3rd Symposium on Lift and Escalator Technologies

# The revision of EN81-1 and EN81-2 to become EN81-20 and EN81-50

Ian Jones

Otis Ltd, Abbey Lane, Leicester, UK

**Abstract.** 1998 saw the last full edition of EN81-1/2 published in order to satisfy the requirements of the Lifts Directive. Since that date more than 400 experts in lift technology have been rewriting those two base standards and in 2014 that work will finally come to fruition with the publication of EN 81-20/50. This paper addresses the reasons for some of the changes, elaborates on the major differences to the new EN 81-20/50 standards from their EN 81-1/2 counterparts and outlines the implementation of these documents which are set to become the first global prescriptive standards for lifts.

## INTRODUCTION

When EN81-1 and EN81-2 were last subjected to a light revision it was due to the introduction of the Lifts Directive in 1998. At that time it was felt by all those involved that something much more in-depth would soon be needed since the standard was beginning to show signs of its age, due to being first published in the mid 1980's. Also at that time it was identified that two major amendments were needed to bring these standards up to what is commonly referred to as "state of the art" in the areas of programmable safety systems (PESSRAL) and machine room-less lifts (MRL's).

Since CEN rules only allow any standard to undergo such revisions three times before it has to be re-published under a new year reference it was decided to start work on the next versions of these standards in parallel to these amendments.

When the Machinery Directive was then revised, forcing the third and final amendment to EN81-1 and EN81-2 to remove lifts operating at speeds below 0,15 m/s and to include stopping and leveling accuracy, it was also decided to included provisions for the protection against uncontrolled movement with open doors.

This effectively sealed the fate of the two most widely used standards for lifts in the world (see Fig 1) and work was intensified on their replacements.

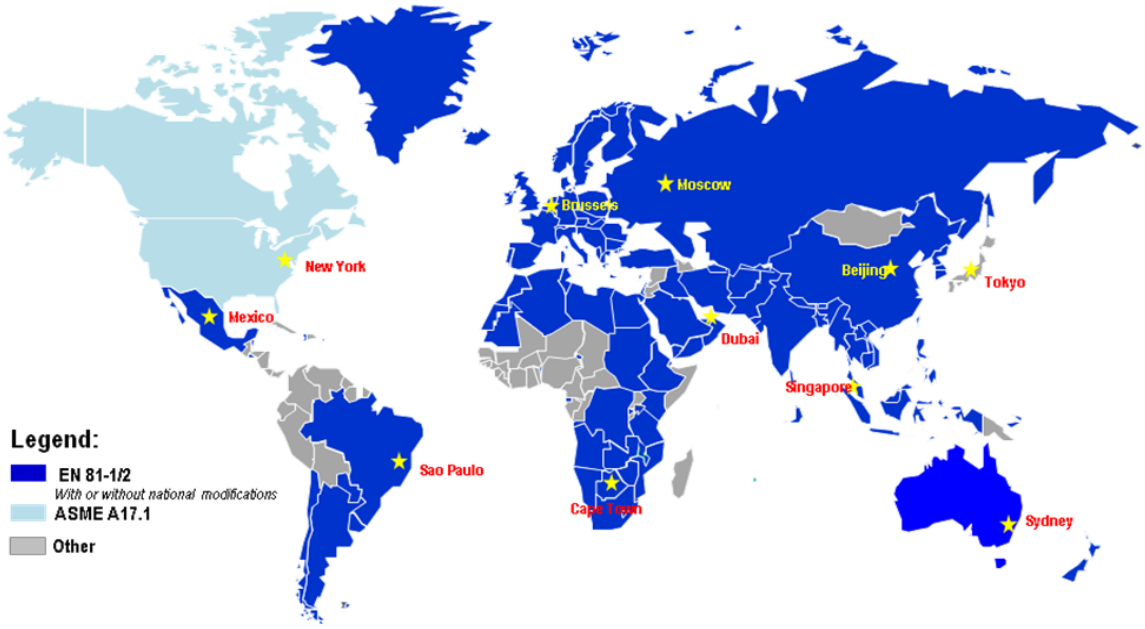


**Figure 1 –** Usage of EN81-1 and EN81-2 at global level

**PLANNING AND INPUT**

So how do you go about re-writing standards which are used not only within Europe but more widely around the world?
The answer is “very carefully!” and with a lot of planning.

The first task was to identify how the standards might look in the future and how to make them easier to work on. The result was the publication of TR81-10 which planned out the future of the whole EN81 series. (See Fig 2)

Therefore it was decided to combine EN81-1 and EN81-2 into a single new standard, EN81-20 and for sections involving validation of design by calculations, Type Testing, etc. to go into a new EN81-50.

