peters, closed the 2016 symposium giving particular thanks to Elizabeth Evans for her skilled efforts and careful organization. Peters also thanked the speakers for their enormous efforts and support which has made the event the success it has become. Peters announced that the Lift Symposium will continue annually at the same venue in Northampton, UK and that the organizing committee had decided to launch a second series of the Symposium on Lift and Escalator Technologies Lift & Escalator Symposium in Hong Kong, China commencing May 2018. More information will be posted on the lift symposium web site.

The following Abstracts listed below were all accepted in 2016. However, the final papers presented sometimes slightly differed and others were held over to be presented at a later event.

Lift Industry Training and academic Education Workshop

Led by David Cooper (CIBSE), Nick Mellor (LEIA) and Stefan Kaczmarczyk (The University of Northampton)

Like many service providing sectors the lift industry needs a wide range of skills to be able to provide a sound level of service. The employment base ranges from mates who assist fitters through to highly qualified engineers in design or development, and those who test or undertake investigative roles. The wide range of skills required by these groups has been met by a mix of training and education from vocational to academic. Without this wide range of skills, the industry would not be able to function fully.

This workshop is a collaboration of the three main interest holders in lift industry education and training and will look at the range of courses available from academic providers, apprenticeship training at vocational level, professional engineering institutions and also the engineer's registration system run by the Engineering Council UK. It is intended that delegates will leave the workshop with a clearer picture of the whole education and training provision and how the various organizations fit into the picture.

A Study into the influence of the car geometry on the aerodynamic transient effects arising in a high rise Lift installation

Hayder Al-Jelawy, Stefan Kaczmarczyk, Seyed Mirhadizadeh, The University of Northampton, United Kingdom

One of the main goals in designing a high-speed lift system is developing a more aerodynamically efficient car geometry that guarantees a good ride comfort and reduces the energy consumption. In this study, a three-dimensional computational fluid dynamics (CFD) model has been developed to analyse an unsteady turbulent air flow around a car moving in a lift shaft. The paper is focused on transient aerodynamic effects arising when two cars pass each other in the same shaft at the same speed. The scenarios considered in the paper involve cars having three different geometries. Two locations on each car have been selected in order to determine the aerodynamic forces that occur due to the traversing motion of the cars. Attention is paid to the airflow velocity and pressure distribution around the car structures. Shear stress distribution in the wake region of each car has been calculated in order to examine the flow separation and reattachment locations. The results presented in the paper would be useful to guide the lift designers to understand and mitigate the aerodynamic effects arising in the lift shaft.

Towards a systematic Methodology for the design of Lift Traffic Systems in high rise buildings

Lutfi Al-Sharif, Ghazi Al Sukkar, Nama' Al-Shamayleh, Asma' Hakouz, University of Jordan, Jordan

Lift traffic system design has been traditionally based on rules of thumb and the designer's judgement and expertise. This is especially true for high rise buildings. This paper attempts to develop a systematic methodology for the design of high rise buildings, by the use of rational rules. In order to ensure clarity and consistency, it defines the terms sector, zone and stack. A sector is a group of floors that are served by one or more lifts in a journey and are not necessarily fixed and are not necessarily contiguous. A zone is a group of contiguous floors that are served by a group of lifts and are fixed in hardware. When a number of zones are grouped together they form a stack, which is effectively a building within a larger building that is served by a main lobby or by a sky lobby.

The systematic methodology is built around the use of rational rules. Rational rules differ from rules of thumbs in a number of ways, and these are discussed in the paper. Eight rational rules are presented and used in the design of high rise buildings. The rules are triggered by the checking of a number of design parameters such as the waiting time and the travelling time, as well as the core area used up and the number of lifts in the group. A simulator for incoming traffic and a single entrance is used in order to obtain the parameters for a design then to trigger the rational rules. A number of case studies are presented that illustrate the efficiency of using the rules in the design and their ability to deal with different user requirement and buildings with different rises.

Lifts in Health: Health technical Memorandum 08-02 Revisited

Gina Barney, Gina Barney Associates, UK

The Department of Health (DH) is responsible for the health and adult social care matters in England, along with a few elements of the same matters which are not otherwise devolved to the Scottish Government, Welsh


Rory Smith


Dave Cooper


Lawrence Dooley


Stefan Kaczmarczyk


Nick Mellor


Lee Gray


Gina Barney


Hayder Al-Jelawy


Ricky Chan


Raul Monge

Government or Northern Ireland Executive. It oversees the English National Health Service (NHS).

The NHS employs more than 1.6 million people, putting it in the top five of the world's largest workforces together with the US Department of Defence, McDonalds, Walmart and the Chinese People's Liberation Army. The NHS in England is the biggest part of the system, catering to a population of 53.9 million and employing more than 1.3 million people.

