On the rise: Lifts as per the Machinery Directive

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This article deals with the EU Machinery Directive – 2006/42/EC. As its name implies, the Machinery Directive is applicable to all kinds of machines and, as such, covers a broader scope than the Lifts Directive.

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The Machinery Directive (2006/42/EC) amended the Lifts Directive (95/16/EC) primarily in regard to its range of applicability (Article 24). This modification provided clarification as to which directive is applicable for passenger lifts traveling at speeds of $v \leq 0.15$ m/s. This distinction in the regulations and demographic change in society have lent new momentum to the elevator industry. This initiated an entirely new market for lifts operating at low speeds, ascending only a few stories, of an identical safety level – in private residences, smaller office buildings, administrative buildings, hotels, and many more.

1 Demographic developments

In the period between 1980 and 2002, average life expectancy in Germany rose from 69.9 to 75.6 years among men and from 76.7 to 81.3 years for women. Globally, life expectancy has risen at a constant rate – about 2.3 years per decade – the past 160 years. There is no indication that this will change in the near future. Viewed in combination with the fact that the birth rate has been declining for years now, the average age in the European Union will have risen by ten years by the year 2050. Whereas about 20 % are more than 60 years of age at the present, UN figures show that this will be 34.5 % in 2050. A large share of these seniors will want to stay in familiar surroundings, remaining in their own homes instead of moving to senior citizens' housing or assisted living facilities.

A conglomerate of project partners, promoted by the European Commission and including the CEN and the ELA, drafted the guideline entitled Build for All [1] with the objective of achieving barrier-free accessibility. This document was presented for public discussion in 2006 and is in the meantime available in various languages (English, French, German, Italian, Polish and Spanish).

Persons suffering from handicaps, older people and people whose mobility is temporarily restricted account for about 40% of Europe's population. This circle of individuals accounts for a significant share of the population but has not been properly considered in the past. Barrier-free accessibility to buildings is intended to ensure safe and efficient use of the building. Thus no building with more than a single floor should be constructed without including a lift.

Table 1: Differences between the Lifts Directive and the Machinery Directive

	Lifts Directive 95/16/EC	Machinery Directive 2006/42/EC
Type and details	Often described in detail by way of harmonized standards	Harmonized standards now being developed; will not be used so frequently since only a few are in existence
Conformity evaluation	Carried out by notified bodies	Effected at the manufacturer's own responsibility; type approval test is optional
Registering/ recording of the lifts in Germany	Responsibility of the operator: Most lifts become known as a result of inspections carried out by notified bodies	Responsibility of the operator
Inspection intervals in Germany	Up to 24 months	Up to 48 months
Passenger release and rescue in Germany	Remote emergency call system	Responsibility of the operator

