

RESIDENTIAL LIFTS ('HOMELIFTS')
UK Experience and Standards

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1. INTRODUCTION

For many years the type of residential passenger lift installed in private family dwellings for use by elderly and/or infirm family members has been known in the UK as a 'homelift'.

Such usage merely required a light-duty, low-rise, slow-speed (eg 0.15m/s) lift, and, perhaps because of limited market demand, a fairly basic design was developed by the relatively small number of lift makers/installers who were interested in providing such lifts.

The demand for this type of lift increased as families were encouraged to keep their elderly/infirm relatives within the family environment, and homelifts were often installed at little or no cost to the family to make it easier for the elderly/infirm relatives to continue to be accommodated at the family home.

Due to concern over the quality of homelifts being installed a specific British Standard for powered homelifts was published in 1980 ie BS 5900.

In recent years the trend within the UK has been for elderly/infirm persons to be accommodated together for care and nursing within specialised residential establishments. These establishments are often known as nursing/residential care 'homes'; they are typically no more than 3 floors in height, and require lifts to be provided for use by residents, staff, visitors etc.

For various reasons, lift makers often made use of BS 5900 when installing lifts in these nursing/residential care homes, in spite of the fact that the duties to which such lifts are exposed are much greater than those experienced by homelifts in private family dwellings.

Subsequently, lift failures occurred in nursing/residential care homes which resulted in at least four fatalities to passengers.

2. BASIC DESIGN OF UK HOMELIFTS

The lightly-constructed lift car is supported by two roller-chains which run over chain-sprockets driven, via worm-reduction gears, by a braked electric motor (see Fig 1).

One end of each chain is connected to the car by means of a tee ('T') bar mechanism, (see Fig 2) which, because it is capable of tilting, is used to