The DH publishes Health Technical Memorandums (HTM) and Health Building Notes (HBN). HTMs give comprehensive advice and guidance on the design, installation and operation of specialized building and engineering technology used in the delivery of healthcare. HBNs give best practice guidance on the design and planning of new healthcare buildings and on the adaptation/extension of existing facilities.

HTM 08-02 Lifts provides guidance and recommendations for lifts to be provided in all health care buildings from the simplest rural practice with one lift to high rise facilities with many lifts.

Lifts were originally covered in HTM 2024:1995. This was replaced by HTM 08-02 in 2010. This HTM was written by the author and peer reviewed by an expert panel. It is held to be authoritative in the health field.

Since 2010 many changes have occurred in regulations and standards. The author has updated HTM 08-02 and presents her work in this paper. She also describes the structure of the HTMs and HBNs published by the DH.

Integration of Lift Systems into the Internet of Things and the need for an open Standard information model

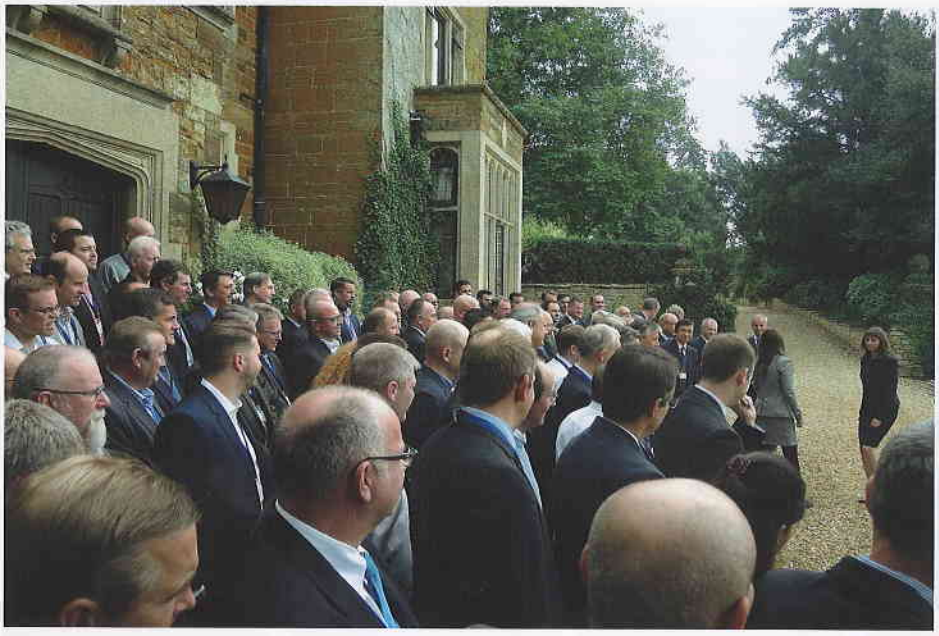
Jonathan Beebe, Jonathan Beebe Ltd, UK

The Internet of Things (IoT) is currently the subject of hype and is still in the process of consolidation from a number of visions of its purpose and the benefits it will bring. This paper starts with a review of the development and current status of, and motivations for, the IoT and continues with a discussion of the potential for integrating lift systems into it. The conclusion is that a top-level semantic layer for the IoT architecture is key to the successful delivery of so-called smart building and smart urban services – particularly when machines talk to machines without human intervention. It is at the semantic level that raw data is transformed into valuable and meaningful information, and it is the semantic level that can unlock the imaginative potential to engineer a smart urban environment in which lift systems play an important role. The new services will inevitably require the exchange of information across disciplines, between different corporate as well as private third-party agents and will highlight the importance of agreed standards upon which systems from different suppliers can interoperate. The paper concludes with an overview of an open standard information model for representing the semantics of lift (and escalator) operation which could support this requirement.

Your Lift Journey – How long will you wait?

Caroline Bird[1)], Richard Peters[1)], Elizabeth Evans[1)], Stefan Gerstenmeyer[2)], [1)]Peters Research Ltd, UK, [2)]thyssenkrupp Elevator Innovation GmbH, Germany

When passengers start their lift journey they initially wait for their call to be answered. Whilst travelling to their destination their trip is often interrupted by intermediate stops which are the result of other passengers' calls. Dispatching algorithms optimize the handling capacity and quality of service of lift groups. The main criteria for quality of service is currently average passenger waiting time. Travel and overall journey time and number of stops are additional criteria. But which is the most important for passengers when they think about their trip? How can dispatching algorithms be improved and tailored to meet passengers' expectations? An online questionnaire has been conducted asking people how they feel while using lifts and to help identify what passengers want and expect. The questions and results from the survey are presented and it is shown how the results can be applied to existing dispatching algorithms.



