

EXPERIENCE WITH THE INSPECTION OF ELEVATORS IN HUNGARY

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ABSTRACT

After an historical introduction a Survey of the Hungarian elevator stock is given. The causes of accidents are discussed. It is noted that the maintenance of the Hungarian elevator stock has deteriorated, but the number of accidents has remained at the same level. The problem of operational supervision is debated. The paper presents some conclusions for future progress.

1 HISTORICAL BACKGROUND

In Hungary in the second half of the XIXth Century the large-scale economic development and industrialization stimulated by the Compromise of 1867 led to the increased installation of elevators. At first this equipment was furnished by foreign makers, but in 1890 elevator construction was started in Hungary. By the turn of the century at least a thousand elevators were in operation in Hungary. It thus became a necessity to establish technical safety inspections of this type of equipment.

Hungary had established at the end of the XIXth Century the technical supervisory function for elevators. Up to 1949 this has been carried out by members of the Engineers' chamber - (who had obtained certification as private individuals). At this date the State Control Organ for elevators was created, which has operated since 1965 under the supervision of EVM within the jurisdiction of EMI.

The elevator testing station of this Institute carries out the technical safety inspections of elevators and escalators operating in Hungary, according to the Regulations of the order of the Council of Ministers No. 12/1973.(V.15).

On the basis of reports and technical data collections submitted by the elevator experts the Institute has established a register of elevators and escalators, from installation to removal. The changes in the Technical condition of the equipment, the operating conditions, the occurrence of accidents and damage are recorded to minimise danger to life and property. Any shortcomings observed during control testing are summarized and the experiences gained from these data are utilized during the formulation of regulations. The main constructors and operators are regularly informed of these conclusions to prevent the occurrence of failures.

2 HUNGARIAN ELEVATOR STOCK

Some 24034 elevators and escalators are subject to the control of the Institute, as at 1st January 1987. Considering the industrialization and infrastructure of the country, this reflects a backwardness with respect to similarly developed neighbouring countries. The number of elevators per 1000 inhabitants is 2.28 in Hungary; 5.23 in Czechoslovakia, 6.00 in Bulgaria, 5.33 in Austria and 2.69 in the GDR. Therefore the equipment in Hungary, although located and operated under similar conditions is subjected to a much greater workload and the resulting deterioration is much larger than in other countries. About a third of the domestic elevators have been operating for more than 20 years, another third 10 to 20 years and only a third less than 10 years.

Considering the expected life of elevators is 20 years the elevators available in Hungary are somewhat worn out and their technical condition at 1st January 1987 is given in Table 1.

Technical condition	Number	National ratio %
Suitable	8,129	34
Due for renovation	15,905	66
Total	<u>24,034</u>	<u>100</u>
Including:		
Due for medium-scale renovation	8,804	37
Due for large-scale renovation	4,572	19
Due for full replacement	2,529	10
Total	<u>15,905</u>	<u>66</u>

Table 1 Technical Condition of Hungarian elevators.

It should be noted that elevators are considered in a suitable technical condition if they did not require replacement of any major component during the last control inspection.

