How Many Breakdowns Are Acceptable?

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Abstract. The number of acceptable breakdowns that a lift may experience is an emotive subject. There appears to be only one published record that says that four breakdowns per annum are acceptable before an interest should be taken into the reasons why [1]. The owner of the lift may also have a different view of the acceptable number of breakdowns compared to the contractor. There are also a number of variables that have an input into the number of breakdowns that actually occur – age of equipment, external influences (power cuts etc.), type of equipment compared to environment, type of occupant, skills level of maintenance operative, type of maintenance contract, whether maintenance is even being undertaken, and also the number of landing doors being a few. The question is…. can an acceptable number of breakdowns be agreed upon subject to the equipment being the right type for the right environment?

1 INITIAL VIEW

When people are asked how many breakdowns per annum are acceptable on a lift the response will be a wide range of opinion.

Some lift owners will say that no breakdowns are acceptable with some maintenance contracts applying penalties for downtime.

At the other end of the scale a lift maintenance contractor on a basic oil and grease contract will rub their hands in financial delight at the thought of a breakdown as they can charge for attendance!

An employee in a building might not care how long it takes them to get to their workplace so if the lifts are regularly out of service they might be ambivalent to it whereas their employer might have a different view.

2 CASE HISTORY

In a recent civil dispute which went legal but settled prior to trial a tenant claimed against the landlord for enduring years of poor lift service in a building which they occupied several floors. Table 1 below shows the difference between the claimants' position and that of the defending landlord.

The claim was that there had been hundreds of lift breakdowns in the period and that the landlord, and its servants (the facilities management company and the lift maintenance contractor) had failed to manage the building in a professional manner.

Long and detailed analysis of hundreds of documents revealed that apart from over occupying the building the list of breakdowns included items such as light bulbs failing in a lift car, fire alarm activations and subsequent lift groundings, power cuts, lifts being left on car preference and so on.

The final analysis was that, whilst the number of breakdowns was high, it wasn't anywhere near as high as the claimant suggested despite the millions of pounds involved in the claim.

Year	Claimant		Defendant	
	Total	Per lift	Total	Per lift
2008	96	13.7	63	9
2009	129	18.4	101	14.4
2010	102	14.6	86	12.3
2011	199	28.4	151	21.6
2012	206	29.4	132	18.9
2013	94	13.4	69	9.9
2014	81	11.6	67	9.6
2015	34	4.85	18	2.6

Table 1 Comparison of total breakdowns claimant versus defendant

Further analysis was undertaken as to the causation of the various breakdowns by tabulating breakdowns where:

- Components were required
- Minor maintenance was required
- Misuse
- No fault found/working on arrival
- Fault not detailed

Type of Call/ Incident	2002	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Breakdown call requiring parts/ repair	0	0	0	0	42	43	20	50	19	19	4	0	**197**
Minor maintenance	0	0	0	0	3	29	43	76	59	33	35	0	**278**
Misuse	0	0	0	0	2	1	1	1	1	0	2	2	**10**
No fault found/ running on arrival	0	0	0	0	1	13	10	6	9	2	2	0	**43**
Fault not detailed	5	3	1	3	15	15	12	18	44	15	24	16	**171**
Total	**5**	**3**	**1**	**3**	**63**	**101**	**86**	**151**	**132**	**69**	**67**	**18**	**699**

Minor maintenance includes resets after power failures

Table 2 Analysis of breakdown causation

Table 2 reveals that whilst the majority of breakdowns were as a result of minor maintenance being required (more often than not doors going out of adjustment) there were also issues with component replacement being required on a regular basis. In truth the lifts had been neglected and poorly maintained.

The above table also reveals that reporting by the maintenance contractor in 171 cases was such that no proper analysis could be undertaken of those breakdowns.

Further analysis as shown below in figure 1 below revealed that the number of passenger entrapments were found to be high and it was in fact this situation that alerted the tenant to the problems as staff were claiming to be scared to use the lifts.