Lift Remote Connectivity

Paul Cardy, Canary Wharf Contractors Ltd, UK

This paper addresses the key elements that are required to enable a phone or data user to have continuous uninterrupted service when using the building lifts. There are a number of challenges which need to be considered and overcome to achieve this goal. Technologies considered include the application of (a) a leaky feeder; (b) a trailing flex with suitable characteristics. Consideration of equipment location needs to take into account maintenance requirements. The application of lift codes and possible requirements for Notified Body approval are discussed. A trial project involving double deck lifts will be reviewed, showing solutions to each of the challenges, and assessing if success criteria have been achieved. The funding has been allocated for a second phase of this project, with a planned start in the first quarter of 2016. Successful application of these technologies enabling continuous service for lift users has global potential, and could be considered an important next step in services being provided by the lift industry.

Fault Diagnosis Methodology

David Cooper, LECS (UK) Ltd, UK

Back in the 1970's the methodology of diagnosis of faults was a standard inclusion in a technician's apprenticeship. Research appears to show that since the withdrawal of the J25 and J26 modules which industry apprentices were taught to at craft level that fault diagnosis methodology has not been taught as a standard whilst technology has advanced with the introduction of MRL's, power electronics and encoded input and output systems for buttons and indicators. Return call backs are on the rise and clients report business interruption as a result and with maintenance contract costs being at an all-time low contractors are finding that they are making losses due to call backs on full comprehensive contracts and clients on basic maintenance contracts are reporting frustration and annoyance at receiving multiple invoices. This abstract has been prompted following research in the industry about fault finding techniques and revealing, with very few exceptions, that there are no formal modules in this area. This paper looks at the methodology that existed previously and updates it to bring it into line with current technologies.

The Report of thorough Examination as a Management Tool for Maintenance

Dominic Dawson, Zurich Engineering, UK

Statistically a lift is a very safe mode of transport, this is fundamentally due to the exacting construction, installation and testing standards and good after care, essentially the only influence that a lift owner or duty holder has over the safety of the lift is the after care. The two main activities over which the owner has control are maintenance and thorough examination and he has legal and moral responsibilities to ensure these are carried out.

Invariably the execution of these responsibilities will be sub contracted to third parties – an inspection body and a maintenance company. The ACOP to LOLER 98 states that the report of thorough examination "is a vital diagnostic aid to the safe management of lifting equipment". HSE guidance INDG339 suggest that the report may be used as an aid to monitor the maintenance provision. The study looked at the thorough examination report, and how it can be used to support the management of the maintenance activity. Information was gathered by asking Engineer Surveyors to participate in a survey whilst completing thorough examinations. Data was extracted from the survey and the corresponding examination report.

The maintenance issues were extracted from the reports and together with information from the maintenance log cards it was possible to build a picture of the maintenance provision. The study concluded the need for clear communication between all parties involved in the after-care of the lift, which would best be procured at the contract level. It noted that although the examination report is a useful tool to aid performance management it does require a level of "intelligence" from the reader and information from other sources for example maintenance sheets need to be combined. With careful management a reduction of up to 60% of reported "b" defects could be seen.

Multicar Dispatching

Stefan Gerstenmeyer[1],[2], Richard Peters[2],[3], [1]thyssenKrupp Elevator Innovation GmbH, Germany, [2]University of Northampton, UK, [3]Peters Research Ltd. UK

When there is effectively no limit to the number of lifts in a shaft and the lifts can move horizontally as well vertically, conventional dispatching operation and objectives need to be reconsidered. This paper considers how to dispatch multicar lifts efficiently and explores the limits of handling capacity. Quality of service cannot be measured simply in waiting time when a new car appears at the main entrance floor almost immediately after the last car is dispatched; the dispatcher must also consider bottlenecks in the shafts which can result in long delays in tran-

sit. The user interface and signalling also needs consideration as ease of use may limit what information and allocation options are available to the dispatcher. Safety considerations also impose limits. Dispatching strategies for shuttle operation and local operation are proposed.

The 1935 Code of practice for the installation of Lifts and Escalators

Lee Gray, University of North Carolina at Charlotte, USA

The 1935 Code of practice for the installation of Lifts and Escalators was drafted by the Lifts and Escalators Installation Panel of the Building Industries National Council. The thirteen-member panel included representatives from the lift industry, insurance industry, trade unions, the Royal Institution of Chartered Surveyors, and the Royal Institute of British Architects. Lift industry members included John W. Stevens (The Express Lift Company), D.R.W. Green (Waygood-Otis, Ltd.) and Ernest M. Medway (J. & E. Hall, Ltd.). The panel reported that they had examined "all existing Codes and Glossaries available, including those in force on the Continent of Europe, in America and in several British Dominions." They also stated that: "Neither in Great Britain, nor in Northern Ireland is there at present a national Code of Practice for the installation of Lifts and Escalators, nor are such installations the subject of legislative control, except as come within the scope of the Factory and Workshop Act."

