



GUIDANCE

IN-SERVICE INSPECTION PROCEDURES

Number: MLCC 12

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Status: Issue 01.1

Date: 22/02/2021

Reference: Otis GeN2 Coated Steel Belts (CSB's)

SITUATION

GeN2 CSB's are designed to retain sufficient strength after being subjected to 12 million bends at their design rated load.

Typical lift starts in commercial premises working a 12 hour day, 5 day week for 52 weeks per year:

180 starts per hour for 3 hours per day (arrival and departure periods)

45 starts per hour for 9 hours per day (general working day)

This works out at just under 250,000 starts per year (245,700).

(Source of reference CIBSE Guide D Chapter 13)

GUIDANCE:

The worst case estimates for bends encountered per start by any section of belt is 3, from a lobby start (source of reference Otis). Assuming 80% of lift starts are from the lobby, then the worst case estimate for bends encountered by any section of belt over one year is:

$$250,000 \times 3 \times 80\% = 600,000$$

From bending fatigue tests carried out by Otis it was determined that the belt design life is 12 million bends. Using the typical utilisation figure given above this gives an estimated belt life of 20 years, for a typical lift in commercial premises.

(This is a conservative estimate and the majority of lifts will have less than 250,000 starts per year and less than 80% of starts from the lobby; but unless a lift is fitted with data logging equipment, or utilisation information can be obtained from the REM system, actual utilisation can only be estimated.)

GeN2 flat belt technology has now been in use for over 10 years and the indications to date, from the considerable data now gathered by the lift manufacturers, show the belts to be extremely durable with only a very small percentage having to be renewed due to deterioration of the internal steel cords.

Nevertheless, it is felt that there needs to be a point in time where a more detailed supplementary examination should be considered to assess the condition of the internal steel cords.

Consideration should be given to:-

- Estimated utilisation of the lift taking account of
 - Number of starts per year
 - Normal loading
- Environment
- General condition of the lift
- Frequency / quality of periodic maintenance
- Any other influencing factors

Note: From the 250,000 starts per year figure shown above, this would equate to, on average, one start every two minutes, working on a 24 hour day, 52 weeks a year. If we also take into account door opening/closing times and journey times, these figures are very conservative.

Whether one uses the 250,000 starts per year figure or the unit is fitted with a Pulse belt monitoring device, the following should always be taken into consideration:

- External condition of the belts
 - Signs of damage, degradation or unusual markings to the polyurethane surface. The surface of the belt should be smooth and uniform without nicks or wear spots.
- Evidence of belt stretch
 - Including reduced clearance under the counterbalance weight

Conclusion

Where a lift is not equipped with a fully functioning Pulse belt monitoring device, it is recommended that a supplementary test, to verify the integrity of the internal steel cords, will be required where it is considered that the lift has undertaken 1.25 million starts or has been in service for 10 years, whichever comes first. (1.25 million starts equates to 3 million bends, 25% of predicted life span.)

Where the competent person considers that a supplementary examination/test is required, their report of examination should clearly state the reason why and when the examination/test is required to be carried out.

Taking into account the practicality of carrying out supplementary testing without the correct monitoring equipment (non Otis lift contractor) it is more than likely that the lift owner will renew the belts when testing is called for after the ten year period.

Where a lift is equipped with a fully functioning Pulse belt monitoring device, then this can be utilised to determine the condition of the internal steel cords.

Information Sources

CIBSE Guide D Transportation systems in buildings

Otis Elevator Co Coated Belt Service Life