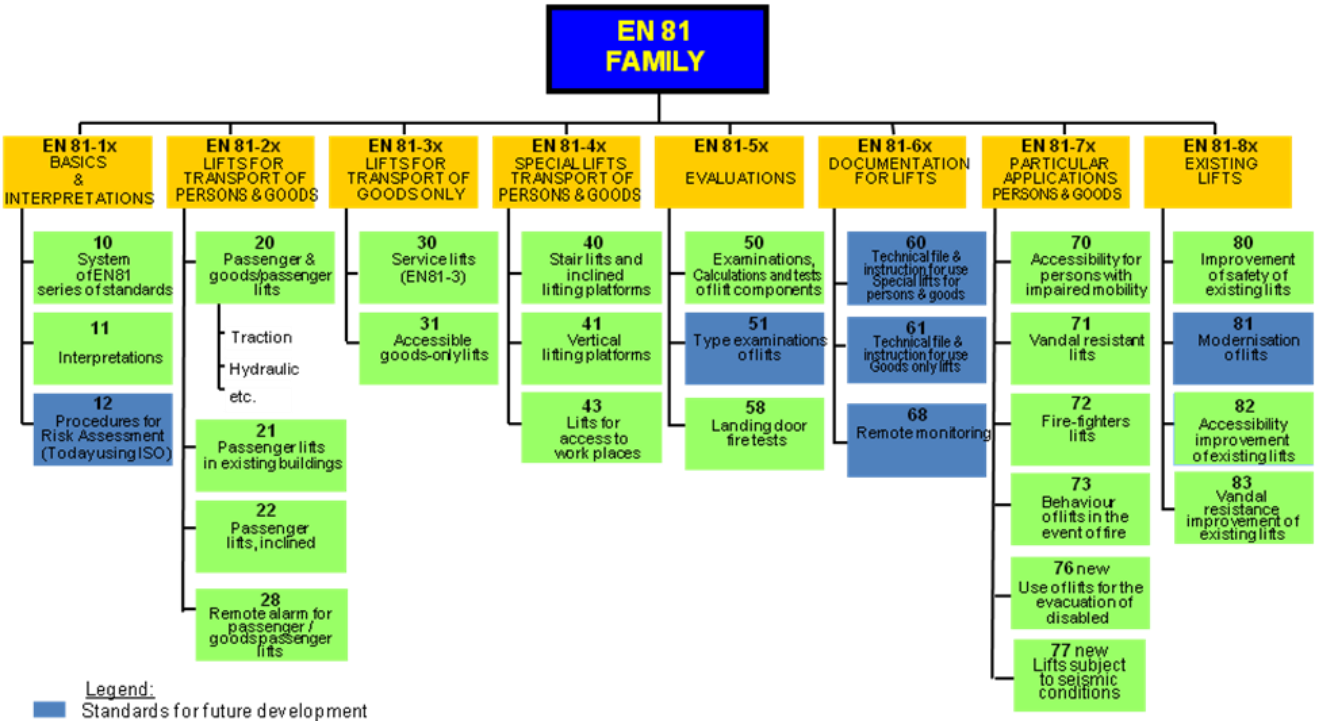


**Figure 2** – The new EN81 Series

After this was decided then the task of reviewing the inputs into any new standard began, which included for the first time any partner organization to CEN including those in the Far East who install more than 400,000 lifts to EN81 series codes every year. The full list of inputs can be seen in Figure 3.

Once these inputs were fully understood packages of work were assigned to 18 specialist teams to develop into firm proposals for inclusion into these new standards. In this way every single clause of the existing standard was considered and either confirmed or altered accordingly.
A total of more than 400 experts in lift technology have therefore been involved in the creation of these new standards.