London Underground Escalator Passenger Safety Strategy – Improving passenger Safety on Escalators

Phil Harley, Kevin Seaborne, London Underground, UK

Safety, Reliability and value for money are at the foundation of London Undergrounds service. Although our safety record is one of the best in the world we must guard against complacency and continue to strive for continuous improvement.

Evaluation of company incident data has identified that the largest cause of customer injuries on London Underground is slips, trips and falls with 40% of all injuries reported occurring on escalators.

A strategy group was set up, comprising all stakeholders across the business, to identify/shortlist and then trial ideas to improve passenger safety. Four key risk controlling measures were identified which were: 1) Hold the handrail, 2) walk/stand safely, 3) be aware of the landing interface, 4) where possible use the lift if mobility impaired.

From the list of ideas 12 were shortlisted for trial on more than 50 escalators at stations with historically high accident rates. The aim was to identify ideas that would positively impact passenger behaviour and in turn reduce the number of slips trips falls and entrapments.

Four varied methods were used to evaluate the effectiveness of each initiative: statistical comparison of accident data, measurement of passenger behaviour, feedback from station staff observation and technical peer review.

Seven of the twelve ideas were found to be effective, following evaluation of the four measures: blue footprints step riser messaging, message embedded handrails, red combs, "hologram" virtual assistant projectors, lift floor signage and video screens mounted on pattresses (A 'toblerone' shaped device mounted across the balustrade decking as a passenger anti-slide de-

terrent). Equally as important as the identification of seven effective ideas was the identification of those measures which were ineffective.

The next step is to roll out, in a targeted manner, selected initiatives to "Top 20" London Underground stations assets where the highest number of accidents and incidents have occurred in previous years.

Standing on both Sides of Escalators: the Holborn Journey

Celia Harrison, Paul Stoneman, Neera Kukadia, Grant Dyer, Transport for London, UK

A pilot was carried out at Holborn Station on London Underground for standing on both sides of escalators exiting the station. The aims were: to look at safety by reducing slips, trips and falls; to reduce congestion by improving passenger capacity; and to change customer behaviour. The data collected was both qualitative and quantitative.

The data collected on safety was statistically insignificant. The data collected on congestion and on effective use of space on escalators showed that using both sides of the escalators to stand on did reduce congestion and increased capacity by approximately 30%. The data collected on customer behaviour showed that the change was only effective while staff were present to encourage the requested behaviour and produced no lasting change.

Modernization Challenges. Thinking outside the box

Roger Howkins, Kate Hibner, Arup, UK

This paper will consider if published lift modernization guidance alone provides sufficient detail to allow for safe modernizations or new lifts in existing lift shafts. It will investigate the professional skill sets needed to design and sign off the total complete lift installation as being safe. The paper will use as a basis "case studies" to highlight deficiencies in designs and suggest where specialist engineers should be engaged to check and sign off proposed designs. It will also investigate if price driven modernization contracts allow sufficient margins for lift contracts to employ professional qualified engineers to give advice on structural, electrical, mechanical and public health issues.

The paper will ask several fundamental questions, does the lift industry provide sufficient due diligence to the building occupiers and the end user client? Or do we accept without question the lift has worked without problem for the last "x" years and should possibly provide service for another "x" years without issue? How much design consideration is given to possible new load paths, structural alterations, adequacy of power supplies and carrying out "cloud surveys" of existing lift shafts?

It will investigate important aspects which are sometimes overlooked such as; will the lift equipment being replaced in the lift motor room have new heat outputs which will require modification or does a redesign of the lift motor room heating and ventilation system need to be carried out or will the existing power distribution design be suitable for the new equipment provided. The fundamental question this paper will address is does existing guidance go into sufficient detail to ensure a lift modernization or the installation of a new lift in an existing shaft is structurally, mechanically or electrically safe or do we need a professional engineer to sign off of the design.

Lift planning for Buildings in India

Anandi Khandekar, TAK Consulting Pvt. Ltd., India

Round trip time calculations and simulations are well known and widely applied in the planning of modern buildings. Guidance is mostly based on American and European practice as discussed in The Vertical Transportation Handbook. The Elevator Traffic Handbook. and CIBSE Guide D 2015 Transportation Systems in Buildings. The fundamentals of traffic calculations are the same all over the world, but the way people live and work is determined by cultural factors. In this paper the author reviews the traffic planning recommendations of CIBSE Guide D 2015 in the context of the

ndian culture. Comment is made on which lift planning ecommendations remain the same, and what would be ifferent.