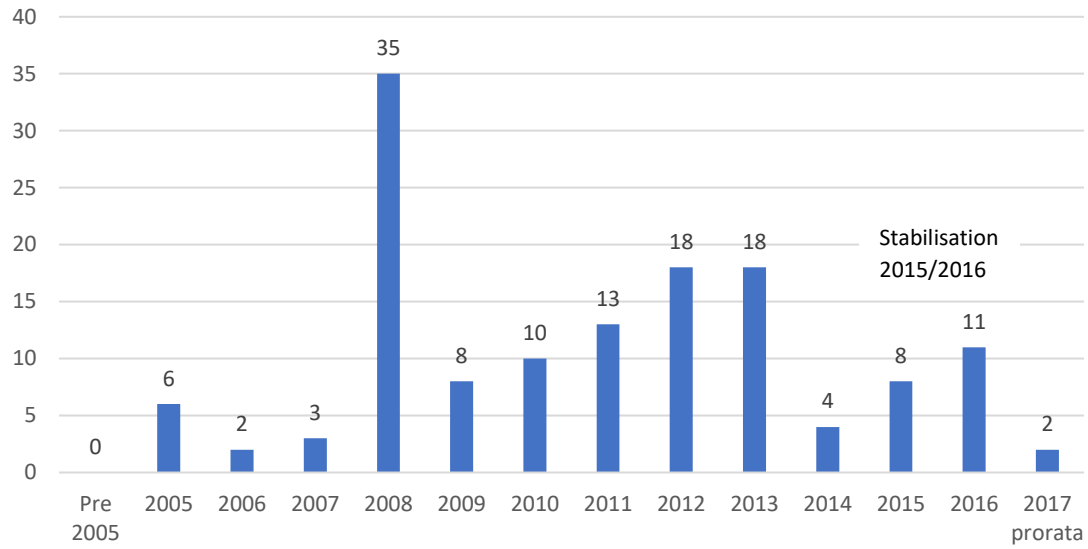

Figure 1 Number of passenger entrapments by year

3 WHAT IS A BREAKDOWN?

In order to agree on a relevant number of breakdowns it is required that a definition of a breakdown be agreed.

There are a number of definitions of what a breakdown is and these can be broken down into two types, namely:

- Total Breakdown
- Depleted Service

For instance, a door lock fault that is on permanently and renders the lift out of service can be described as a total breakdown whereas a stuck push button may place the lift into a depleted service where the lift will only stop at that floor occasionally rather than being stuck there permanently as was the case before stuck button recognition.

For the purposes of this paper the definition used for a breakdown is one which leaves the lift out of service and unable to respond to any calls.

For the purposes of clarity issues such as a defective indicator, defective safety edge where nudging is fitted where the contractor has been called to affect a repair is not considered a breakdown.

4 SUB LEVEL OF BREAKDOWNS

There is a sub level of breakdowns which need to be removed from the total breakdown count and these include:

- Vandalism where appropriate equipment has been installed.
- Power cuts

- Card reader (security system) failure
- Grounding as a result of fire alarm inputs
- Lift left on car preference control
- Obstruction in door track

In simple terms a breakdown where the causation of the breakdown is as a result of an external influence and not as a result of a component failure or poor maintenance.

In addition, callouts labelled as working on arrival should be removed from the equation as these cannot provide substantive evidence as to the cause of failure however it is recommended that where these are excessive they should be considered as a separate data set.

5 ACCEPTABLE NUMBER OF BREAKDOWNS

Only one published reference to an acceptable number of breakdowns has been found in which it says that four breakdowns per annum can be considered acceptable[1].

This reference is not specific as to the environment in which the lift in installed.

This raises the question whether the acceptable number of breakdowns should vary for different environments?

Maybe one would have an opinion that a hospital environment should have less than a social housing environment and so on.

This may well promote social debate especially as there is currently a situation where social housing residents are critical of local authorities for value engineering construction projects. There has been nothing more evident than the Grenfell Tower fire for this discussion.

The lift industry finds it acceptable to apply a different average interval and handling capacity to private residential dwellings than it does to social housing which begs the question as to whether the approach is correct or not. Table 3 below sets out the published difference in CIBSE Guide D [2].