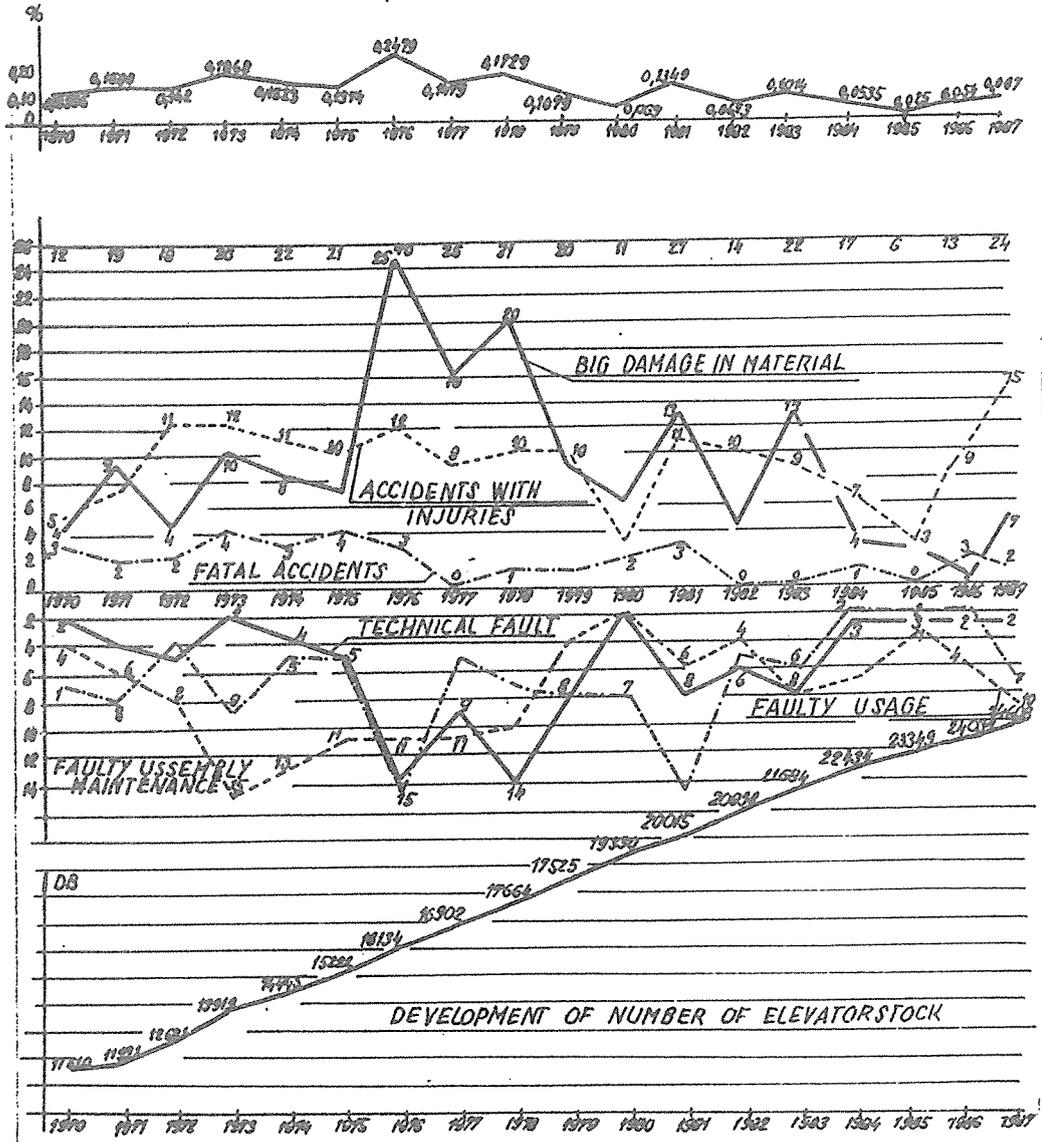
During the period 1971 to 1977 the technical condition of the Hungarian elevator stock showed improvement, partly due to the intensified investment and renovation activity at that time.