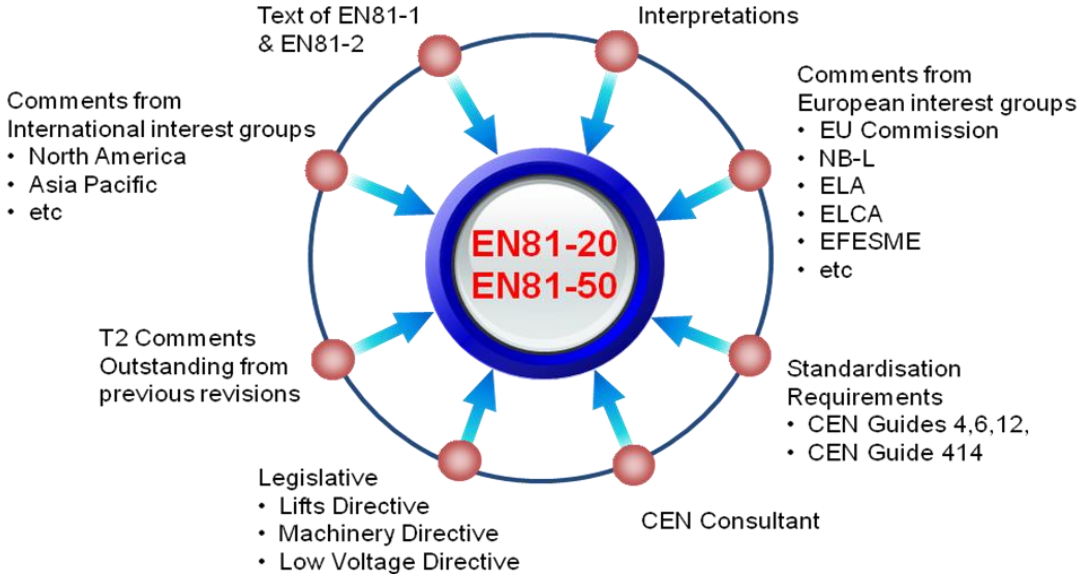


**Figure 3 –** Inputs to the revision

## MAJOR CHANGES

One of the most difficult things to change, but one which people have the most affinity with, is that of the numbering system. Anyone working with EN81-1/2 for any length of time will start to learn specific clause references and so the documents become embedded in memory.
Due to the requirements of new CEN rules all new standards must be drafted in a common way, which results in all technical clauses being encompassed within Clause 5. Therefore every clause in the existing standards now has a new number which might extend to six digits. e.g. **5.1.2.3.4.5**

Whilst it is impossible to give all of the changes made to these documents in such a short presentation, some of the major changes and their rational are described below.

**The Well.** A review of the requirements for this area has led to several changes having far reaching implications on installation design.

a) The ventilation of the well is now considered as an architectural issue rather than a concern of the lift designer. This is due to many changes throughout Europe's building regulations with the result that statements about well ventilation become meaningless in certain countries. The manufacturer will have to give details of the heat output of the lift installation to the building designer.

b) The strength of materials used to construct the well has been altered to give limits to permanent and elastic deformation under defined forces. At the same time lift wells made of glass must be of laminate material throughout their full height to protect from breakage of panels.

c) Where lift cars are not required to have balustrades on the car roof to protect from falling there must be no ledges greater than 150 mm in order to prevent maintenance engineers and inspection persons stepping off the car.

d) The option to use a solid pier under a counterweight to protect accessible spaces below the well is now deleted.

e) Pits deeper than 2.5 m must have an access door at the base of the pit. Access ladders to pits less than 2.5 m are now fully defined in EN81-20.

f) Counterweight screens are redefined in strength and to prevent access from behind, whilst still allowing inspection to take place. They must have a label indicating the design clearances under the buffer to ensure correct adjustment and re-roping.

g) Pits are to be fitted with inspection control stations to allow engineers in the pit to have full control of the lift in order to maintain equipment mounted under the car, such as safety gear, guide shoes, etc.

h) Refuge spaces above and below the car are redefined (see **Table 1**);

- There must be one refuge space for each person working in that area.
- Refuge spaces are defined as standing, crouching and laying positions with signs stating which is provided.
- All refuges spaces in the same area must be of the same type

– All refuge spaces are increase in size from EN81-1/2

i) Lighting requirements remain at EN81-1/2 levels with the exception of ambient lighting in scenic well no longer to be allowed to contribute to the well lighting. There is an addition of an emergency light on the car roof.

| Type | Posture | Pictogram | Horizontal dimensions of the refuge space (m x m) | Height of the refuge space (m) |
|---|---|---|---|---|
| 1 | Standing |  | 0,40 x 0,50 | 2,00 |
| 2 | Crouching |  | 0,50 x 0,70 | 1,00 |
| 3 | Laying |  | 0,70 x 1,00 | 0,50 |
| ①: Black colour ②: Yellow colour ③: Black colour | | | | |

**Table 1** – Refuge space dimensions and pictograms

**Machinery Spaces.** Whilst this area underwent a complete revision in 2006 with the introduction of MRL technology some changes have been made to reflect the state of the art. This includes improved provision for access to these spaces and light levels in pulley rooms and at emergency and test panels.

Clear heights of entrances to these areas and the working space within have been altered to 2.0 m and 2.1 m respectively.

Where working areas in the well are from the car roof and blocking devices are employed to prevent car movement, then there must be a permanent means of escape to prevent engineers from becoming trapped in these areas.

