

# Lifts Group

**Minutes of the CIBSE Lifts Group: Lift (US: Elevator) Traffic Analysis & Simulation Open Forum, 25 September 2013, Highgate House, Northampton**



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## **PRESENT**

Mr Pat Ahern, Ramboll UK Ltd, UK  
Dr Lutfi Al-Sharif, University of Jordan, Jordan  
Dr-Eur.Ing Gina Barney, Gina Barney Associates, UK *Technical Editor CIBSE Guide D 2010*  
Mr Michael Bottomley, Lerch Bates Ltd, UK  
Mr John Carroll, Norman Disney Young, Australia  
Mrs Theresa Christie, Otis Elevator, USA  
Mrs Elizabeth Evans, Peters Research Ltd, UK *Member, CIBSE Lifts Group Executive*  
Mr Stefan Gerstenmeyer, ThyssenKrupp Aufzugswerke, Germany  
Mr Adrian Godwin, Lerch Bates Ltd, UK  
Mr Len Halsey, Canary Wharf Contractors Ltd, UK  
Ms Ana Lorente-Lafuente, Universidad de Zaragoza, Spain  
Mr Gordon Lucas, ILECS Ltd, UK  
Mr Jörg Müller, ThyssenKrupp Aufzugswerke, Germany  
Dr Richard Peters, Peters Research Ltd, UK *Guide D 2010 Steering Committee, Section 4 Author*  
Mr Jose Patricio, ThyssenKrupp Elevator, UAE  
Mr Olaf Rieke, Japssen Ingenieure GmbH, Germany  
Mr Simon Russett, Hoare Lea, UK  
Mr Adam Scott, Grontmij, UK *Guide D 2010 Steering Committee Chairman*  
Dr Marja-Liisa Siikonen, Kone Corporation, Finland  
Dr Rory Smith, ThyssenKrupp Elevator, UAE  
Mr Janne Sorsa, Kone Corporation, Finland

## **DISTRIBUTION**

Those present plus  
Lifts Group web site  
Dr Ken Butcher (CIBSE)

## **1. INTRODUCTION**

The purpose of the Forum was to bring together those experienced in lift traffic analysis and simulation from different sectors of the industry for discussion and debate on topics of mutual interest.

The meeting was chaired by Mr Scott, Chairman of the CIBSE Guide D 2010 Steering Committee. Notes of the meeting were made by Mrs Evans. As always with CIBSE meetings the opinions and views expressed by the speakers did not necessarily agree with their organisations or CIBSE.

The meeting was opened by the Chairman who welcomed everyone and thanked them for attending. He explained the two main objectives of the meeting were (1) to review and discuss current and future requirements of simulation templates and (2) to review and discuss quality of service criteria. It was hoped a consensus could be reached and that any agreed changes could be incorporated into the 2015 edition of Guide D.

## **2. PART 1: SIMULATION TEMPLATES**

Dr Barney introduced the discussion with a presentation on “A brief history of templates”. She described the work started by herself and dos Santos in the early 1970’s and the first public domain simulation package LSD (Lift Simulation Design) completed in 1975. Dr Barney highlighted the work of George Strakosch and the inclusion in the Vertical Transportation Handbook (1967) of various traffic patterns, some of which are still used today.

Barney and dos Santos used the Strakosch templates and created the up-peak and step profiles that were included in the “Elevator Traffic Handbook”. These profiles were subsequently included by Dr Peters in Elevate software in 2004.

Dr Barney went on to say that several new templates were introduced to the 2005 (Standard up-peak traffic, Standard down-peak traffic, Standard mid-day traffic, Standard interfloor) and 2010 (CIBSE classic office up-peak, Step profile, Constant traffic, CIBSE modern office up-peak, CIBSE modern office lunch-peak) editions of Guide D and it is now generally agreed that there are too many. Looking towards Guide D 2015 the number of profiles needs to be reduced to make it easier for designers/consultants. Profiles also need to reflect the modern market and changing working patterns.

Dr Barney concluded by saying she hoped during the Forum it could be agreed which templates were out of date and that new templates could be agreed (subject to available data) for hotels and residential buildings. She also emphasised the need for there to be a complete set of traffic templates for all types of building because this would allow for better modelling of energy consumption.

Dr Peters thanked Dr Barney for her presentation. Dr Peters then led a general discussion on the individual templates.

### **2.1 Current templates**

#### *2.1.1 Constant traffic template*

This is regarded by all as a “basic building block” although presently Guide D

states “there is no consensus as to how long a constant traffic template should be run”.

A long discussion followed regarding the length of time a standard simulation should be. It was initially felt that the minimum length should be 30 minutes and that the first and last five minutes should be discarded. In addition longer simulations or an increased number of simulations give more stable results.

Dr Barney said that this should be a research template rather than a design one.

However Mrs Christy added that the constant template is a useful tool to show what the sustainable peak is in a building as customers often ask “what is the peak handling capacity?”.