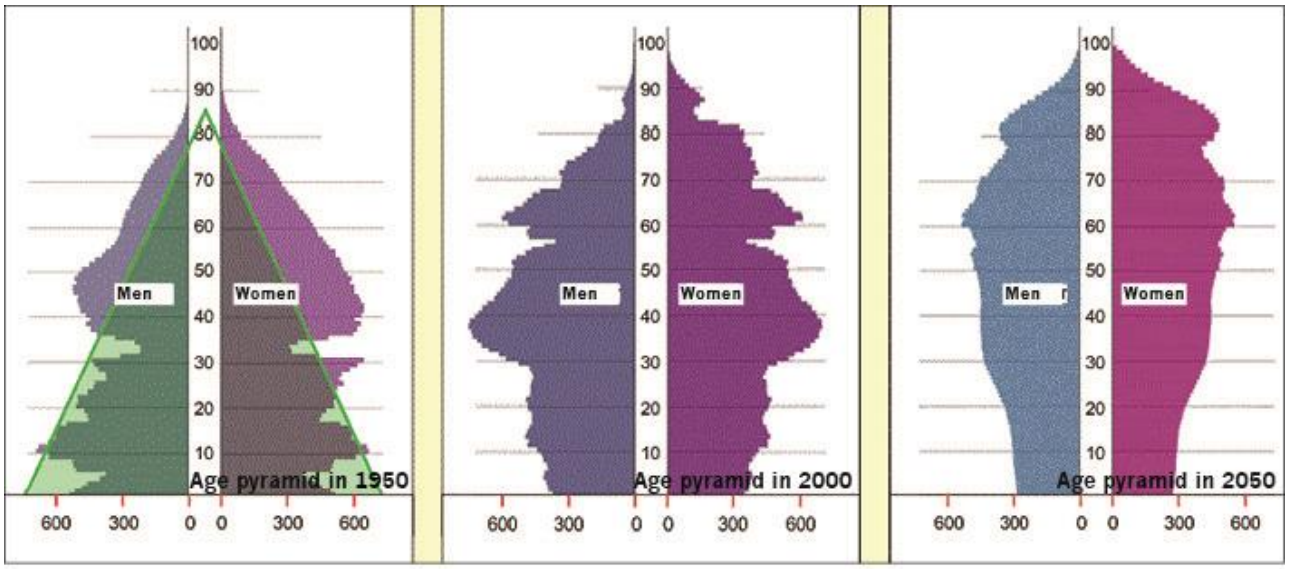

Figure 1: Age pyramids

Various studies and their conclusions are supposed to spark public awareness and give impetus to the technical world, encouraging it to work out new guidelines and standards governing the development of new products.

The rise in the age of the population will cause a significant increase in the market share for lifts built in accordance with the Machinery Directive.

2 Legal background

The Lifts Directive – 95/16/EC – went into force on July 1, 1999, and from that time onward was applicable for passenger and freight lifts in regular service in buildings and structures. The Machinery Directive – 2006/42/EC, which was introduced on December 29, 2009, modified Article 24 of the Lifts Directive to the extent that the latter was, as of that point in time, only applicable to lifts operating at v > 0.15 m/s.

These two directives are intended to guarantee that users and maintenance personnel can use the lift safely. In addition, it is also necessary to ensure that freight cannot be damaged. To achieve this, the ele-vator industry demanded that a new safety standard be developed, since the EN 81-41 standard did not cover all the factors involved when engineering a lift of this type in accordance with the Machinery Directive. There are, however, distinct distinctions between the Lifts Directive (95/16/EC) and the Machinery Directive (2006/42/EC) in regard to commissioning, marketing and safety evaluations (risk appraisal).

The Lifts Directive is better adapted to the specifics of an lifts than is the Machinery Directive which, as the name says, is applicable to all moving machines. If, for example, elevators as per the Machinery Directive convey persons and the fall distance exceeds 3 meters, then this is a so-called “Annex IV Machine” (type approval test). It may be marketed with the collaboration of a notified body as per the Machinery Directive.

3 Safety level

If these standards are adhered to in their entirety, then it may be assumed that the applicable directives have also been satisfied (see table 2 and table 3) (presumption of conformity).

Table 2: Digest of the harmonized standards as per the Lifts Directive	
DIN EN 81-1:2010-06	Electric lifts
DIN EN 81-2:2010-08	Hydraulic lifts
DIN EN 81-21:2010-01	New passenger and goods passenger lifts in existing buildings
DIN EN 81-28:2003-11	Remote alarms on passenger and goods passenger lifts
DIN EN 81-70:2005-09	Accessibility to lifts for persons including persons with disability
DIN EN 81-71:2007-08	Vandal resistant lifts
DIN EN 81-72:2003-11	Firefighters' lifts
DIN EN 81-73:2005-08	Behavior of lifts in the event of fire

Table 3: Digest of the harmonized standards as per the Machinery Directive	
DIN EN 81-3:2011-06	Electric and hydraulic service lifts
DIN EN 81-31:2010-06	Accessible goods-only lifts
DIN EN 81-40:2009-06	Stairlifts and inclined lifting platforms intended for persons with impaired mobility
DIN EN 81-41:2011-06	Vertical lifting platforms intended for use by persons with impaired mobility
DIN EN 81-43:2010-06	Lifts for cranes

4 Safety inspections

Almost 700,000 lifts are in place in Germany and of these about 250,000 were not inspected in the year 2011. The number of inspections falls continuously, while the number of elevators exhibiting deficiencies rises.