low current Technology Trends are Empowering us all to drive Innovation

en Langham, London Underground, UK

ecent technological trends have given those outside ne Information Technology industry access to increas-gly sophisticated products and the ability to contrib-te to their development. These trends, such as cloud mputing, democratization of the web and ubiquitous w cost technology are breaking down the separation etween creator and end user. The result of this is the ility for the user to drive the development of their own novative solutions, informed by essential domain owledge. This paper explores the implications of this the maintenance of lifts and escalators and the asso-ated challenges and risks. Some of the ways in which ese opportunities are improving the maintenance of ndon Underground's assets shall also be presented. ese include the development of a web-based solution ich integrates multiple data sources to facilitate ef-tive maintenance and asset management decisions.

novations in pulley Design to address new equirements in the international Lift Market

cob Meijer, Schwartz GmbH Technical Plastics, Germany

ere is a clear trend in lift design. Lifts with high loads d high speed require very precise and rigid pulleys. In dernization the requirements are small drives and stic coated ropes or other traction media of innova-e character and flexible design. For volume driven andard" lifts, reducing cost is the major driving force. s paper focuses on products which deal with these uirements, and additionally increase rope life.

ew type of deflection pulley is shown which reduces tallation time and increases the life of plastic coated es. Test results are presented. The author will also lain the development of a weight optimized pulley for in high rise, high load and high speed lifts. The new ign lowers cost and reduces environmental impact.

delling of a ropeless Passenger transporta-n System for active damping Cabin vibration

s Missler[1], Thomas Ehrl[2], an Kaczmarczyk[3], Oliver Sawodny[1], iversity of Stuttgart, Institute for em Dynamics, Germany, ssenkrupp Elevator Innovation H, Germany, University of Northampton, UK

ventional vertical passenger transportation is per-ed by lifts. These conventional lifts use ropes to sfer the rotational movement of an electrical motor vertical movement of the cabin. The here consid-vertical passenger system does not use any ropes,

the motor directly provides a driving force, which moves the cabin. This new propulsion system is realized through an electrical linear motor. The use of the linear motor requires a new design of the passenger transportation system, which includes reducing the weight of the car through light weight construction. The reduced stiffness of the light weight design renders the construction more vulnerable to vibrations. In order to improve ride quality of the transportation system it is necessary to develop concepts to damp the vibrations.

One way to increase stiffness characteristics of the system is to introduce active damping components to be used alongside passive damping components. It is essential to derive a dynamic model of the system in order to design and also later control these damping components in the best possible way. This paper describes the fundamental steps undertaken to derive a dynamic model for designing and controlling active damping components for the new type of vertical passenger transportation system.

The model is derived as a Multi-Body System (MBS), where the connection between the bodies are modelled as spring damper elements. The derivation of the MBS is demonstrated on a transportation system, consisting of three main components: A sledge, holding the rotor of the linear motor; a mounting frame, which is used to provide support for the cabin; and the actual cabin. The modelling of the propulsion system, thus the electrical part of the passenger transportation system, will not be the focus of this work.

Dynamic Lift Control for Improvements in Energy Efficiency

Vicente Pacheco, IMEM Lifts, Spain

A lift's energy behaviour is an important issue and R&D departments are constantly searching for ways to improve results. Focusing on the electrical-electronic area: It is already well-known that the use of 3VF inverters and PMSM motors allows better energy results to be achieved. The combined use of real-time communications between lift control and inverter and the use of DTF (direct approach to floor) allows: Achieve an energy decision-making control panel and improve traditional energy consumption. From this point onwards, our objective is to present an improved concept for energy-efficiency based on the development of a new dynamic control. To achieve this, the following is important:

- Identify the different behaviours of the lift with regard to energy-efficiency in each different stage of the journey, taking into account: The number of people travelling, the direction of travel, the distance to be travelled and the lift's speed.
- Propose energy-saving improvements for each stage, always using DTF & sharing information in real time as a basis.
- Develop an intelligent control capable of taking decisions affecting energy-efficiency in real time. This allows the best energy-saving profile to be selected for each journey, adapting the curves as well as the motor and brake control in any situation.
- Using a certain energy profile and incorporating a certain set of proposals can produce good results in some circumstances and only acceptable results in others. For this reason, the smart lift control must always select the most suitable option.
- Show a comparative analysis of the results obtained with the new dynamic control with traditional solutions, as well as a comparison with current regenerative systems. Results with ISO 25745-2:2015 are also shown.

The aim of this paper is to make an in-depth presentation of the studies carried out for the journey stages, the proposals and the obtained results. All the results shown have been taken from real lift installations.