Table 3.13 Design criteria: residential buildings (5-minute, two-way)

Type	Luxury	Normal	Low income
Interval (s)	45–50	50–60	50–70
Two-way handling capacity (%)	8	6–8	5–7

Table 3 Different approach to residential dwellings with respect to traffic design

The question of where the lift(s) are in their lifecycle should also be considered. Figure 2 below sets out a graphical representation of equipment life as published in the claimant's experts report[3] (source not known). If they are in phase 1 of their life and appropriate equipment has been installed it would not be appropriate to consider modernisation or replacement.

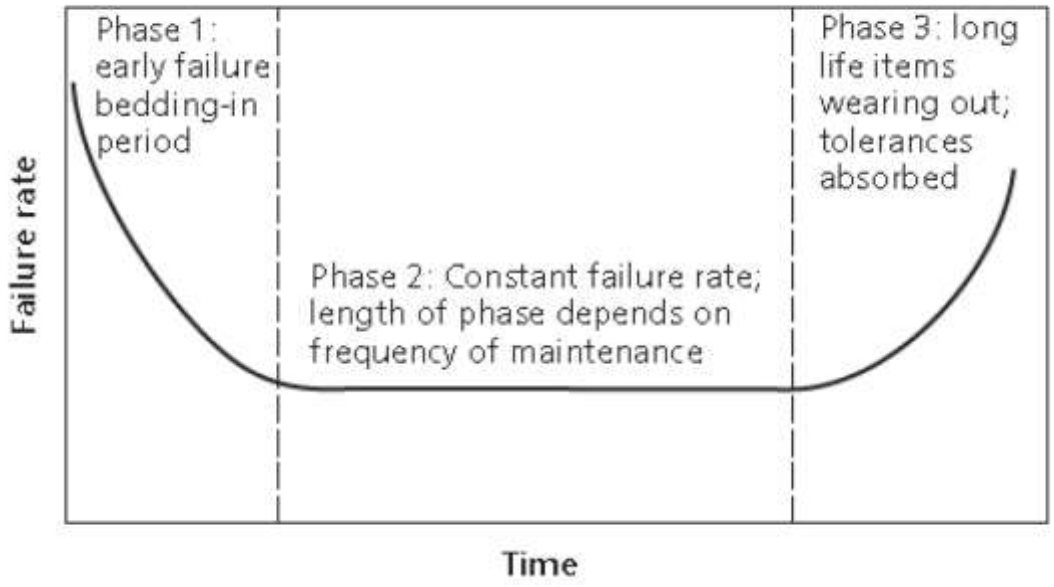

Figure 2 Phases of equipment life

In addition, consideration needs to be given to advice from control panel component manufacturers with respect to Mean Time to Failure (MTTF)

In a real case of a brake failure on a lift as a result of the lift driving through the brake, the contactor manufacturer had established a MTTF or number of operations the contactor could be expected to last as being 1 million operations.

The MTTF is established by testing a number of similar components until they fail and averaging the number of operations.

The location of the lift was a high-rise residential tower block of around 20 levels. With two lifts in the block and 6 dwellings on each landing mostly containing two persons it is not unreasonable to estimate that the lifts would have made 960 starts per day (6 x 2 x 4 x 20) or 480 starts each. This is based on a simple rule of thumb that every occupant did a return journey in the lift twice in a day but doesn't allow for the postman, milkman etc who may use the lift to stop at every floor.

On that basis of this rule of thumb the contactor could be expected to last 2,083 days or 5.7 years. In this case the control panel was around 20 years old and the contactor was thought to be the original but it does demonstrate that scheduled component replacement should be considered especially as control panels are expected to last between 10 and 15 years on average. Journey counters would be useful on all control panels to assist with a MTTF component replacement strategy.

6 REPEAT CALLOUTS

Repeat callouts can occur for many reasons including an intermittent fault that only raises its head every now and again either because of the nature of the defect or as a result of circumstances coming together to make the fault appear (a perfect storm).