Sprinklers are now allowed in the well, but before they discharge the lift must be sent to the main exit level and the lift parked with the doors open.

Access to working areas is now allowed via private premises on agreement with the building owner concerning provision of access for maintenance and rescue. This however may be subject to National Regulation which requires access always via public areas.

**Entrances (Car and Landing)**. One of the largest changes has been that made to the car and landing doors. These have now been increased in strength and door retainers added to improve integrity under impact conditions. To this effect all doors, not only those made of glass must be subject to pendulum testing with increased impacts from those in EN81-1/2.
After such testing the doors must be within certain defined limits regarding permanent deformation.

Glass doors are now to be provided with increased protection for the "drawing in" of children's hands. This includes reduced clearances over the lifetime of the doors and limitation of opening force from the door operator.

All power doors must be fitted with non-contact protection devices, which when not able to detect persons must either reduce the door impact force or take the lift out of service.

New limitations have been placed on the height of the unlocking mechanism to avoid persons falling into the well whilst trying to unlock and open doors at the same time.

All car doors are now to be fitted with a "restrictor" which prevents opening from inside the car by more than 50 mm when outside the unlocking zone.

**Lift Car.** The measurement of the floor area at the lift car entrances has been re-defined in terms of overall car floor area. This to bring consistency with ISO 4190 car dimensions.
In addition the materials used inside the car are now subject to fire rating classifications and decorative mirrors are to be made from safety glass. Cars are to have increased normal use lux lighting levels and a defined emergency lighting level.

The requirements concerning loading devices which enter the car to load and unload the lifts, but do not travel with it have been clarified in order to ensure safety under overload conditions.

Outside the car there are new requirements for the strength of the car apron and car roof balustrade, whilst all car roofs must not be provide with a toe board to help protect against objects falling from the car roof.

**Suspension Systems**. Whilst there have been some minor changes the inclusion of suspension systems other than conventional wire rope is to take place at the first revision of EN81-20.

**Safety Gear, governors, buffers and UCM.** A decision was taken by the working groups not to make sweeping changes to the requirements of type tested components since these were seen throughout the world as being sufficiently effective. However two items have been include in order to clarify existing requirements.

a) The speed governor must activate the safety gear within 250mm of downwards movement of the car or counterweight. This is in order to ensure that the speed of the lift is not beyond the capacity of the safety gear if the governor misses its first engagement point.

b) A limit of 6g has been placed upon the peak deceleration of buffers at time intervals less than 0.04 s to restrict manufacturers to reasonable levels. This since the effect of high deceleration at short time intervals has never been studied.

Type testing of UCM means at component level, rather than complete systems, is now allowed and the provision for lifts without means of re-levelling clarified.

**Lift Machine.** Little has changed here for conventional lifts (non MRL) with the exception that it must now be possible to check each brake set, from outside the well, for failure in order to ensure the lift is able to be slowed and stopped with one set inoperative.

The requirements for emergency operations have been reviews with the following results;

- The brake must be able to be released manually from outside the well even under failure of the main power supply.
- With brake open and car loaded to +/- 10% of balanced rated load the car must move under gravity or by manual means or electromechanical means with backup supply, available at site.
- If the manual effort to move the car with +/- 10% of balanced rated load greater than 150N then electromechanical means with backup supply, available at site to be provided.

**Electric installations and appliances**. One of the main areas of the standards to be completely overhauled is that of the electrical installation, which has not changed in any substantive way since the mid 1980's. Whilst PESSRAL systems were added in 2006, the rest of the electrical systems remained unaltered.

This has changed dramatically with the introduction of EN81-20 which now requires the installation to be in conformity with EN 60204-1. This means some areas of the existing standards have been removed from EN81-20 since it is not allowed to repeat the content of another EN standard.
Other areas have been added, such as requirements for RCD protection, protection from heat emitting components and the requirements of other EN standards for basic electrical protection and the design and use of contactors, etc.