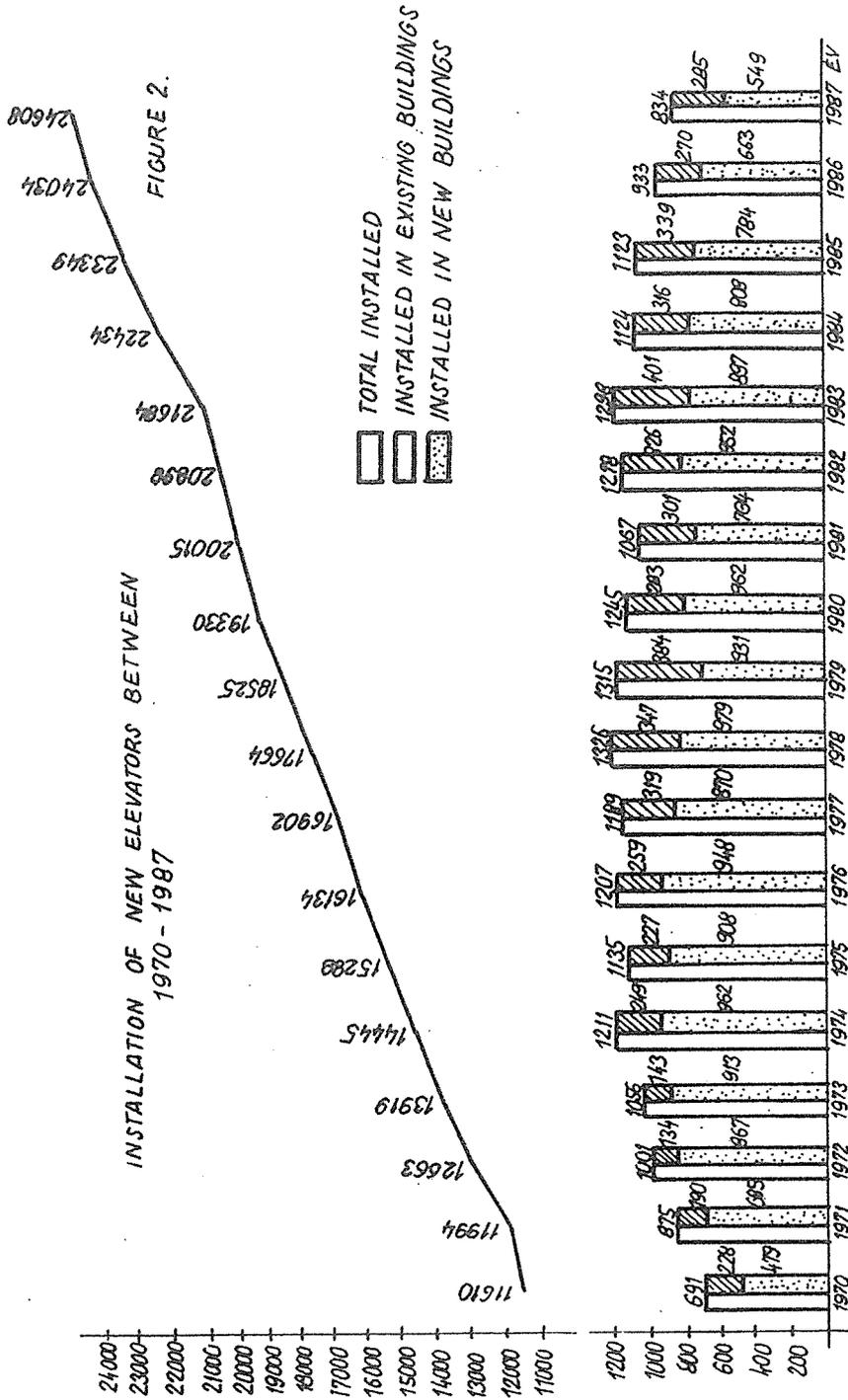
In the period above the number of elevators due for renovation reduced to 50% and those due for full replacement to 6-8% of the total stock.

The main consequence of the combined efforts of the industry (manufacturers, assemblers, maintenance and inspection personnel) resulted in the relative and absolute reduction of the number of accidents and damage per elevator (Figure 1).

FIGURE 1.

PERCENTUAL NUMBER OF EVENTS PER ELEVATOR
 (NUMBER OF EVENTS / NUMBER OF ELEVATORS · 100)





3 CAUSES OF ACCIDENTS

Studying the causes of accidents shows that the most frequent cause was incorrect use and not a technical defect. Many serious and fatal accidents were caused by incorrectly executed escapes or freeing of passengers from a stalled elevator car; by the careless use of elevators with no car doors; or by the improper use of circulating elevators (paternosters). About half of the fatal accidents occur with these circulating elevators. In spite of warnings they are used by handicapped persons or for the transportation of large objects, (crates, ladders etc.). Events due to technical defects are caused mostly by defects in the electrical safety contacts controlling the shaft door locks and in the locks themselves.