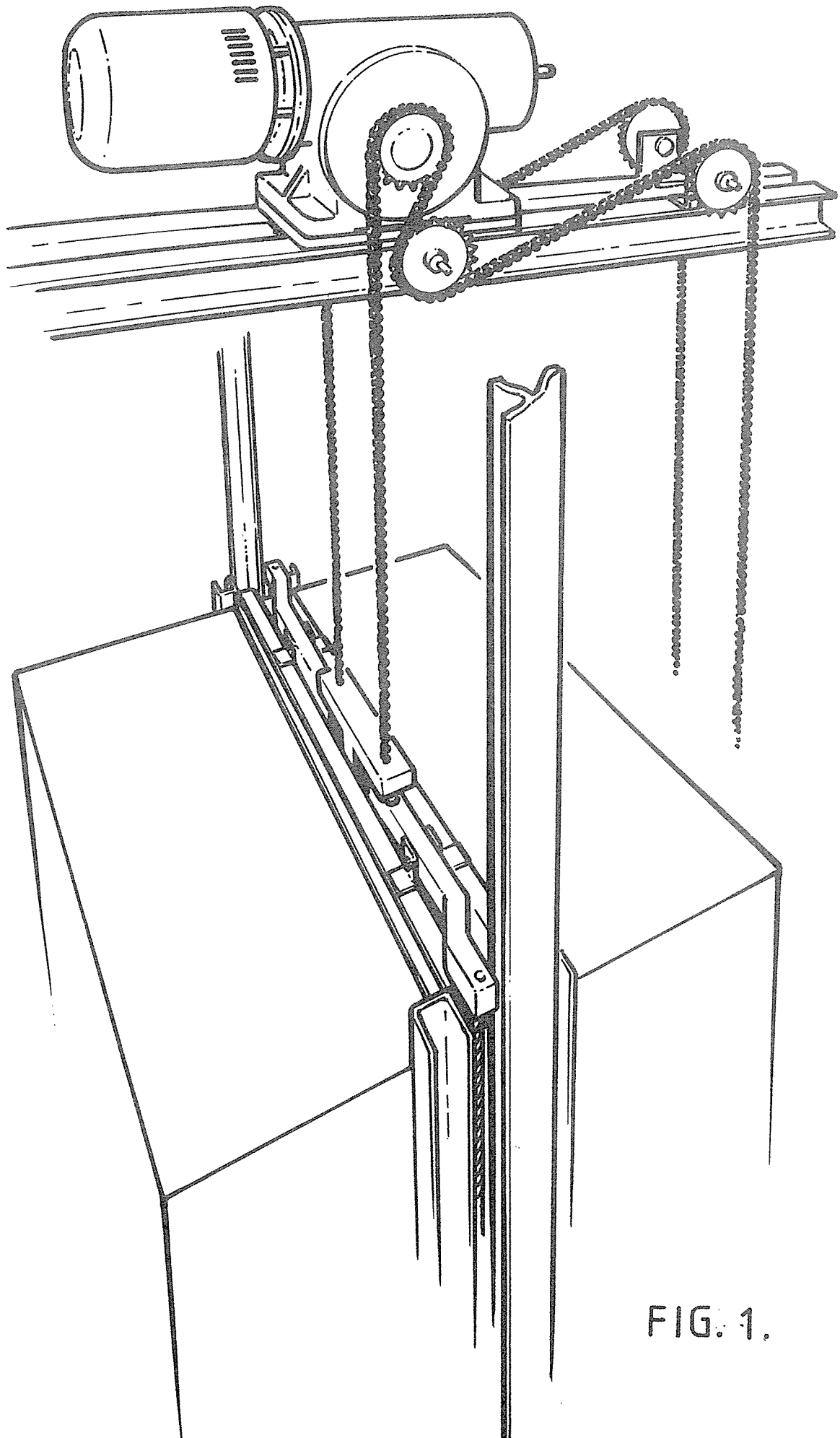


FIG. 1.