Lifts have to be inspected both as working equipment and as equipment requiring special surveillance (two distinct sets of rules apply here). Required here are the initial inspection, recurring inspections, inspections after modifications and repairs, and inspections following extraordinary events. As a rule, the inspections for working equipment are carried out by a qualified person and those for systems requiring special surveillance are conducted by an authorized inspection agency.

Introducing the Ordinance on Industrial Safety and Health brought about a significant change in how lifts were dealt with. If these are systems that require special surveillance, then the operator bears responsibility. The operator must determine the inspection intervals, doing so by way of a safety evaluation (risk assessment). In regard to working equipment, this determination can also be made within the course of a risk assessment. This safety evaluation makes it possible to determine the degree of hazard to which users and maintenance and inspection personal are exposed. Where applicable, measures for compliance with the state of the art may be derived.

Since the operator bears responsibility, work on such systems should be carried out only by competent ser-vice companies and not (as is currently the case) in part by "private" operators.

The construction regulations, given in Table 5, are applicable in recurring inspections.

5 Accidents

The inspection organizations have observed – in recent years and in both private and public buildings – that more and

more lifts are being marketed that are built as per the Machinery Directive. It is assumed that a disproportionate share of such systems has not been registered.

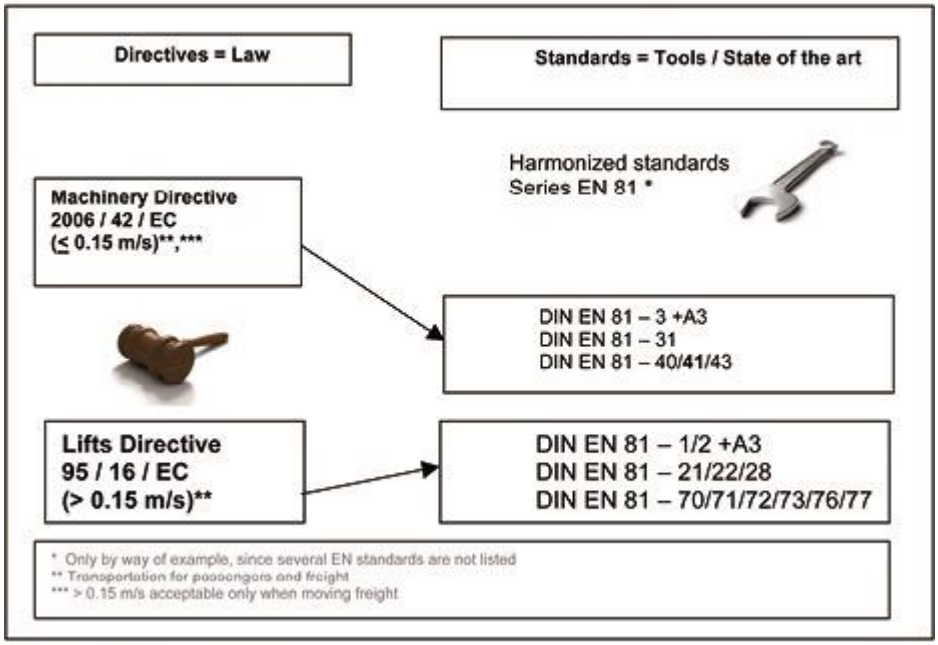

Table 4: Lift inspections

Inspection	Systems requiring special surveillance	Working equipment
Prior to commissioning	Certified inspection agency as per the 9th ProdSV* (Qualified person as per the 12th ProdSV*)	Qualified person
Recurring (main and interim inspections)	Certified inspection agency	Qualified person
Following an accident or damage	(Certified inspection agency)	Qualified person
After modifications or repairs	Certified inspection agency	Qualified person
Following major modifications	Tantamount to marketing anew, as per the 9th or 12th ProdSV*	Tantamount to marketing anew, as per the 9th or 12th ProdSV*
Prior to restarting an lift which has been out of service for an extended period of time	Certified inspection agency	Qualified person