**Controls**. The following requirements have been added/amended;

- New requirements for control buttons for the inspection stations (run button, button marking and colour, etc.)
- New requirements for protection of maintenance operations
- New requirements to reduce speed under inspection control when less than 2m clearance.
- New requirements for landing and car door by-pass

**Other Modifications, Additions and Deletions.**

- Annex E (NEW) Building Interfaces
  New informative annex for building interfaces including support of loads on structure, guide rails and ventilation
- Annex F (NEW) Pit Ladder
  New requirements for pit access ladders
- Annex G Proof of guide rails
  Calculations modified/corrected, some examples deleted

- Annex K to EN81-1 Top clearances for traction drive lifts (Traction)
  Deleted
- Annex K to EN81-2 Calculations of rams, cylinders, rigid pipes and fittings (Hydraulic)
  Calculations modified/corrected
- Annex L to EN81-1 Necessary buffer stroke (Traction)
  Deleted
- Annex M to EN81-1 Traction evaluation (Traction)
  Calculations modified/corrected
- Annex N to EN81-1 Evaluation of safety factor for suspension ropes (Traction)
  Calculations modified/corrected

**PUBLIC ENQUIRY**

One of the most impressive statistics of the creation of EN81-20 and EN81-50 is that found within the Public Enquiry stage. During this period all National Standards Bodies in Europe and those partner organizations (of which there are 18 countries represented) were encouraged to make comments on these new proposals.

What was something of a surprise to the drafting committee was the seriousness with which this process was carried out by those organisations, reflecting the importance they place on these documents.

After all comments had been received, sorted and verified a total of 4200 comments had been made, the majority of which were against EN81-20.
The resolution of these comments has taken more than a year to complete, with the result of a much better standard, more easily understood and, hopefully, acceptable to all involved.

These final documents were submitted to the CEN Formal Vote process in July 2013.

**FORMAL VOTE AND IMPLEMENTATION**

The next stages are for the main TC10 committee to accept the documents and then transmit it to CEN. Once received they will dispatch them to various consultants, such as those for machinery, noise, etc for review before translation into the French and German versions.

Once available these are then transmitted to the National Standards Bodies in Europe for formal acceptance. Whilst those outside of Europe have no vote during this process countries such as China have already stated their intension to adopt them as their National Standards when finally published.

This Final publication is scheduled to be no later than September 2014.

Once published there will be a period of duality between the new and old standards, with both being acceptable as a means of satisfying the Lifts Directive until September 2017, when EN81-1 and EN81-2 will be formally withdrawn. (See **Fig 4**)

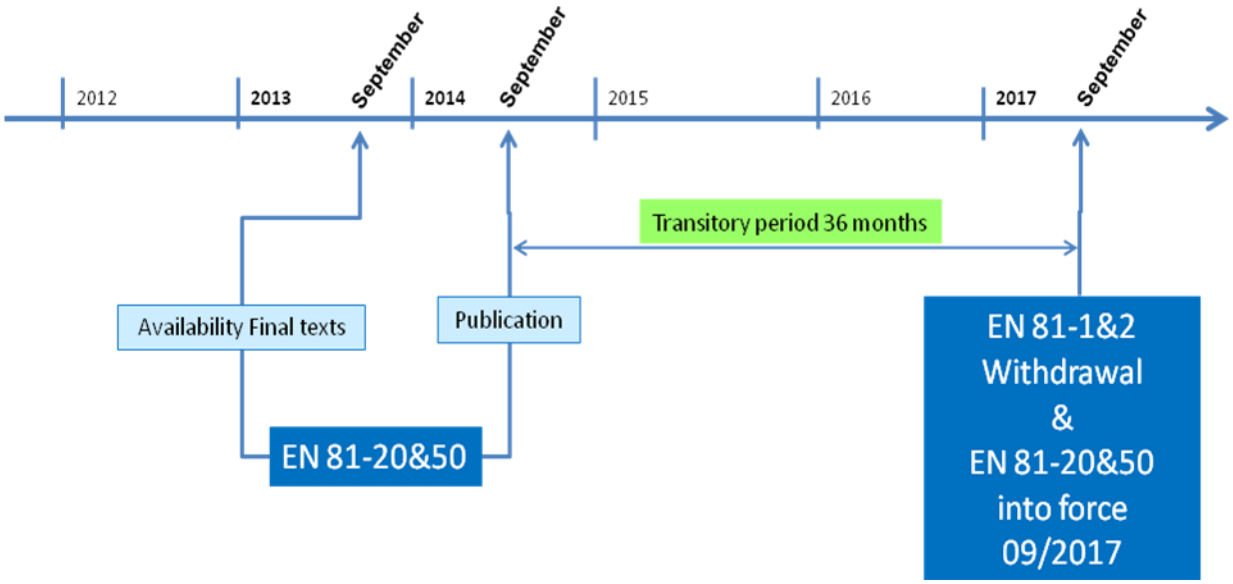


**Figure 4** – Project Timescale

The final retirement of these stalwart standards of our industry will be a bitter-sweet day for CEN/TC10/WG1, the committee responsible for their creation, amendment, interpretation and finally their replacement.

We can only hope that these new standards are held with equal high regard as those existing, by all the countries that today rely on EN81-1 and EN81-2 for provision of a globally acceptable level of safety.