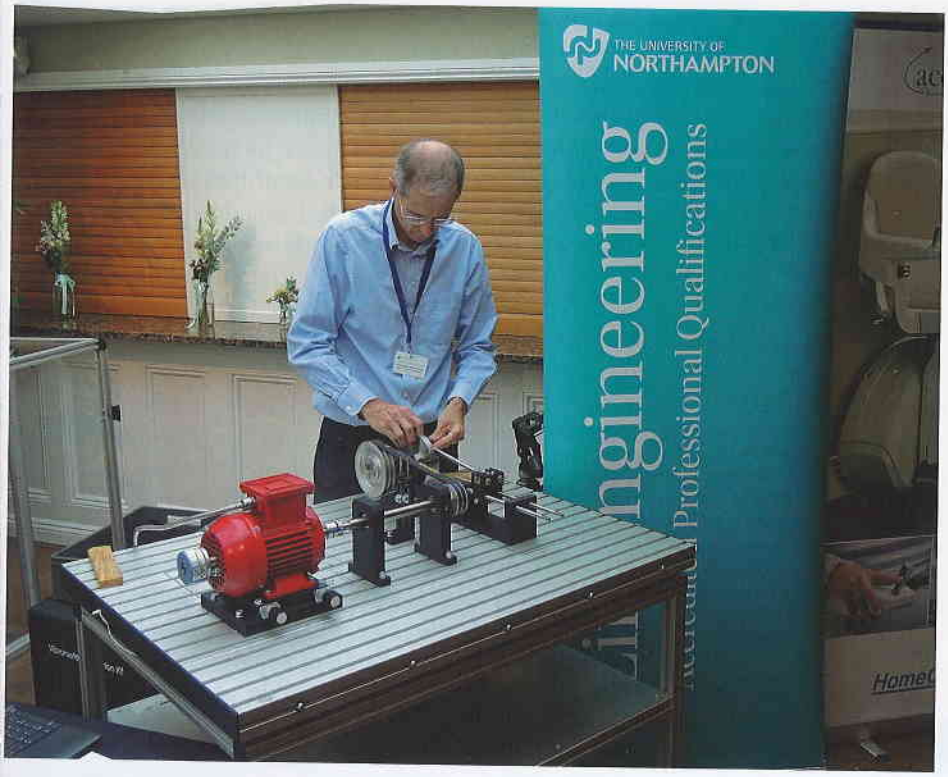
Fire Lifts, Escalators & Moving Walks Management System in an Airport

Giovanni Pappalardo, ANACAM, Italia

In December 2013 the Management of the International Airports of Rome (ADR) decided to assign me as project manager for the project of a fire safety system similar to EN 81-73, for lifts installed in the Airport of Rome Fiumicino. The specific requirement of the Direction of the Airport was to implement a fully automatic system, with no human supervision, to prevent passengers in a lift being stranded on a floor or in a lift, where a fire has broken out.

The Direction of ADR add some further specific project requirements:

- the system had to be reliable and with an high level of safety;
- hardware and software of the system with "open" architecture



- to reduce at the minimum the probability of "fake" alarms and to safeguard the capability of the system to start with a real fire alarm.

The Satellite Terminal G Gates has been chosen to start with the project. Also Escalators and Moving Walks have been included in the system. To reduce the probability of fake alarms a simulation 3D model of fire sensors map, based on 1,400 sensors of Terminal and statistical data of 18,000 fire sensors, has been prepared and verified.

After this the requirements of open hardware (open PLC and electronic equipment) and open software (open PLC and SCADA software) have been fully accomplished and the system is now running in the TERMINAL G GATES. ADR management has recently decided to extend the system to all the airport and to require certification to ENAC (Italian Airports Authority).

Global Dispatcher Interface

Richard Peters, Peters Research Ltd, UK

The efficiency of a lift group depends heavily on its dispatcher (also known as the group traffic control). A dispatcher decides how a group of lifts serve the passenger demand, normally based on calls placed on the system by the passengers. Defining a common, global dispatcher interface makes it easier for simulation and real word systems to talk to each other. The author draws on practical experience to consider if the next generation of dispatchers should be centralized or decentralized, and to suggest a dividing line between lift controller and lift dispatcher functions. Having addressed dispatcher architecture and scope, the requirements of a global dispatcher interface are considered. These include, but are not limited to single deck cars, double deck cars, and multiple independent cars in a shaft. The dispatcher interface also needs to consider different user interface options including landing call buttons, car call buttons, destination based input, together with associated indicators and displays.

Map-Based active Compensation of lateral vibrations in Lifts

Jose-Manuel Rodriguez, Javier Saumell, Raul Monge,
Instituto Tecnologico De Aragon, Spain

Lateral vibration in lifts has an important effect in the comfort levels perceived by the passengers. This phenomenon is highly affected by the geometry of the guide rails and the load distribution of the car. In this connection, irregularities in the former behave as perturbations that excite the oscillation of the vehicle. The effect is more and more important as the speed of the lifts increases, which is the current trend in the industry. In order to improve the performance of medium and high speed lifts, the present paper describes a method for compensating the lateral oscillations appearing in a lift due to the irregularities of the guide rails.