* ProdSV = Verordnung zum Produktsicherheitsgesetz = Implementing order for the Product Safety Act

Table 5: Allocation of the types of elevators and the installation regulations/ maximum inspection intervals

Type of elevator	Regulation (example)	System requiring special surveillance	Working equipment	Main inspection	
				Every 2 years	Every 4 years
Passenger elevator in residential building	EN 81-1/2	+ (1)	+ (1)	X	
Passenger elevator in public building or building used for commercial purposes	EN 81-1/2	+	+	X	
Freight lift (which can carry passengers, as well)	EN 81-1/2	+	+	X	
Freight lift that is large enough for a person to enter (but without passenger conveyance); simplified freight lift	EN 81-31	-	+		X (4)
Service lift	EN 81-31	-	+		X (4)
Paternoster	Formerly TRA* 500	+	+	X	
Mill lift	Formerly TRA* 600	+	+ (2)	X	
Façade lift	EN 1808	+	+		X (3)
Construction lift, also for passengers	EN 12 159	+	+	X	
Inclined stairlift	EN 81-40	Only in the case of falling hazard above 3 m height	Only when used by employees		X (3)
Platform lift (simplified lift for handicapped persons)	**EN 81-41**	**Only in the case of falling hazard above 3 m height**	**Only when used by employees**		**X (3)**

(1) Except in the case of private use, when the elevator is not intended for use by employees, and provided that the technical regulations for construction do not specify anything to the contrary

(2) Except in small mills, when no employees use the lift

(3) Mandatory where there is a hazard of falling more than 3 meters (system requiring special surveillance); recommendation for fall height of up to 3 meters (not a system requiring special surveillance)

(4) Recommendation for this kind of working equipment

* Technische Regeln für Aufzüge = Technical Rules for Elevators

Experience shows that systems like this, built according to the Machinery Directive, do not exhibit the same safety technology level as those complying with the Lifts Directive. As was mentioned above, these systems are often installed by “private” operators and thus cannot be made equivalent to normal elevators.

In principle, lifts as per the Machinery Directive should be no less safe than units engineered in accordance with the Lifts Directive. In actual fact, however, elevators complying with the Machinery Directive are turning up in the accident statistics ever more frequently. In some cases these are quite serious accidents, which one would not expect for lifts designed as per the Lifts Directive.

Example: April 25, 2011, in Pfelling (Straubing) [2]

Two ladies, aged 79 and 71, fell with a homemade lift and, as a consequence, suffered serious injuries. The late husband of the older woman had attached this outdoor lift to their single-family home years before. This comprised a platform measuring 1.5 square meters. It was fitted with a railing and was driven by an electric motor and steel rope. The 79-year-old, using her wheeled walker and accompanied by her friend, 71 years of age, had boarded the lift, intending to travel to the upper floor. At a height of about two meters, the steel rope parted; the platform fell. Both women incurred severe injuries in the fall.

In summary:

Many accidents could be prevented if lifts were built according to the Machinery Directive. Thus during commissioning, marketing and the safety evaluation (risk assessment), the same requirements should apply as for “normal elevators”.