The Institute has succeeded in eliminating numerous typical defects and the number of accidents is less than in any other mass transportation facility. However, since human lives are at stake, it is important not to be satisfied with the results and it is necessary to reduce the number of accidents still further.

4 INADEQUATE MAINTENANCE

Unfortunately this relatively favourable period did not last long. Due to changes in the Hungarian economy the money available for maintenance or renovation of elevators was substantially reduced. This resulted in wear and deterioration of the technical condition and an increase in the proportion of the equipment due for renovation to two thirds of the total elevator stock. see Figure 4.

The replacement of the more than 2500 elevators over 30 years old, operating mostly in owner-occupied blocks of flats, has been an increasing problem for many years. Their owners are mainly old retired people on low incomes and they are unable to raise the costs of an elevator replacement. They must therefore pay unrealistically high costs for the inadequate operation of the equipment. It is fortunate that modern safety equipment and more effective inspections has prevented an increase in the number of accidents.

The greatest problem is due to the chronic lack of spare parts. The life span of more than 50% of the elevators is longer than the obligation of the producers to supply spare parts. However, even the supply of spare parts for products still in production is problematical. It frequently happens that a part has to be produced individually or taken from a disassembled unit. Sometimes the lack of cheap, rapidly worn-out parts causes a replacement of whole units, which could operate. This state of affairs could be mitigated by modifying the restrictions concerning the stock management of repair enterprises.

5 OPERATORS & CENTRAL SUPERVISION

In addition to the technical problems the former system of elevator operators - based on the house-porters - has practically ceased to exist. Caretakers not living in the block and the flat occupants will only temporarily undertake elevator operation for the ridiculously low operator's pay. Staff turnover is considerable: in 1986 13,735 elevator operators had to be trained and sent for examinations to operate 24,000 elevators. The lack of operator supervision permits its incorrect use. Use without supervision, increases the danger of accidents and accelerates the deterioration of the equipment. Many fatal or serious accidents to children happen because they play with the elevator. The most frequent accidents occur when a child is trapped in an elevator stuck during its travel and who panics, tries to escape and falls in the shaft or when climbing out is crushed when the car starts to move usually suffering fatal injuries.

In order to prevent such accidents the Institute experts have to shut down more than 1000

elevators each year. (See "Other causes" in Figure 3). This dangerous situation has been presented to the public through the mass media, and has brought some improvement, but the situation is still not satisfactory.

A solution could be the establishment of central elevator inspections (employed frequently abroad) where 2 or 3 persons, could supervise the operators of several hundred elevators with the aid of modern electronics.

In spite of these problems it is possible to conclude that the reliability of Hungarian elevators (the average yearly defect rate 4.8/elevator/year; average yearly idle time 2.12 days/elevator/year) may be better than in several neighbouring countries. This results may be ascribed to the Hungarian maintenance organisations' above average efforts.

6 NEW INSTALLATIONS

An important Authority activity of the Elevator Control is the commissioning tests of new elevators and escalators. In Hungary recently about 1000–1200 Elevators have been commissioned each year. Nearly one third of these have replaced elevators completely worn out in an old building. (See Figure 2.). More than 50% have been produced by the Ganz–Mavsg Elevator Factory and the rest by the Municipal Elevator Repair Enterprise, the Machine and Elevator Assembling Enterprise, the Vorosmarty & Agricultural Cooperative etc. The proportion of imported or cooperative produced high performance elevators is 5 to 10%. Surprisingly hydraulically driven elevators have gained ground and today represent 20% of new elevators. This proportion is expected to grow. Since investment has been restricted the number of elevators commissioned each year has fallen below 1000 units.

From practical experience the commissioning tests of 20 to 30% new elevators must be repeated owing to constructional defects, assembly or production defects, non-adherence to safety technical requirements viz:

- Defects of adjustment of suspension elements, armatures, shaft doors and their locking devices,
- Irregular operation of control equipment
- Incorrect electric installation, piping or device adjustment
- Negligent execution or omission of adjustment or preliminary operation.
- Non-appearance of competent persons to execute the test,
- Errors in shock-proof isolation, contamination of the equipment etc.

These inadequacies cause at least 1000–1500 lost working days per year.