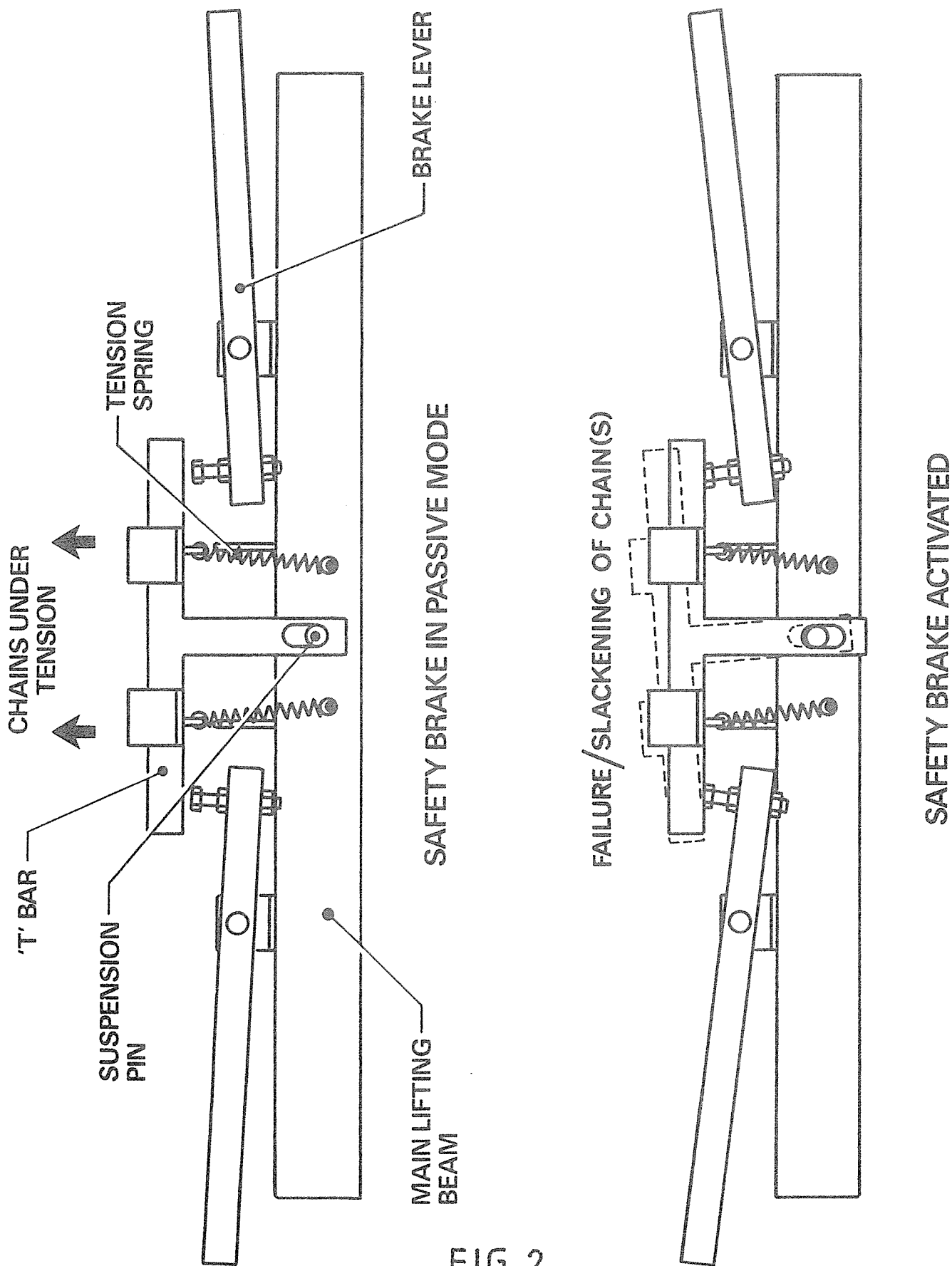


FIG. 2.

detect slack or broken chains and activate safety gears and slack-chain switches.

The free end of each chain hangs within the lift well, sometimes slightly tensioned by a small 'bobweight' and constrained within a rigid plastic tube.

The car is rarely counterweighted and overspeed governors are not provided. Safety-gears are of the instantaneous type and there are a number of design variations for safety gears and the guide-rails upon which they act.

In order to fit compactly and unobtrusively into a private dwelling, cars are often guided at one side, and well enclosure is not always provided at the lowermost landing. (see Fig 3).

In such circumstances, a pit is not normally provided and a pressure-sensitive device is attached to the underside of the car to stop the descending car immediately any obstruction is encountered.

3. LIFT ACCIDENTS AT NURSING/RESIDENTIAL CARE HOMES

The commonest cause of the serious accidents has been failure of a component part of the lift machine, ie the wormwheel of the worm-reduction gearbox. Consequently, as the lifts are uncounterweighted the cars have virtually descended in 'free-fall' with both suspension chains still sufficiently tensioned to prevent activation of the slack/broken chain safety gears.

Other accidents/incidents have been initiated by failure of slack-chain switches to cut off power to the motors when the uncounterweighted cars have been physically prevented from descending by some obstruction, misaligned guides, etc. Subsequently, the safety gears proved to be inadequate to prevent the cars plunging down the well when the obstructions were suddenly removed.

4. COMMENTARY ON LEGISLATION AND STANDARDS

The prevailing health and safety legislation and national standards for lifts were unable to prevent homelifts being manufactured, installed and used in places of work within the UK, eg nursing/care homes, hotels, etc.

Specific UK legislation for lifts is less detailed than legislation in some other countries, and it specifies general performance criteria to be achieved rather than specific requirements for detailed design and testing, etc.