The proposed approach makes use of a mapping algorithm developed by the authors for identifying, learning and efficiently storing the geometrical configuration of the rails as a combination of straight line segments. The system is conceived for active roller guides, whose position can be continuously controlled in order to dampen the oscillations of the vehicle and to compensate the perturbations caused by the geometry of the guide rails. In order to develop the system and validate its performance, a 2D virtual environment is modelled in a simulation software. This environment includes the geometry of the guides and the main elements of the lift affecting the horizontal oscillation: inertial parameters (mass, inertia), stiffness of the roller guides among others. The present analysis does not take into account the oscillations caused by the traction rope or the movements of the load inside the cabin. The results of the proposed method show the improvement that can be obtained in the ride quality of the lift by mapping the geometry of the guide rails and properly using this information for compensating the identified irregularities by active roller guides.

Lifts Selection Graph

Mirko Ruokokoski, Marja-Liisa Siikonen, KONE Corporation, Finland

In the lift planning phase of a building, the number of elevators, their sizes and speeds are selected. Traditional performance criteria for the selection are the nominal travel time as well as the handling capacity and interval. These criteria are usually assessed in an up-peak traffic situation since up-peak is in general the most demanding traffic situation and for an up-peak situation the values of the criteria can be calculated by using the theoretical round-trip time formula.

For simple buildings, the suitable lift installations can be pre-calculated and the results combined in a graph. From a selection graph the most appropriate lift configuration can be read for the given number of served floors and population. This paper describes in detail the creation of the selection graphs

and discusses when the lift selection based on a graph is valid and when more sophisticated analysis methods such as simulations are needed.

The Role of economic Factors in traffic Planning and Selection of Lift Equipment

Rory Smith,
The University of Northampton, UK

Traffic planning and lift equipment selection normally focuses on the quality and quantity of lift service. While these metrics continue to be of great importance, economic factors should also be considered when selecting lift equipment. The financial consequences of both over lifted and under lifted buildings are explored. Low cost low performance solutions are contrasted with high cost high performance systems. Simple financial engineering methods to evaluate equipment selection, such as Net Present Value analysis, are presented. The financial aspects of complex lift systems such as double deck, destination dispatch, and multiple cars in a single hoistway are explained.

Evaluating a Holistic Energy Benchmarking parameter of Lift Systems by using Computer Simulation

Albert So, Ricky Chan, Stefan Kaczmarczyk, The University of Northampton, UK

At present, there are benchmarking parameters to assess the energy performance of lift drives, e.g. one in Europe adopted by VDI (4707-1/2), one by ISO (BS EN ISO 25745-1:2012, BS EN ISO 25745-2:2015 and BS EN ISO 25745-3:2015), and the other in Hong Kong adopted by The Hong Kong Special Administrative Region (HKSAR) Government. These parameters are only checking the energy consumed by a lift drive without considering passenger demands and traffic conditions, the one in Hong Kong pinpointing a fully loaded up-journey under rated speed while the two in Europe pinpointing a round trip, bottom floor to top floor and return with an empty car. A holistic normalization method was developed a number of years ago by one of the co-authors of this article, which can assess both drive efficiency and traffic control, termed J/kg·m, which is now adopted by the HKSAR Government as a good practice, but not specified in the mandatory code. In this article, such parameter is evaluated under different lift traffic scenarios using computer simulation techniques, with an aim to arriving at a reasonable figure for benchmarking an energy efficient lift system with both an efficient drive as well as an efficient supervisory control.

Evacuating a high-rise office Building by Lift

Peter Sumner, WSP Buildings, UK

The premise for most buildings is that lifts shall not be used in case of fire and that there shall be sufficient evacuation stairs to ensure a safe evacuation by all building occupants. The question is; does the current design standard best serve the occupants of very tall buildings? Evacuation times for very tall buildings, either for planned evacuation or for real fire or non-fire emergencies can be extreme. There are two main issues surrounding conventional evacuation by stairs; does the number of flights cause undue physical stress to evacuees, considering their size, age and general ambulatory condition and; does the time required to evacuate lead to fatigue and obvious delays. There have been previous studies, technical discussions, specialist meetings, symposium and a vast number of papers written in debating the problems to overcome if lifts were ever going to be used to assist the general evacuation of buildings.

It is a fact that evacuation by lift is likely to cost more in terms of capital expenditure for both the design and construction of a building but it can also cost more in terms of lost income due to additional space requirements that the life safety strategy and building and lift design may require. As such, all parties involved with the design will need consent from both client and architect if the thought of improved life safety through reduced evacuation times is to become a reality. Since 2001, a number of buildings have been constructed with the safe use of lifts to assist the evacuation process. This paper sets out initial proposals for the evacuation of a high-rise office building by a combination of lift and stair and provides an insight into the problems overcome in achieving approval of the client team and of the Local Fire Authority.