Unsuccessful start-up is mostly due to negligent and unprofessional work on site, inexact adjustment and in-sufficient cooperation rather than a production defect.

7 TECHNICAL ADEQUACY

The quality of products produced in cooperation with a foreign partner is in every respect identical to the quality of similar products of large international firms. The microprocessor elevator control system developed by Villgep (Pecs) does not lag behind the most modern products. The production technology and technical level of elevators produced by the Ganz–Mavag Elevator

NUMBER OF CLOSING OF ELEVATORS BETWEEN 1970 - 1987

FIGURE 3.

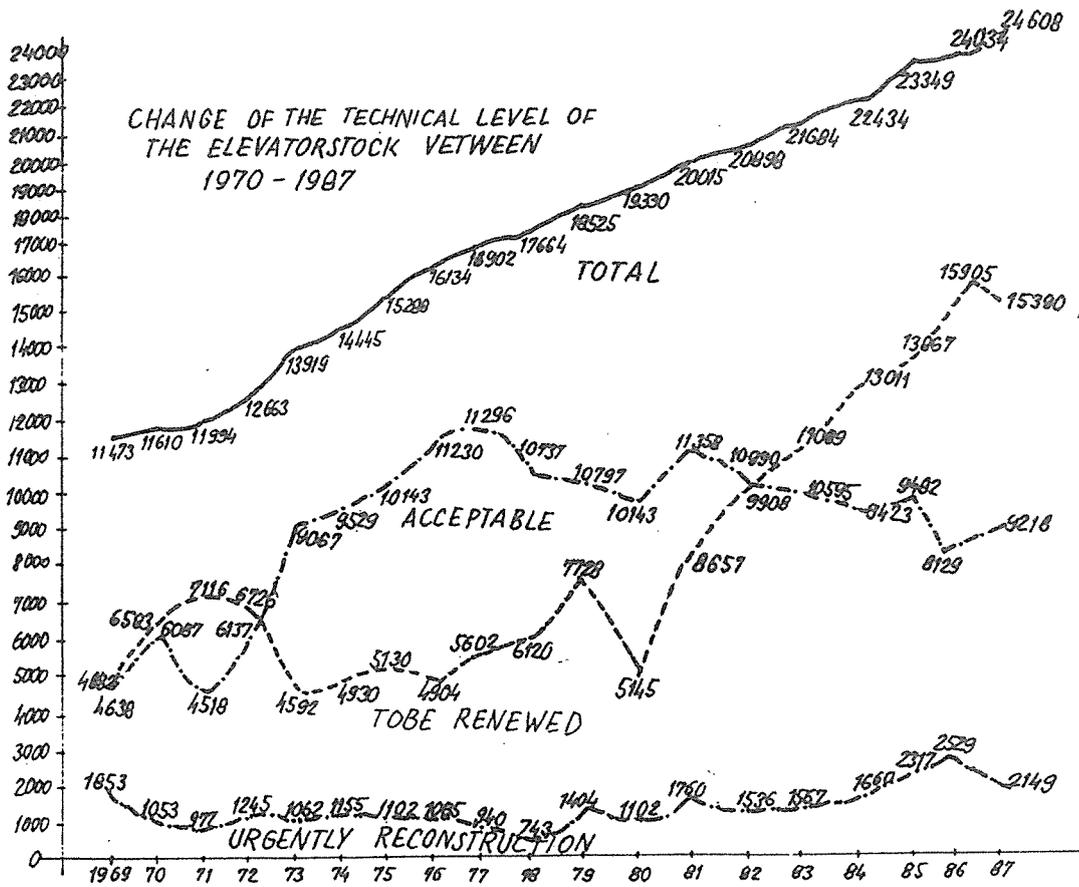
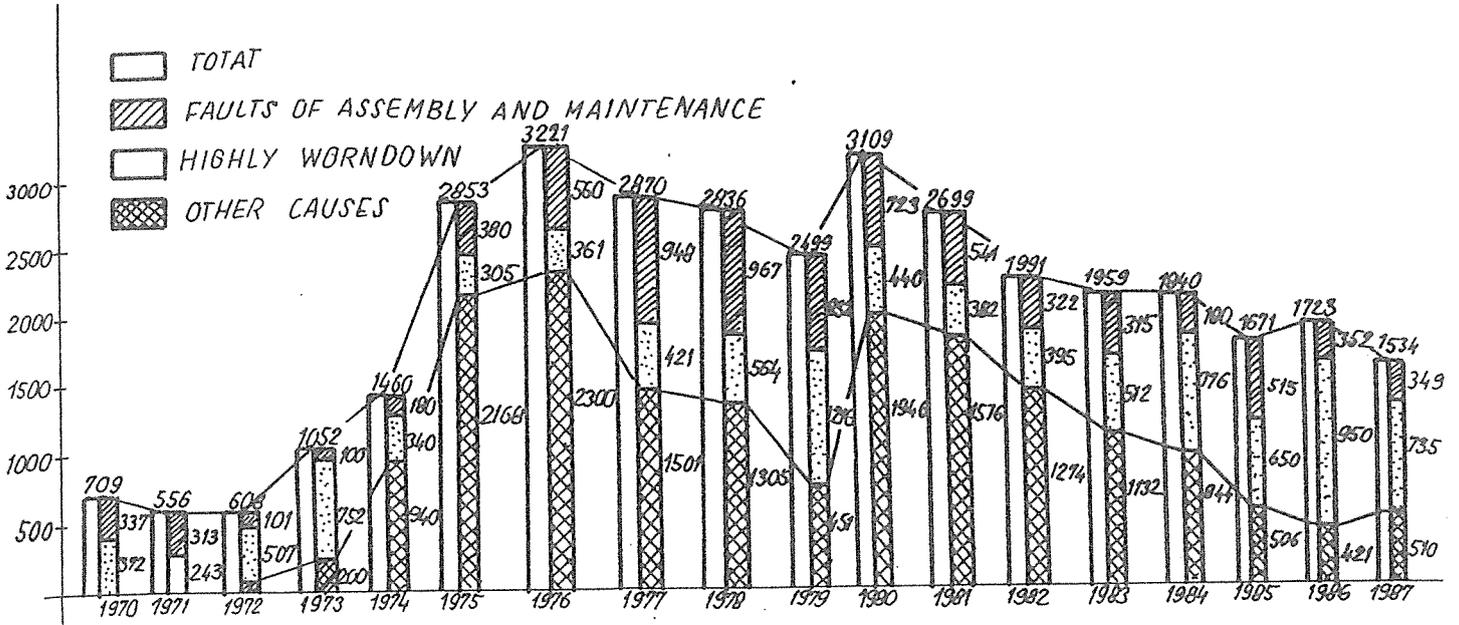