To those affected by such a situation the fact that the fault is intermittent is annoying but also very real and as far as they are concerned they will see them as separate breakdowns because to them

they are whereas to an industry operative they might see it as one breakdown that took X number of visits to solve.

In one case the safety gear on a lift operated over 30 times in a year as a result of incorrect installation as the governor rope was run through rough cut holes cut in the guide brackets yet nobody from the contractor diagnosed the cause.

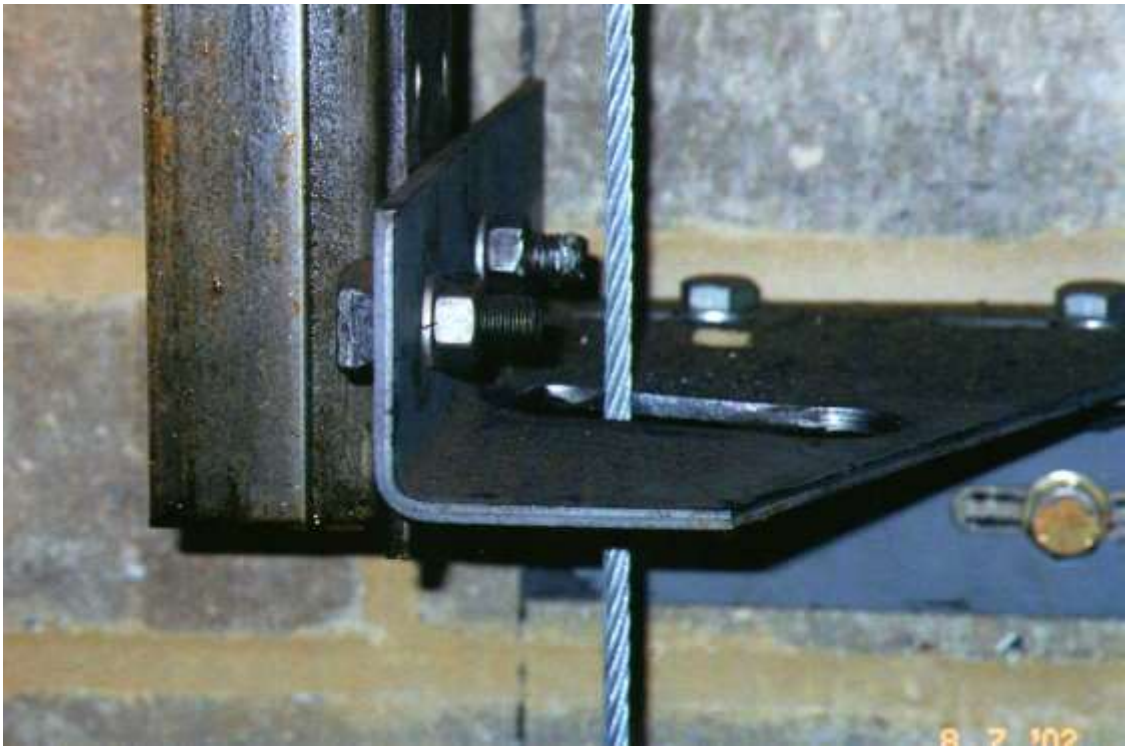

Figure 3 Incorrectly installed governor rope

7 WHAT IS A CALLOUT AND HOW SHOULD THEY BE CLASSIFIED?

Examples of different callouts (note callouts not breakdowns albeit some of the callouts can be deemed breakdowns) to lifts are tabulated below and the difference in claimed outcome can be seen.

Table 4 below is purely hypothetical and is intended to provoke debate.