Mr Rieke said that currently he uses it with a range of different intensities e.g. 8%- 14% to work out the limits of a design.

Mr Halsey suggested that it could be adopted as the first step in the design process. Dr Siikonen added that in her experience 30 minutes was not sufficient time as some results could be unstable.

It was proposed and agreed that a default of an hour should be adopted with the first and last 5 minutes removed and that, where appropriate, a number of simulations should be run.

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### *2.1.2 Step profile*

Dr Peters suggested that the step profile template is a quick method to find the saturation point which enables us to narrow down the number of design options. Guide D 2010 currently has steps from 1% to 15%.

A discussion then ensued over the number of steps and length of duration and which percentage of the population to start at. Some people suggested that each step should be run as 1 simulation over 1 hour whilst others felt that more simulations should be run over shorter periods.

The debate highlighted the different priorities that consultants and researchers have.

Mrs Christy asked about the role of Guide D. Is it “putting something in to debate” or is it “putting something in to recommend as the correct procedure”?

Dr Barney responded that Guide D has a dual role. Mrs Christy emphasised that it needs to be very clear about what is set out and that the wording and language used need to be very precise. Guide D is extensively used; customers and designers are looking for instruction from it.

Dr Barney agreed and hoped that the day’s discussions would go some way towards that.

Dr Siikonen endorsed Mrs Christy’s comments and stressed the importance of Guide D and the influence it has.

No consensus was reached on the step profile template.

### *2.1.3 Barney one hour up-peak template*

It was agreed that this could be depreciated.

*2.1.4 Barney down-peak template*

It was agreed that this could be depreciated.

*2.1.5 Barney lunch template*

It was agreed this could be depreciated.

*2.1.6 Powell 2 hour lunchtime template*

There was some discussion regarding this as it was felt that it was still used mainly in the USA. However later in the meeting (following item 2.1.14) it was agreed that it could be replaced following the adjustment of the CIBSE lunchtime office template to better reflect the down-peak at the start of the lunchtime period.

*2.1.7 Powell 40 minute lunch time template*

It was agreed this could be depreciated.

*2.1.8 Siikonen full day template*

Dr Al-Sharif stated that a variety of all-day traffic templates are required for energy consumption calculations and he suggested that additional weekend templates should be introduced. Dr Peters said that to allow for this he uses an occupancy factor.

Dr Barney felt that the energy consumption of lifts were small however Mrs Christy added that customers are very aware of energy so it's important to be able to calculate the costs.

It was agreed that this template should be retained and that further all day templates are required to assist with energy consumption modelling.

*2.1.9 Strakosch full day template*

It was agreed this could be depreciated.

*2.1.10 CIBSE full day office template*

It was agreed this could be depreciated.

*2.1.11 Strakosch residential template*

It was agreed this should be kept until further data is gathered to develop a more up to date template.

*2.1.12 Strakosch higher education template*

It was agreed that this should be retained. Kone are currently undertaking some research on a destination control system at a university. ThyssenKrupp in Germany also have some data available which they will review.

*2.1.13 Modern CIBSE office up-peak template*

It was agreed that this template should be retained

*2.1.14 Modern CIBSE lunch time template*

There was a wide ranging discussion on this template and most people felt it would be beneficial for it to reflect the greater percentage of down-peak traffic seen at the start of the lunchtime period. Dr Peters said that he would revisit the existing research data which reflects this and prepare a revised version for the

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CIBSE Guide D 2015 edition.

Mrs Christy added that as destination control systems are becoming more prevalent then the templates need to mirror more realistic traffic situations.

Mr Rieke felt that if buildings were designed to peak periods then they would be “over elevated”. Again it was emphasised that step profiles can be used to test the limits of a system.

Mrs Christy suggested that the stages of design should be documented in Guide D. Mrs Christy, Dr Siikonen and Mr Rieke agreed they would develop this idea based on a fictitious building.

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OR

## **2.2 New templates and data available**

### *2.2.15 Full day*

Currently there are 2 full day templates: Siikonen and CIBSE Guide D 2010 Figure 4.1

Mr Carroll said there was a danger of consultants using the most optimistic template for design.

It was agreed that an additional full day template is required. Dr Smith agreed that a third template could be developed from a ThyssenKrupp project.

RS

### *2.2.16 Residential & hotels*

This section was led by Dr Siikonen. She introduced two new templates for hotels and residential buildings based on research that Kone have conducted using three measurement methods. (1. Control system using load weighing and photocell signals. 2. Kone Lift Traffic Analyser, 3. Lobby manual counting.)

The hotel profile concentrated on the peak in the morning covering the main check-out time and the peak in the evening where there was a restaurant on an upper floor.

Kone have compiled the data and averaged the results leading to the new template.

Generally it was felt that the Kone template was a good starting point but that further work was needed. Points for consideration were:

- i. Different profiles for different types of hotels e.g. business, holiday, airport, conference.
- ii. What about hotels with different check-out times.
- iii. As the survey occupancy was unknown, demand could be greater than measured for a fully occupied hotel.
- iv. Kone definition of interfloor traffic is different from that currently used in Guide D.