British Standards for lifts are not mandatory, and a lift used in a nursing/care home might have been designed and installed in accordance with BS 5900, BS 2655 (predecessor of BS 5655/EN81), BS 5655 or it may have been

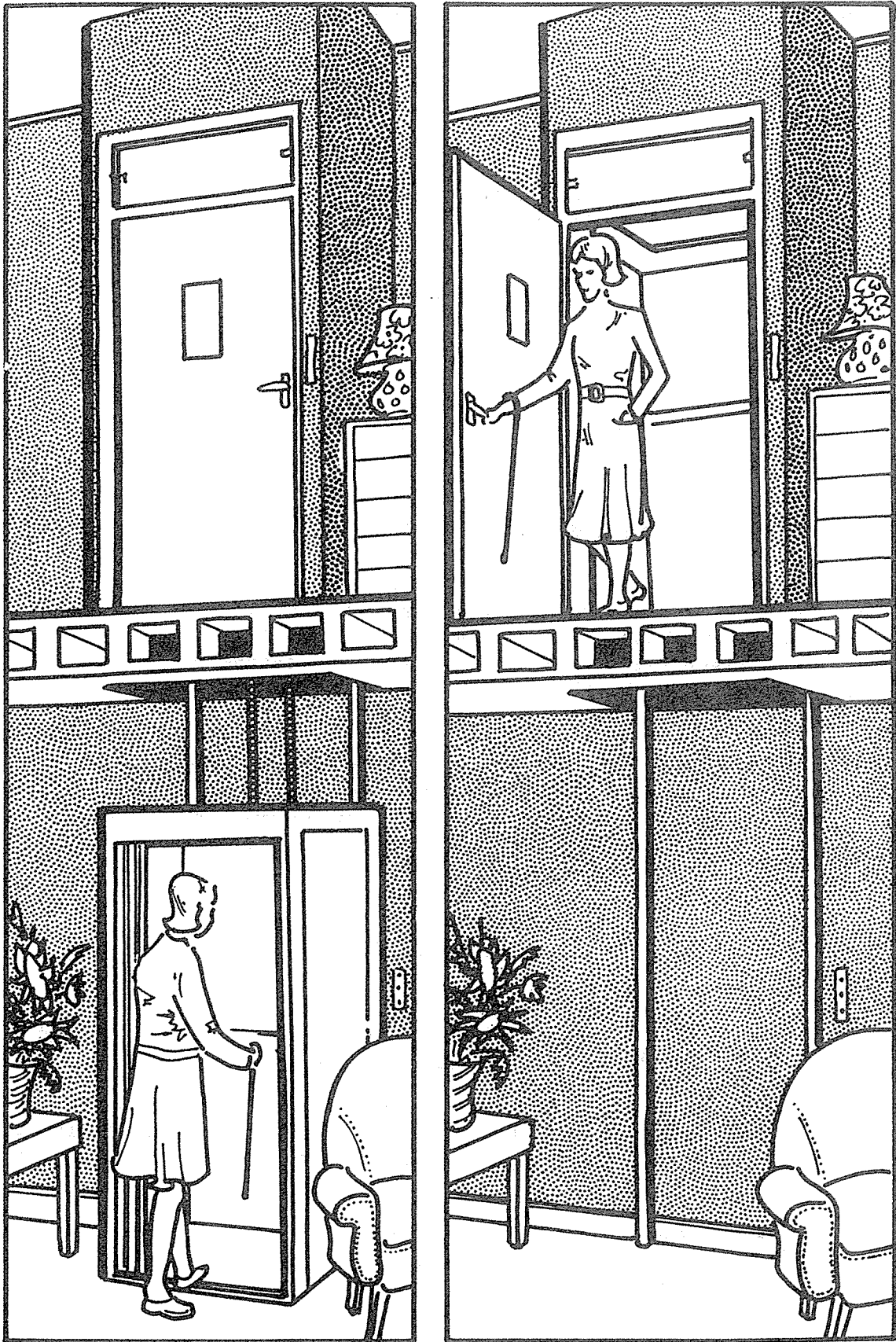


FIG. 3.

designed and installed with little or no reference to any current British Standards.

It is interesting that none of these Standards requires that only counterweighted lifts should be used for carrying passengers. They all include some reference to the use of positively-driven (chain/rope) lifts, and BS 2655 permitted car safety-gear to be activated by means other than an overspeed governor at certain lifts operating at speeds not exceeding 0.50m/s.