Understanding the Requirements of the new EN-81 Standards

Sam Tanno, Atwell International, UK

In August 2014, BSI published their new standard documentation covering safety rules for the construction and installation of lifts. Different parties have interpreted these standards in different ways. Efforts are being made by everyone to understand these legislations and keep ambiguity to a minimum. To, hopefully, assist in this cause this paper attempts to understand a few key areas of the publication. The first part of the paper examines what the new standard defines as the difference between excessive speed in the up direction and unintended car movement with doors open, in terms of the speed monitoring, speed reducing and prevention or stop devices allowable.

It considers the nature of each situation and how the standard deals with them accordingly. It ponders apparently contradictory sections of the standard before attempting to clarify them, and also casts doubt over common ways of complying with the standard such as doubling or tripling up on lift machine brakes. Having done this, the document then proposes standard-compliant systems for protection against excessive speed in the up direction and

unintended movement with car doors open respectively.

The paper then moves on to the matter of the application of the speed monitoring, speed reducing and prevention or stop devices and looks at what the requirements are for testing and certification, examining certain sections of the standard.

Once again, it picks out passages of the standard that could be construed as ambiguous and unclear, considers the implications of what the standard says and attempts to elucidate the abstruseness. This section is slightly more technically involved, considering calculations to determine permissible mass and energy absorbed by safety gears as well as looking at type testing procedures, before eventually drawing conclusions as to the author's interpretation of the standard as well as compliant safety systems.

Installing and Calibrating Loop amplifiers to EN 81-70 so that test Certificates can be produced for Audio Frequency induction Loop Systems in accordance with BS EN 60 118-4

John Trett, CE Electronics, UK

Service providers have to make "reasonable adjustments" to the physical barriers to access in all buildings. The summary of main provisions for disabled access includes: f) Emergency telephone and inductive coupler for hearing aid users. Inductive loop amplifiers need to be installed and calibrated correctly so that test certificates can be produced for Audio Frequency Induction Loop Systems (AFILS) in accordance with BS EN 60118-4. If they are not powerful enough or incorrectly set up they produce distorted sounds. Often installed systems are simply a loop behind the COP with limited range so they cannot be heard by a person at the other side of the car or collapsed on the floor. This leaves users with impaired hearing at a dangerous disadvantage as they cannot hear normal and telephone lift messages. This paper provides guidance on how existing loop amplifier specifications and installations can be improved.

John Gale

Robert S. Caporale †

Robert S. "Bob" Caporale passed away on the weekend of September 3. Best known in the industry as longtime editor of ELEVATOR WORLD, Caporale was an industry leader who hailed from the Bronx and began his lifelong career in New York City (NYC).

Caporale began his career in the construction industry in 1964 as a draftsman at the engineering firm of Jaros Baum & Bolles. There, he advanced to the position of associate and was the principal designer, field engineer and inspector on some of the world's largest vertical-transportation and materials-handling projects. In this capacity, Caporale provided oversight of new installation and modernization projects and was the company's principal elevator, escalator and materials-handling-systems project manager. In 1990, he joined DTM Elevator Consulting and Drafting Services, where he was director of engineering. In 1991, he joined Syska and Hennessy Engineers as vice president and director of the Transport System Group, where he continued to manage numerous elevator and escalator installation and modernization projects throughout the U.S.

In 1993, Caporale began working for Elevator World, Inc. as associate editor. He was appointed editor in 1997, a post he held until March 2014, when he retired and was given the honor of editor emeritus (EW, March 2014). Never one for idleness, he continued to work, operating his own firm RSC Consulting; serving as editor of the NAESA International newsletter Progress; joining the team of forensic analysts and technical experts at Unified Investigations and Sciences, Inc.; and working with magazine/online news source High Rise Facilities as part of its editorial staff.

In his 50-plus-year-long industry career, Caporale worked and reported on some of the world's most iconic buildings, including the original World Trade Center in NYC and the Willis (formerly Sears) Tower in Chicago. He was also a QEI and coauthor of The Vertical Transportation Handbook. He was proud to have traveled the world commissioning elevator systems on many projects throughout the U.S. and internationally in Kuwait, Hong Kong, South Korea, Egypt and the U.K.

Highly educated, Caporale held an associate's degree in Electrical Technology from the State University of New York and an MSc in Lift Engineering from the University College Northampton in the U.K. He was a longtime member of NAESA, the International Association of Elevator Engineers, the American Society of Mechanical Engineers and the Elevator Conference of New York, and served in positions of leadership and on important committees in many of these organizations throughout the years. Caporale was also a founding member of the International Association of Elevator Consultants and Elevator U, as well as a QEI and State of Florida certified elevator inspector.

Caporale was always ready to serve the industry by covering important projects and events and remained in frequent correspondence with EW after his retirement. Caporale is survived by wife, Terri; sons, Anthony and Robert "Bobby"; and two grandchildren. His family asked that, in lieu of flowers, cards or donations, he be remembered simply with love and laughter, which he considered to be the greatest gifts.