Dr Peters agreed to undertake another hotel traffic survey which could then be compared with Dr Siikonen’s template.

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Similarly with residential buildings further work needs to be done before a new template can be defined.

### 2.2.17 Hospitals

Dr Peters reported that Peters Research has undertaken some traffic studies in hospitals in both the UK and Europe but that further research is required before a template can be developed.

## 3. PART 2: QUALITY OF SERVICE CRITERIA

### 3.3 Perception of quality of service

The session was opened by Dr Smith with a presentation on the relationship between waiting and journey times and the passenger's perception of the quality of service.

Various studies have been undertaken (notably Meister 1985, Norman 2007) about the psychology of waiting in lines and how a person's emotions dominate in such situations. The "masters" of waiting in lines/queues are Disneyland.

For lift passengers the waiting experience is often perceived as the most "painful" part of their trip. However transit time is also important. Designers need to consider user friendly interfaces, countdown indicators and early call announcement. Lobby and cabin design can affect people's emotions. Time appears to pass more quickly when there are distractions, e.g. mirrors, in-car screens, etc.

People expect to have to wait a certain amount of time but do not want to feel the system has "forgotten" them.

In buildings with destination control systems people are becoming more aware that the number of stops can be controlled.

There isn't an absolute trade-off between waiting time and transit time.

Dr Smith concluded by stating there are several factors that influence the quality of service and the perceived quality of service. Perceived quality of service needs to be quantified through research. Quality of Service is more than Waiting Time.

### 3.4 Review relationship between round trip time and simulation.

Mr Sorsa opened the session with an explanation of the inputs and outputs of a traditional Round Trip Time Calculation (RTT). He then went on to describe the link between the RTT calculation and lift traffic simulation - an up-peak RTT calculation with a constant arrival rate should give the same results as simulation. He also highlighted other simulation criteria (detection of the saturation point, minimum length of simulation to allow it to reach a steady state, 100% car loading being allowed to reach 80% average car load factor, and subtracting the lift vacant time from RTT).

Discussion followed on why in many instances simulation does not tie-in with the RTT, notably when the lifts are not continually cycling.

Section 4:10 of CIBSE Guide D discusses these variations.

Mr Sorsa continued by saying that the traditional RTT model only:

- i. up-peak traffic
- ii. buildings with one entrance floor

- iii. conventional control
- iv. lift groups with identical lifts

However in modern design it is also important to consider:

- i. lunch-time traffic
- ii. destination control systems
- iii. passenger characteristics (pushchairs, wheelchairs)

He then introduced the concept of a generalised round trip where the average car load factor allows for the estimation of handling capacity for different traffic patterns and control systems.

It was agreed that simulation needed to be based on reality and that it would be good to tie up RTT and simulation.

Dr Peters said that the same assumptions must be made for both RTT and simulation methods. He added that if dwell times are included in RTT then there can be consistency. However, once a system saturates then interval is of no value as a measure of quality of service.

### **3.5 Review of modern office template criteria**

A general discussion followed on the quality of service criteria that are in the 2010 edition of Guide D and which templates should be used when designing. Some people felt that if the CIBSE modern office templates are used then a building will be “over-lifted”.

Dr Peters said that the morning template reflects reality as morning traffic is no longer 100% up-peak.

Mr Halsey expressed concern that the star-ratings in Guide D are only theoretical. In reality buildings are often used very differently from the original design. The rating can be divisive between building owners and tenants. He added that people are looking for robust designs and future proofing. In the UK tenants’ expectations are usually based on BCO (currently under review).

Mr Carroll said that in Australia the PCA (Property Council of Australia) have different rating categories: Premium, Grade A and Grade B which are very different from the BCO and CIBSE criteria.

BCO is currently being reviewed and there is a suggestion that it will move towards the CIBSE templates but will not adopt the star ratings.

There was general consensus that the star ratings could be omitted from the next edition of Guide D and that they should be replaced by an alternative measure.

It was suggested for a conventional system that the following could be applied:

Target AWT – 20secs (worst 5 mins)

Target ATT – 80secs (worst 5 mins)

80% (of actual) loading based on area.

A second set of criteria for destination control systems would be required as there is a strong demand for this type of system in the market, but AWT criteria have to be relaxed for the value of the reduced time to destination to be recognised.

The following for destination was proposed.

AWT – 25sec

ATTD – 80secs

80% loading based on area.

A discussion then followed on whether it is better to design to up-peak or lunch-peak and which criteria should be used. It was agreed that CIBSE should set standards and procedures.

It was felt that it was also important to take into account the different elements of traffic (up, down and interfloor) during both up-peak and lunch-peak periods. However, some designers still prefer to use 100% up-peak.

The meeting closed at 5:30 pm with Mr Scott thanking everyone for attending and their contributions.