Callout reason	Number of callouts	Possible claimants view on number of callouts	Possible defendants view on number of callouts
The lift was found to be on car preference and re-entered service immediately after this was removed.	5	5	0
The lift was found not to have been "working" because it has shut down in energy saving mode as it was deemed by the control system that the other lifts provided sufficient service	3	3	0
The lift had clipped a lock at the 3rd floor three days in succession but then restarted but the contractor had not been called.	3	3	1
The lift had clipped a lock at the 3rd floor three days in succession and the contractor had not been called on each occasion.	3	3	3
There had been a total power cut in the building	4	4	0
The safety edge had been vandalised	2	2	0
The lift had crash stopped in travel over a period of a month. It was found that there was a break in a trailing flex that intermittently dropped the safety circuit. On most occasions the lift restarted as the break remade and the fault wasn't diagnosed until the break became permanent.	5	5	1
A lamp in the lift car failed	3	3	0
Total		28	5

Table 4 Hypothetical Callout Table with possible different stances

The customer experience isn't good but it is far from being the fault of the lift itself.

8 ACTIONS WHEN BREAKDOWNS APPEAR EXCESSIVE

Even if it was agreed that four breakdowns a year were acceptable that shouldn't automatically initiate a programme of modernisation or replacement.

The maintenance contractor should review the contract and ask the following questions:

- Is the equipment installed appropriate for the location?
- What is the age of the equipment installed?

- Is the equipment installed obsolete?
- Are the breakdowns being caused by a single or multiple cause?
- Does the location suffer from misuse?
- Is the number of breakdowns high due to a single issue that hasn't been properly diagnosed or rectified?
- Is the maintenance operative suitably skilled for the task/equipment?
- Is technician support provided in an appropriate and timely manner?

Once an analysis has been undertaken the owner/operator should seek independent advice from a suitably qualified consultant to avoid a possible commercial bias from the contractor.

Following this the owner should ask the following questions:

- Is the maintenance contractor appropriate for the equipment installed?
- Is the maintenance operative suitably trained?
- Are breakdowns escalated to a more appropriate technician when required?
- Is the type of maintenance contract suitable for the location?
- Has an agreed causation of breakdown analysis been undertaken?
- Does the location suffer from misuse?
- How can the analysis and information be taken forward?

9 CONCLUSIONS

A standard X number of breakdowns per annum is not an appropriate way of measuring the need for modernisation or replacement.

It may however alert an owner and/or maintenance contractor to the fact that problems exist.

Over and above this:

- It might also be more appropriate to say "the acceptable number of breakdowns is X on the basis that appropriate equipment is installed"
- Discussion is required as to an appropriate level of breakdowns based on the locus.
- Reliability is just as important as a design based on traffic analysis
- Detailed reporting of breakdowns by the maintenance contractor is a must to allow adequate analysis to be undertaken.
- Tenants are seeing the opportunity to claim against contractors and/or building owners for poor lift performance.

It is the authors' opinion that only once a true picture of breakdowns versus callouts has been established that a discussion can be had as to whether modernisation or replacement are appropriate.

It is however important that an appropriate maintenance regime considering MTTF and undertaken by properly trained staff needs to be in place and be monitored. This should include staff being trained in how to complete log cards and maintenance records.

REFERENCES

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BIOGRAPHY

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David Cooper is the Managing Director 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. He holds a Master of Philosophy Degree following a 5-year research project into accidents on escalators, a Master of Science Degree in Lift Engineering as well as a Bachelor of Science Honours degree, Higher National Certificate and a Continuing Education Certificate in lift and escalator engineering. He is a co-author of "*The Elevator & Escalator Micropedia*" (1997) and "*Elevator & Escalator Accident Investigation & Litigation"*. (2002 & 2005) as well as being a contributor to a number of other books including CIBSE Guide D. He is a regular columnist in trade journals worldwide including Elevation, Elevator World and Elevatori. He has presented at a number of industry seminars worldwide including 2008 Elevcon (Thessaloniki), 2008 NAVTP (San Francisco),1999 LESA (Melbourne), 1999 CIBSE (Hong Kong), 1999 IAEE (London), 1998 (Zurich), 1997 CIBSE (Hong Kong), 1996 (Barcelona) and 1993 (Vienna) as well as numerous presentations within the UK. He is also a Founding Trustee of the UK's Lift Industry Charity which assists industry members and/or their families after an accident at work. In 2012 David was awarded the silver medal by CIBSE for services to the Institution. David Chairs the Charity that runs the Lift Symposium and is an Honorary Visiting Fellow at The University of Northampton.