FIGURE 4.

Factory from a Schindler licence is identical, on average, with that of units produced in highly industrialized countries for similar apartment-house installations.

Unfortunately this cannot be said of the rest of our elevator products, although they are satisfactory from a safety technical point of view. Their construction and production requires modernization.

8 CONCLUSION

The following requirements should be satisfied (at least) in order to improve elevator production and protect safety of life and property:

- (1) The further deterioration of the elevator stock to the undesirable "dangerous operational state" should be prevented by every means. To this end the investment expenditures for renovation should be increased. In order to improve the supply of spare parts the regulations concerning stock management should be changed.
- (2) To reduce the overloading of elevators the transport performance of the equipment should be increased; this means a modification of the relevant OESZ regulations.
- (3) The operator control system (extremely important from the owner's point of view but breaking down because of social changes) should be replaced with modern service and dispatcher centres, which could each control and repair the defects of several hundreds of elevators.
- (4) The control organization should be modernised. The Quality Control of manufacturing organizations should be reinforced. In the case of dependable products the number and extent of on site tests could be considerably reduced by random laboratory testing with measuring instruments. This would increase the proportion of quality control operations carried out by the manufacturer and a corresponding proportion of the State organ's control capacity would be freed for higher level tasks.
- (5) A strengthening of the work discipline of the installation personnel by individual motivation and individual responsibilities.