6 Equipment as per the Machinery Directive, 2006/42/EC

6.1 Alternate lifting gear

Falling under the purview of the Machinery Directive (2006/42/EC) are, as previously mentioned, not only elevators but also other types of lifting gear.

a) Underfloor platform lift (see Fig. 3)

b) Laboratory lifts/Dumbwaiters (see Fig. 4)

c) Pallet lift (see Fig. 5)

d) Platform lifts (see Fig. 6, 7 and 8)

e) Special-purpose lifts (see Fig. 9)

f) Stairlift (see Fig. 10 and 11)

Figure 3: Lerch Aufzüge AG

Figure 4: Avanti Liftsysteme

Figure 5: Avanti Liftsysteme

Figure 6: Lift-Reith GmbH Co. KG

Figure 7: Högg Liftsysteme

Bild 8: Verralift

Figure 8:

Figure 9: Lift-Reith GmbH Co. KG

Figure 10: Lift-Reith GmbH Co. KG

Figure 11: Süd Lift

6.2 Creating a lift as per the Machinery Directive at the Wittur Group

At Wittur, safety was always in the foreground when developing a so-called “lift as per the Machinery Directive”. A lift was developed which is very similar to an elevator complying with the Lifts Directive:

- With a rated speed of $v \leq 0.15$ m/s
- Using certified safety components exclusively
- With a fully enclosed car
- With automatic, energy-efficient car door
- With a deadman circuit

- Which can be used simultaneously by a person in a wheelchair and a second, standing person

Since there was no harmonized standard, Wittur's HHL W Line was based on the Machinery Directive (2006/42/EC), the Lifts Directive (95/16/EC), and the standards mentioned below.

The topics of ecology and energy savings were consistently observed during the development and enginee-ring of the HHL W Line. The car was designed using modern FEM analyses to optimize materials thicknesses and thus to reduce raw material consumption. The Wittur ECO door drives used here consume an average of just 11 W when opening or closing.

The Wittur maxim "Excellence in Solutions" affected the HHL W Line in regard to three essential items:

- Machine-room-less lift system
- Nominal rated load (number of passengers): 250 kg (3)/315 kg (4)/ 385 kg (5)
- Rated speed: max. 0.15 m/s
- Enclosed car or lift platform
- EC type approval with certification by the TÜV in accordance with the Machinery Directive (2006/42/EC)

7 Summary

Lifts engineered to the Machinery Directive are certainly on the advance, since the market for transporta-tion means facilitating access to residential buildings, resulting from the mandate to achieve barrier-free access, exists. This market will continue to grow in coming years due to the demographic change in society.

At the German and European levels (e.g. VDMA, VFA, ELA, CEN), attention is being turned to this subject. Currently being discussed is the development of a new, autonomous standard for low-moving lifts (in the past SSL = Slow Speed Lift, today LSPE = Low Speed Passenger Elevator).

Trends indicate that these so-called "LSPEs" are used primarily in private homes, in smaller office and ad-ministrative buildings, and in hotels. The reason for this is that the number of older people and those with limited mobility will rise significantly in coming years. A rated speed of 0.15 m/s and the ability to cover two to three stories is, as a rule, sufficient for this type of lift. In these lifts, greater attention is paid to accessibility, use and control, and the amount of space required. The LSPEs should be similar to a standard lift in every respect, which is why automatic car doors and a fully enclosed car are required. Intelligent electronics make the LSPEs ecologically benign and energy efficient. The most important point, however, is the safety of the users and the maintenance personnel. In order to ensure this, it is necessary to outfit these lifts with all the relevant, certified safety equipment to guarantee that they can be installed in all types of buildings.

This is the reason why the lift as per the Machinery Directive is on the advance and will most certainly conquer its sector of the market!