5. ACTION TAKEN WITHIN UK

A survey initiated by the Health and Safety Executive (HSE) established that these types of lift were sometimes merely assembled at nursing/care homes from components/equipment obtained separately from various suppliers, and assembly and installation were not always done by suitably experienced personnel. Very little research or testing of the overall design appeared to have been done, and functional testing of the whole or component parts of completed lift installations had rarely been undertaken.

The actual duties, loads and forces to which these types of lift were being subjected were often under-rated and/or not completely appreciated by those concerned with their design, manufacture and installation, etc. It seemed to have been wrongly assumed that these slow-speed, low-rise, low-capacity lifts did not merit the attention to design, etc, which would normally be anticipated for lifts installed elsewhere eg office or factory buildings, high-rise residential premises. In particular, such under-rating had serious consequences for some worm reduction gearboxes which suffered accelerated wear, leading to a complete failure in some instances.

Eventually a Specification was issued by HSE detailing safety requirements for passenger lifts already being used in nursing/residential care homes, and the Specification was publicised nationally by HSE.

The Specification was primarily intended to improve safety at lifts already installed, and dealt with five particular topics:- the installation; machinery and equipment; safeguards against uncovenanted descent of lift cars; testing; and periodic maintenance/thorough examination.

Suspect gearboxes were to be replaced, adequate safety gears had to be provided and the safety gear was required to be actuated by a device (eg an overspeed governor) capable of responding adequately to any failure of suspension, gearing, brakes, couplings or any other parts of the lift machine which might cause the lift car to descend uncontrollably.

The maximum tripping speed of any overspeed governor was limited to 0.35m/s, and functional testing of safety gears and associated actuating devices was required.

Enforcement of the requirements of the HSE Specification is carried out by national government/local government inspectors carrying out their duties under the Health and Safety at Work, etc Act 1974.

The British Standards' Institution (BSI) also reacted promptly to the situation and concluded the required amendment action to make it perfectly clear that BS 5900 only applied to lifts intended for use in private domestic premises.

BS 5655 would henceforth be the state-of-the-art Standard for lifts used anywhere else.

6 CURRENT POSITION

There is no doubt that safety at lifts used in nursing/care homes has been enhanced by the actions taken by HSE, BSI, enlightened lift owners/users, and responsible makers, installers and suppliers of lifts and lift components.

It would be incorrect to claim that all retrospective improvements to existing lifts have been completed, or that those completed are perfectly satisfactory.

New lifts being installed in nursing/care homes are generally of a higher quality and BS 5655 has clearly become the quoted Standard. It is interesting that a greater number of hydraulic lifts are now being specified and installed.

Complete conformity with BS 5655 requirements is not always possible, however, particularly as most lifts are scheduled for installation in existing buildings which have not previously contained a lift.

Type-tested components are not always being used, and it is not unknown for inexperienced/irresponsible lift suppliers to install components such as overspeed governors and associated safety gears which are incompatible, or which are individually incapable of functioning correctly.

7 CONCLUSIONS

It is unlikely that the situation and accidents described earlier would have occurred if lifts complying with the requirements of BS 5655 (EN 81) had been installed.

Also, it is possible that the accidents would have been prevented if these lifts had complied with BS 2655, which is now obsolescent.

These British Standards are not mandatory, and existing UK legislation relating specifically to lifts is limited in its content and application.

Although it is regrettable that this unfortunate situation was allowed to develop within the 'general' constraints of UK health and safety legislation, it should not be forgotten that guidelines for the design, manufacture and installation of safe lifts has existed within the UK - and the rest of the world - for many years past.

Regrettably, accidents sometimes have to occur before safety authorities, legislators, manufacturers' associations, inspection bodies etc, are again reminded that designers, makers, installers of lifts/lift components cannot always be relied upon to make proper use of available Standards, etc, or to become fully conversant with the aims of such Standards.