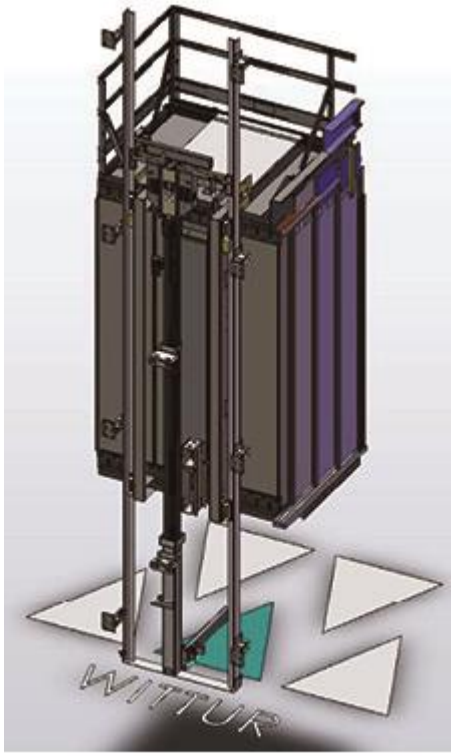

Figure 13: HHL W Line

Figure 14: Certificate for HHL W Line/Annex

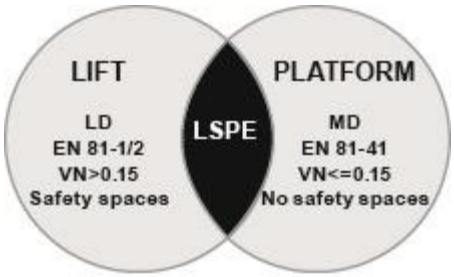

Figure 15: Applications for the LSPE (Low Speed Passenger Elevator)

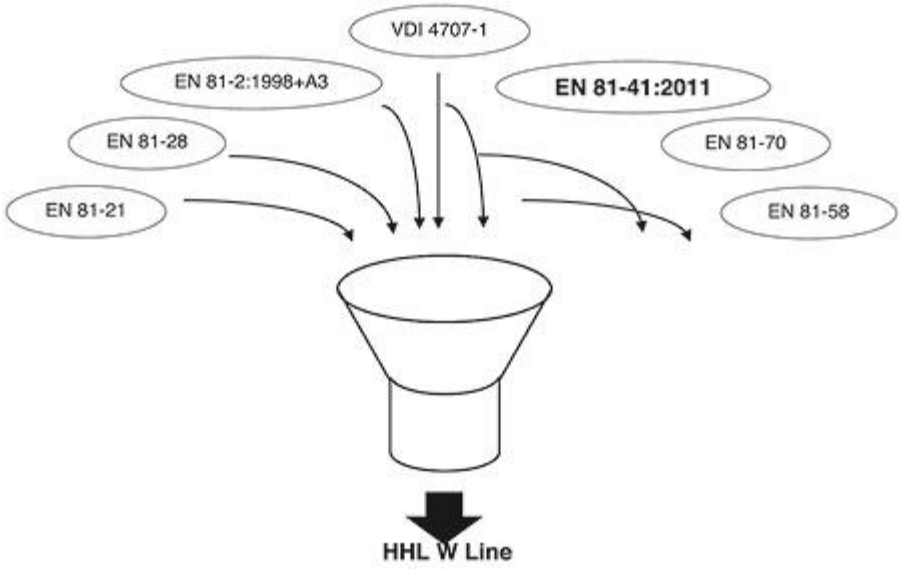

Figure 12: Creation of the HHL W Line

Annex

[1] Published by the Build for All project partners, Info-Handicap, Luxembourg (www.build-for-all.net)
[2] Published in Wochenblatt, newspaper for the Straubing region (www.wochenblatt.de)

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Info

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completed an apprenticeship in diesel engine construction at the M.A.N. company in Augsburg and then was certified by the Chamber of Industry and Commerce as a mechanical engineering technician.

In 1981 joined Bauer Aufzug as the manager of the lift drive technology department. As of mid-1985, he was employed by Kone in Germany. There he assumed a variety of management positions in the fields of engineering, development and methods, inspections, and lift modernization.

Wolfgang Adldinger has worked for the Wittur Group in Germany since 1994, initially as manager of the section specializing in industrial applications. Today he is active in Wittur Deutschland Holding GmbH and is the technical director responsible worldwide for the fields of standards and regulations, certification, patents and brands. The company's headquarters are located near Munich.

Wolfgang Adldinger chairs the committee for components at the ELA in Brussels. He is a member of numerous national and international lift committees, such as the CEN.

1) WITTUR Deutschland Holding GmbH, 85259 Wiedenzhausen